COLORADO RIVER RECOVERY PROGRAM
FY 2014 ANNUAL PROJECT REPORT

RECOVERY PROGRAM
PROJECT NUMBER: 126a & 126b

I. Project Title: **Removal of Smallmouth Bass in the Upper Colorado River between Price-Stubb Dam near Palisade, Colorado, and Westwater, Utah.**

II. Bureau of Reclamation Agreement Number(s): R13PG40018

Project/Grant Period:
Start date (Mo/Day/Yr): 6/3/2013
End date: (Mo/Day/Yr): 9/30/2017
Reporting period end date: 9/30/2014
Is this the final report? Yes _____ No _X_

III. Principal Investigator(s):

Travis Francis, Fish Biologist
Dale Ryden, Project Leader
U.S. Fish and Wildlife Service
445 West Gunnison Ave., Suite 140
Grand Junction, Colorado 81501
Phone: (970) 628-7204
Fax: (970) 628-7217
Email: travis_francis@fws.gov
dale_ryden@fws.gov

IV. Abstract: The purpose of this study is to remove as many non-native smallmouth bass as possible, of all size-classes, from main channel riverine habitats in two distinct sections of the Colorado River: 1) a 66-mile reach from between the Grand Valley Water User's (GVWU) dam in CO, downstream to the Westwater boat landing in eastern UT; and 2) a 45-mile reach between Rifle and Beavertail Mountain in CO. This is the eleventh year of this study, which started in 2004. Although we were tasked with completing eight passes in these reaches in 2014, we were able to complete up to eleven passes in some reaches based on extra available resources.

We removed 1,120 smallmouth bass, 1,394 largemouth bass, 107 walleye, and various amount of other nonnative fish in 2014. Catches of age-0 smallmouth bass indicate a weak year class (< 100 mm) was produced in 2014 in the Grand Valley reaches of the Upper Colorado. The catch rate for juvenile size smallmouth bass < 100 mm declined precipitously (80%) from 2013. Catches of largemouth bass in 2013 and 2014 suggest that survival of juvenile largemouth bass to adults in the river is relatively low. Experimental removal efforts for walleye demonstrated higher catches in the fall than the spring. All walleye captured were adults. Adult walleye pose a particularly high threat to native species recovery because of their overlapping niche and their high predatory threat – demonstrated by the discovery of two juvenile Colorado pikeminnow found in the stomachs of walleye during our efforts.

V. Study Schedule: 2004-Ongoing

VI. Relationship to RIPRAP:

Colorado River Action Plan: Mainstem

III. Reduce negative impacts of nonnative fishes and sportfish management activities.

III.A. Develop and implement control programs in reaches of the Colorado River occupied by endangered fishes.

VII. Accomplishment of FY 2014 Tasks and Deliverables, Discussion of Initial Findings and Shortcomings:

Task 1. Remove all sizes of smallmouth bass, other centrarchids, and other non-native species as deemed appropriate and described in state (Colorado and Utah) collection permits.

Task completed. The FY 2014 scope of work called for eight removal passes in the Grand Valley; however, with additional employees and equipment available we expanded our effort from eight to eleven passes depending on the reach (see methodology below).

All age groups of smallmouth bass (age-0, juveniles, and adults) were present in the 2014 summer collections. These ranged from age-0 (42 mm) to adult (411mm) fish with a mean of 201 mm. A total of 1,120 smallmouth bass were removed, including 53 considered piscivorous competitors to Colorado pikeminnow (≥325mm). A weak year class of smallmouth bass (< 100 mm) was produced in 2014 in the Grand Valley reaches of the Upper Colorado, as only 86 were collected and removed (Figure 4). In fact, the catch rate for juvenile size fish < 100 mm declined precipitously (80%) from 2013 from 3.33 fish/hr to 0.17 fish/hr, similar to catch rates during 2004, 2008, 2009 and 2011 (Figure 6). During 2014, the catch rate for all size classes of smallmouth bass declined 46% to 95% (≥ 200mm 46%, 100-199mm 78%, > 100mm 95%), most likely in response to a larger in magnitude and longer in duration spring runoff. In 2014, the highest rate of removing UCRRB defined 'piscivorous sized (> 325mm)' smallmouth bass occurred from Cisco, UT to Dewey Bridge, UT at 0.9 fish/hr (n=20; Figure 4).

A total of 1,394 largemouth bass were removed from all reaches, in 2014, a substantial decrease from 2012's catch (n = 5,227, Table 2), but similar to 2013's catch. Our catch ranged from age-0 fish (31 mm) to adult fish (674 mm) with a mean of 97 mm (Figure 2). Twenty one were of a piscivore size (≥ 325 mm TL) and are considered a competitive threat to Colorado pikeminnow. Our catch was also proportionate in size classes to our 2013 catch: 97% (n=1,349) were less than 250 mm, 76% (n=1,052) were less than 100 mm and only 3% (n=50) were adults greater than 250 mm. 2013 and 2014 data suggest that survival of juvenile largemouth bass to adults in the river is relatively low due to the very low number of adult fish (i.e., >250 mm) in electrofishing collections vs. the high number of juvenile size fish.

A total of 107 walleye were removed from Cisco to Potash, UT, in Fall 2014, a substantial increase from 2013's catch (n=23; Table 3, Figure 3); however, an increase in effort was also expended. Our spring 2014 removal efforts, conducted while collecting Colorado pikeminnow for abundance estimation from Cisco, UT to the confluence of the Green River, resulted in 109 walleye removed (Table 3, Figure 3). This is a substantial decrease from 2013, when 268 walleye were removed. In 2013, our catch also consisted of all adults, with their total lengths ranging from 346 mm to 600 mm (mean = 484 mm) (Figure 3). Large numbers (n=368) of walleye captured during our spring 2013 & 2014 Colorado pikeminnow collections in lower reaches of the Colorado River (RMI 111.0 to 0.0) warranted additional investigation in these reaches during the summer and fall. Additional removal passes ranged from one to three depending on reach from RMI 111.0 to RMI 47.2.

Task 2. a) Analyze data; b) Prepare annual RIP reports.

Task completed. Report submitted to the Program Office in November, 2014.

B. Findings (2014 Highlights)

General

Study Direction. The removal of centrachids from the Colorado and Gunnison rivers under Recovery Program guidance began in 2004. From 2004 to 2011, the Grand Valley portion of the study area encompassed a 61-mile section of the Colorado River in western Colorado from the Price-Stubb Dam to the Westwater, UT BLM River Ranger Station, and a 2.3-mile section of the Lower Gunnison River from the Redlands Diversion Dam to the Colorado/Gunnison River confluence. In 2014, the study area was lengthened 72 miles including river segments from GVWU dam (RMI 193.7) to Price-Stubb Dam (RMI 188.3) and Westwater Ranger Station, UT (RMI 127.6) to Westwater Wash (RMI 124.8), and Cisco boat launch, UT (RMI 111.0) to Potash boat launch, UT (RMI 47.2).

Upstream portions of the study area have changed over time as well. During 2004, 2005, and 2006, a 45-mile reach of the Upper Colorado River from the Rifle Bridge (RMI 240.4) to Beavertail Mountain in Debeque Canyon (RMI 195.7) was sampled with raft electrofishing. In 2007 and 2008, a 7.6-mile reach from Silt to the Rifle Bridge was added to assess distribution of smallmouth bass upstream of Rifle. This reach was eliminated from sampling in 2009 because only one smallmouth bass was collected in this reach in 2007 and 2008. During 2011, the number of passes in this 45-mile reach was reduced from three to one. Moreover, the only reaches sampled during 2011 were from Rifle to Rulison and Rulison to Cottonwood Park boat landing at Parachute, CO (RM 222.2). Starting in 2012 and continuing through 2014, CPW conducted all of the removal (see PPR) from Silt to Beavertail Mountain.

Project study goals in 2013 were slightly modified to that of 2007 through 2012. An abundance estimate for juvenile (100-199 mm) and adult (≥ 200 mm) smallmouth bass in concentration areas of the Grand Valley reaches of the Upper Colorado and Lower Gunnison rivers was calculated in 2006-2012; however, an abundance estimate will not be calculated for 2013 or 2014. Catch per effort (CPE) has been calculated for all years

of the study, throughout all of the reaches and will be calculated for 2014 as a metric to compare yearly fluctuations of non-native fish populations and size classes.

Methodology

General

In 2014, up to eleven removal passes were made using raft-based electrofishing to collect non-native fishes in the Colorado and Gunnison Rivers in Colorado and Utah (Table 7). Colorado Parks and Wildlife (CPW) performed the removal between Rifle and Beavertail Mountain, while the U.S. Fish and Wildlife Service (FWS), Grand Junction Colorado River Fisheries Project (CRFP) office completed all other passes. Two electrofishing craft were used in every river segment during the removal passes.

Although smallmouth bass were the target fish for removal in this project, all other centrarchid fishes encountered were collected and removed. These fishes included largemouth bass, green sunfish, bluegill, and black crappie. All gizzard shad, grass carp, walleye, perch, and northern pike encountered were also collected and removed. Starting in 2013, the majority of white sucker and white sucker x native sucker hybrids encountered were also collected and removed (Figure 8). All fishes removed were frozen and then taken to the Mesa County landfill. Number of individuals collected, total length, and weight were recorded for most non-native fishes caught and removed. Capture date and corresponding river mile for each non-native fish collected were recorded along with actual time electrofished (seconds; converted to hours fished).

Catch Rate

Catch rate or catch/effort (CPE) is often used as an index of population size if it is consistently proportional to absolute abundance (Ricker 1975). Unfortunately, catch/effort can be highly variable and is not the most reliable metric for population analyses or comparing trends in population abundance densities among years (Hangsleben et al. 2013). It is more likely that unexplained variations in capture probability or "catchability" (not catch per unit of effort per se) preclude the use of catch per unit of effort as an abundance estimate. However, it was determined during the UCRRP 2012 Non-native Workshop that CPE will suffice as an index of population size during most years (starting in 2013), and that during an as yet to be determined interval (e.g. every third year) a mark-recapture abundance estimate will be performed to track actual abundance of smallmouth and largemouth bass in the Colorado River.

The initial study objective (during 2004 and 2005) was to lethally remove as many smallmouth bass and other centrarchids as possible; as such, fish were not marked and released and a population estimate was not possible. For those years' data, effort was recorded, catch/effort (CPE) was calculated, and CPE was used to monitor increases and declines in centrarchid populations. To determine if densities of smallmouth bass and largemouth bass were being depleted as a result of the removal effort, catch effort indices (e.g., fish/hr) over time (i.e., by pass) in each river sub-reach were calculated and interpreted. Because population estimates for smallmouth bass were not available for 2004, 2005, and now 2013 and 2014, effort was still recorded during 2006-2012 and catch/effort was computed for use as a trend to compare annual abundance of smallmouth

bass and other centrarchids during 2004-2013. Where abundance estimates were not performed for a population statistic, catch/effort was a useful metric in comparing relative abundance and interpreting year class strengths among years, particularly for juvenile smallmouth and largemouth bass (< 100 mm, Tables 1-2 & 4; Figures 4-7).

Results and Conclusions

Results presented herein are a compilation of the efforts of the FWS in the Grand Valley reaches, Ruby-Horsethief reaches, and Cisco to Potash reaches of the Upper Colorado River during 2014. Removal passes performed by the CPW in the Upper Colorado River between Silt and Beavertail Mountain are also reported here. Data are presented for main channel habitats only. This includes backwaters that are hydrologically connected to the mainstem river. Integration and comparison of results from earlier years (2004-2013) of this study are provided where appropriate.

Size Distribution–Length Frequency.

Smallmouth Bass

Length frequency distribution of all sizes of smallmouth bass collected with electrofishing during 2014 between Rifle, CO and Potash, UT were plotted (Figure 1). All age groups of smallmouth bass (age-0, juveniles, and adults) were present in the 2014 summer collections. These ranged from age-0 (42 mm) to adult (411mm) fish with a mean of 201 mm. A total of 1,120 smallmouth bass were removed, including 53 considered piscivourous competitors to Colorado pikeminnow (≥325mm). A weak year class of smallmouth bass (< 100 mm) was produced in 2014 in the Grand Valley reaches of the Upper Colorado, when considering only 86 were collected and removed (Figure 4).

In 2009, age-0 smallmouth bass were first detected in the Grand Valley reaches starting in mid-August (39 mm total length). Length frequency comparison between 2008 (see 2008 annual report no. 126(a)) and 2009 suggest that the 2009 year class may be stronger than 2008. However, overall catch rates for juvenile smallmouth bass (< 100 mm) in the Grand Valley sections of the Upper Colorado and Lower Gunnison rivers are almost identical during these two years (Figure 6).

However, in 2010, there was some reason for concern. The highest number of juvenile smallmouth bass (< 100 mm) from the Grand Valley reaches of the Upper Colorado and Lower Gunnison rivers during this eight-year study was collected in 2010. The catch rate for this juvenile size class of fish (C/E=5.82 fish/hr, n=2,054) exceeded catches during the 2007 removal passes (C/E=4.15 fish/hr, n=1,358) (Table 1). A strong year class of smallmouth bass was produced in 2007 which was documented throughout upper Colorado River basin rivers. During the 2010 marking pass in the Grand Valley reaches, age-0 smallmouth bass were first detected during the last week of July (31 mm).

In 2014, the catch rate for juvenile size fish < 100 mm declined precipitously (80%) from 2013 from 3.33 fish/hr to 0.17 fish/hr, similar to catch rates during 2004, 2008, 2009 and 2011 (Figure 6). The hypothesized reason for this decline was the prolonged large (magnitude) discharge from the 2014 spring runoff. Elevated discharge extended into July, which delayed the warming of river waters. Decreased and prolonged cooler river

temperature may have resulted in smallmouth bass delaying spawning, larvae hatching later, or even weak, young smallmouth bass being swept away from nests or quiet near-shore habitat resulting in high mortality. This in turn probably led to a shorter growing season and, ultimately, reduced growth for age-0 smallmouth bass. In any event, these environmental conditions probably lead to a shorter growing season and a weak year class of smallmouth bass in 2014.

In 2012, a smaller (magnitude) and shorter (duration) than average peak runoff season and lower (magnitude) and longer (duration) base flows, that began earlier in the season hypothetically produced an increase in our catch rate for juvenile and age-0 size fish < 100 mm from .55 fish/hr (2011) to 2.62 fish/hr (2012). 2013 was a similar hydrologic year to 2012 with the exception of a few rain spikes in late summer and throughout the fall; once again, hypothetically two years of drought aided in increasing our juvenile and age-0 size fish < 100 mm catch rate even more to 3.92 fish/hr (third highest catch rate since project inception, Figure 6).

In some river segments (15-mile reach [GVIC Diversion Dam to the Colorado/Gunnison River confluence], 18-mile reach [Colorado/Gunnison River confluence to the Loma Boat Landing], smallmouth bass reproduced during 2011 as they did between 2004 and 2010. It cannot be proven if these fish were produced in the river, or in off-channel habitats (e.g., ponds or irrigation returns that connect to the main river) and later escaped to the river. In the Grand Valley reaches, the numbers of smallmouth bass within the 2008 and 2009 year classes (<50mm or <100mm) were noticeably less than those of the three previous years (2005, 2006, and 2007) as shown by catch rate data. Catch rates for smallmouth bass < 100 mm declined significantly from the high in 2007 (4.15 fish/hr) to 0.63 fish/hr in 2008 and 0.55 fish/hr in 2009 (Table 1; Figure 6). Except for the 2007 and 2010 year classes, young smallmouth bass (<100mm) have proven to be highly susceptible to low survival to age-1. The strong 2012 year class (age-0) coupled with the strong 2013 year class (age-0) have produced enough individuals to provide concern as to how many adults (> 200 mm) have survived (Figures 1 & 5).

Largemouth Bass

A total of 1,389 largemouth bass were removed from all reaches, in 2014, a substantial decrease from 2012's catch (n = 5,227, Table 2), but similar to 2013's catch. Our catch ranged from age-0 fish (31 mm) to adult fish (674 mm) with a mean of 97 mm (Figure 2). Twenty one were of a piscivore size ($\geq$ 325 mm TL) and are considered a competitive threat to Colorado pikeminnow. Our catch was also proportionate in size classes to our 2013 catch: 97% (n=1,349) were less than 250 mm, 76% (n=1,052) were less than 100 mm and only 3% (n=50) were adults greater than 250 mm.

Specifically, in 2013, a total of 1,174 largemouth bass were collected during the six removal passes. Ninety seven percent (n=1,135) of these fish were less than 250 mm; and 59% (n=693) were less than 100 mm. Only 3% (n=47) of the total number of largemouth bass were greater than 250 mm. 2013 and 2014 data suggest that survival of juvenile largemouth bass to adults in the river is relatively low due to the very low number of adult fish (i.e., >250 mm) in electrofishing collections vs. the high number of juvenile size fish.

Walleye

A total of 107 walleye were removed from Cisco to Potash, UT, in Fall 2014, a substantial increase from 2013's catch (n=23; Table 3, Figure 3); however, an increase in effort was also expended. Our catch consisted of all adults, with total lengths ranging from 370 mm to 641 mm (mean = 496 mm) (Figure 3). Our spring 2014 removal efforts, conducted while collecting Colorado pikeminnow for abundance estimation from Cisco, UT to the confluence of the Green River, resulted in 109 walleye removed (Table 3, Figure 3). This is a substantial decrease from 2013, when 268 walleye were removed. In 2013, our catch also consisted of all adults, with their total lengths ranging from 346 mm to 600 mm (mean = 484 mm) (Figure 3).

Actual Numbers.

During 2004, 2005, and 2006 the number of removal passes were identical (4) and direct comparison of actual numbers of fish removed was justified. However, starting in 2007 and continuing through 2010, four additional removal passes were added. In 2011, two additional removal passes were added to bring the total number of passes to ten. In 2012 and 2013 passes were reduced to six. 2014 increased passes from eight to eleven depending on reach. Therefore, comparing actual numbers of fish removed per pass or by combining passes and river reaches with the earlier sampling years is not warranted. Actual numbers of smallmouth bass removed are provided among the various figures and tables by major river section and year in the attached appendices.

There is one location that could be consistently used to compare total number of fish captured to establish annual trends. This is the fish trap at the Redlands Diversion Dam fish passageway on the Lower Gunnison River. The number of smallmouth bass collected in the fish trap of the Redlands Diversion Dam passageway has been recorded for 18 years. From 1996–2001, only one smallmouth bass was captured. However, 13 were collected in 2002, 6 in 2003, 9 in 2004, and 21 in 2005. Keeping with the pattern of lower smallmouth bass catches in main channel habitats, no smallmouth bass were found in the Redlands fish trap during 2006 or 2007. In 2008, four smallmouth bass were collected in the Redlands fish trap, none in 2009, and three in 2010 . No smallmouth bass were collected at Redlands in 2011. 2012 produced the third largest total of smallmouth bass (n=14) collected at Redlands. The largest annual catch of smallmouth bass in the Redlands fish trap was 2013 (n=22). Only two smallmouth bass were collected in 2014.

Catch/Effort.

General

Mean catch/effort (fish/hr) was computed separately for smallmouth bass and largemouth bass for each of the ten sampling years, 2004-2013 (Tables 1 & 2; Figures 4, 5, & 6). To view the "big picture", for some analyses, river reaches and removal passes were consolidated. Catch rates were computed separately from the Rifle to Beavertail Mountain reaches, the Grand Valley River reaches (Government Highline Dam to Westwater Wash, UT, plus the Lower Gunnison River), and the Cisco to Potash, UT reaches.

Effort Fished

Electrofishing effort in 2004 (168.665 hours) was similar to 2005 (174.560 hours) between Price Stubb Dam and the Westwater, UT, ranger station and the Lower Gunnison River. In 2006, electrofishing effort in these reaches was 161.906 hours. The electrofishing effort increased to 327.101 hours in 2007 because of the addition of four removal passes. The total effort (1 marking and 8 removal passes) during 2008 was 349.889 hours. In 2009, the total effort (1 marking and 8 removal passes) was 416.851 hours. A 3.9-mile reach between Government Highline Dam (GVWU) and the Cameo XCEL Bridge was added in 2009 which accounts for some of the increased effort in 2009 over earlier years. In 2010, the total effort was (1 marking and 8 removal passes) was 413.555 hours. In 2011, the total effort was (1 marking and 10 removal passes) was 449.934 hours. Effort was decreased in 2012 because low water levels in certain reaches (2.3-mile section of the Lower Gunnison River from the Redlands Diversion Dam to the Colorado/Gunnison River confluence, the additional reach between the Government Highline Dam and the Cameo Bridge, and from Cameo Bridge to GVIC) made them impassible by electrofishing craft. In addition, no passes were conducted from Loma boat landing to Westwater Ranger Station. Three pre-marking passes, one marking pass, and six post-marking passes expended 290.326 hours of electrofishing effort. In 2013, six removal passes between GVWU dam and Loma boat launch and three removal passes from Loma to Westwater Ranger Station expended 364.39 hours of electrofishing effort. An additional 2.8 mile reach (Westwater Ranger Station to Westwater Wash) and eight to eleven passes per reach significantly increased our effort by 29% to 511.19 hours of electrofishing effort in 2014.

Between Rifle and Beavertail Mountain, the effort expended in 2004 was 19.750 hours compared to 39.799 hours during 2005 and 37.512 hours during 2006. During 2007, electrofishing effort increased to 86.84 hours which was related to adding the river reach from Silt to Rifle and an additional removal pass from Silt to Beavertail Mountain. In 2008, the total effort was 86.038 hours, which was almost identical to 2007. The total effort during 2009 was 62.321 hours and in 2010, 78.985 hours. During 2011, the total effort (12.626 hours) was much less than former years due to only one pass being performed and some reaches not being sampled. In 2012 and 2013, CPW conducted two passes; one pass included two boats electrofishing both banks in all reaches except the reach between Parachute and Debeque, and the second included electrofishing all backwaters and slack water sloughs in the same reaches this pass also included experimental gill netting effort. In total, CPW expended 45.68 electrofishing hours in 2012, 54.58 hours in 2013, 44.2 hours in 2014, and 10.8 gill net hours in 2012, 5.2 hours in 2013, and 0 sill net hours in 2014. The increased effort was in response to the increase in northern pike catch in this reach in 2011.

In response to an elevated catch of walleye (n = 268) by our crews during our spring 2013 Colorado Pikeminnow abundance collections from Cisco, Utah to the confluence of the Green River (Table 3), 73.6 hours of electrofishing effort was expended in 2013 and 254.83 hours of effort was expended in 2014 experimentally to target walleye from Cisco to Potash, Utah.

Smallmouth Bass

For the Grand Valley river reaches, the trend for smallmouth bass relative abundance from 2006-2009 was downward. Overall mean catch rate was highest for smallmouth bass juveniles (100-199 mm) and adults (≥ 200 mm) during 2004 (6.37 fish/hr) and 2005 (6.36 fish/hr). However, a 51% decline in catch rate was detected from 2005 to 2006. In 2007, the catch rate dropped even lower to a 4-year low (2.27 fish/hr; 27 % decline from 2006, Figure 4). And again in 2008 and 2009, the overall catch rate continued to decline to 1.19 and 0.9 fish/hr, respectively. This catch effort decline is consistent with the decline observed with the population estimate between 2006 and 2007, and between 2007 and 2008 (Table 3). During 2010, the catch rate for smallmouth bass > 99 mm (0.98 fish/hr) increased slightly from 2009. During 2011 and 2012, another increase in catch per effort occurred from the juvenile and adult size classes to 1.83 and 2.55 fish per hour, respectively. A large recruiting class of smallmouth < 100 mm collected in 2012 represented the third highest catch rate of juvenile and adults, in 2013 (5.57 fish/hr). During 2014, the catch rate for all size classes of smallmouth bass declined 46% to 95% (≥ 200mm 46%, 100-199mm 78%, > 100mm 95%) most likely in response to a larger in magnitude and longer in duration spring runoff.

During the summer of 2010, for the Grand Valley river reaches, overall mean catch rate for smallmouth bass < 100 mm total length was the highest in this eight-year removal study (5.82 fish/hr). Formerly, 2007 had the highest catch rate (4.15 fish/hr) and the lowest was this year 2014 (0.17 fish /hr) (Table 1; Figure 6). Initially, it appeared that the 2007 cohort was one of the strongest in five years of sampling between 2004 and 2009. However, the 2010 cohort exceeded the strong year class of 2007. These young life stages can be subject to high mortality to age-1 due to a myriad of environmental factors over the winter. Small age-0 smallmouth bass going into winter may be susceptible to higher overwinter mortality because their relatively small body size limits energetic reserves that may run out before spring arrives. Therefore, overwinter survival is not known until the following summer sampling season. The 2011 catch rates for the juvenile size class (100-199 mm) increased from 0.45 fish/hr in 2010 to 1.47 fish/hr in 2011, a 3.3 fold increase. The 2012 catch for juvenile smallmouth bass was 1.09 fish/hr. The juvenile catch for 2013 was second in size only to 2004 (2013 – 3.52 fish/hr, 2004 3.66 fish/hr; Table 1). The strong year classes produced in 2007, 2010, 2012 and 2013 recruited to the adult smallmouth bass population which may contribute to the persistence of this species in the Grand Valley reaches of the Upper Colorado and Lower Gunnison rivers.

It also appeared that a weak year class was produced in 2014 (0.17 fish/hr) and 2008 (0.63 fish/hr)(Table 1; Figure 6) since this study commenced in 2004. The high spring flows during the 2014 and 2008 runoff in the Upper Colorado River could have swept weak swimming young smallmouth bass away from nests or quiet near-shore habitat resulting in high mortality. From catch/effort comparisons, the 2011 (0.55 fish/hr) and 2009 year class (0.55 fish/hr) also appeared to be similar to 2014 and 2008.

The hydrologic conditions of 2008, 2009, 2011, and 2014 in the Upper Colorado River were similar, 2011and 2014 being the most dramatic because of the prolonged high discharge extending into July. These four years have been characterized as average or moderately wet with sustained runoff compared to former years (2003-2007, 2010, and

2012) and 2013 that were dryer with shorter runoff magnitude and duration. The four wetter years with accompanying prolonged cooler water temperatures may have disrupted or delayed spawning resulting in slower growth of early-life stages (i. e., age-0) of smallmouth bass, and ultimately reducing survival and recruitment. However, 2012's catch of juvenile (100-199 mm) smallmouth bass (1.09 fish/hr) suggests 2011's recruitment may have been negatively impacted but a mild winter may have allowed for better survival of the few that were still alive after the high run-off.

Survival of smaller age-0 fish entering the winter period could be reduced under these hydrologic scenarios. The timing or detection of the first captures of age-0- smallmouth bass may provide one means to predict recruitment success into later years. For example, the first date age-0 smallmouth bass were detected in wetter years (2008, 2009) in which weak year classes were produced was 8 and 14 of August, respectively. It appears that smallmouth bass spawned later in 2011 than any previous years of this eight-year study. In 2011, age-0 smallmouth bass were first detected on 24 August (n=3; 22, 35, and 46 mm). Other age-0 smallmouth bass (n=12; 25-32 mm) were collected between 5 October and 11 October. Compared to dryer years, 2007, in which a strong year class was produced, age-0 fish were first detected on 23 July, some 2-3 weeks earlier than 2008 and 2009. In 2010, age-0 smallmouth bass were first detected on 28 July. In 2012, the earliest detection of age-0 fish (n=6; 36 – 56 mm) occurred on 21 June, a full month earlier than the strong year class detected in 2007. In 2013, crews were not out in the field in June; however, they were out in early July and had an early first detection of age-0 fish (n=15; < 70 mm) on the 9 July. One anomaly in this theory occurred in 2014, a wet year that still had an age-0 smallmouth bass collected 1 July (86 mm) however; this fish may have been produced in an off channel source.

Catch rate for all length sizes of smallmouth bass, in the reaches between Rifle and Silt, decreased to 0.44 in 2014 from 0.62 in 2013. These values are an increase following a drop in mean catch per effort in 2012 (0.09 fish/hr), the lowest value was achieved during 2009 (0.24 fish/hr) compared to 2011 (0.49 fish/hr), 2010 (0.92 fish/hr), 2008 (0.95 fish/hr), 1.04 fish/hr (2007), 2.11 fish/hr (2006), and highest during 2005 (5.75 fish/hr; Table 1). Spawning success in these reaches appears not to be as successful as that in the Grand Valley reaches. Age-0 (< 100 mm) smallmouth bass catches have been less than that of the Grand Valley reaches throughout the eight-year project. Only 57 age-0 smallmouth bass (0.72 fish/hr) were collected in these upper reaches during 2010. No age-0 smallmouth bass were collected in these upper reaches during 2009 or 2011. One age-0 smallmouth bass was collected in 2012, four were collected in 2013, and 8 were collected in 2014. Only one smallmouth bass (237 mm) was collected between Rifle and Silt at RM 241.2 during 2007 and 2012; none were collected during 2008. Mean catch rates for smallmouth bass < 100 mm was the lowest in 2004 (0.15 fish/hr); the highest was during 2005 (1.46 fish/hr; Table 1). During 2013 and 2014, the catch rate for smallmouth bass < 100 mm was 0.07 fish/hr and 0.14 fish/hr, respectively.

Catch rates for all length sizes of smallmouth bass in Ruby-Horsethief Canyon (Loma to Westwater Ranger Station, UT) were consistently low from 2004 to 2012 ranging from a low in 2007 and 2008 of .07 fish/hr to a high in 2011 of 2.65 fish/hr. Budget constraints for 2012 necessitated a reduction in work and the decision was made to drop this reach. However, large numbers of largemouth bass caught in Black Rocks during our Fall humpback chub (*Gila cypha*) work, in 2012, prompted restored effort in these reaches in

2013. The largest catch rate of smallmouth bass, in any of the reaches covered by projects 126a and 126b during the ten year study period, occurred in 2013 and 2014 in Ruby Horsethief Canyon at 6.53 fish/hr and 3.94 fish/hr (Figure 4 & 5). Late summer and fall rain events may have washed a portion of this population downstream in 2013, or this population may be expanding. In either case, continued effort is necessary in this reach in 2015.

New effort was expended experimentally, in 2013 and 2014, from Cisco to Potash, Utah. While the primary species being targeted was walleye, juvenile and adult smallmouths were removed from these reaches in 2013 at a rate of 0.33 fish/hr which increased to a rate of 1.83 fish/hr in 2014 (Table 2; Figure 4). In 2014, the highest rate of removing UCRRB defined 'piscivorous sized (> 325mm)' smallmouth bass occurred from Cisco, UT to Dewey Bridge, UT at 0.9 fish/hr (n=20; Figure 4).

Largemouth Bass

Unlike the downward trend in catch rate for smallmouth bass juveniles and adults, for the Grand Valley river reaches, overall mean catch rate for largemouth bass juveniles (100-199 mm) and adults (>200 mm) steadily increased from 2004 – 2007 and peaked in 2007 (4.2 fish/hr; n= 1,375; Table 2). This was 6.7 times greater than the catch rate for 2004 (0.63 fish/hr). During 2008, this trend was reversed for largemouth bass ≥ 100 mm. The catch rate declined to 1.3 largemouth bass/hr (n=383). In 2009, the catch rate increased slightly to 1.83 fish/hr. Catch rate increased to 3.31 fish/hr in 2010. Catch rate, however, declined in 2011 to 1.96 fish/hr. 2012 produced the largest catch of juvenile and adult largemouth bass to date at 6.0 fish/hr (n=1,743); we hypothesize that the large (in magnitude) extended peak flows in 2011 inundated off channel gravel pits and ponds and fish from these sources made it into the river and available to our catch in 2012. An 83% decrease in our juvenile and adult largemouth bass catch rate occurred from 2012 (6.0 fish/hr) to 2013 (1.06 fish/hr, n=293) and the catch rate continued to decline in 2014 (0.5 fish/hr, n=255; Table 2, Figure 7).

Perhaps enough adults escaped from off channel spawning and nursery areas during the high flows in 2011, and were removed from the population by unfavorable river conditions and our efforts – that a large reduction in production occurred in 2013 and 2014 largemouth bass < 100 mm (1.45 fish/hr, n=425 and 2.1 fish/hr, n=1,071; Figure 7). This reduction follows the 2012 (12 fish/hr) year class which has been the second strongest in this ten-year study. In 2011, catch rate for largemouth bass < 100 mm (6.05 fish/hr) declined 50 % from 2010 (12.13 fish/hr). Overall mean catch rate for largemouth bass < 100 mm total length steadily increased since 2004 from 1.03 fish/hr to a high of 12.13 fish/hr in 2011 (Table 2; Figure 7). The 2008 year class of largemouth bass was only slightly less (4.32 fish/hr) than 2007 and 2009. So, where the 2008 high spring runoff flows reduced the spawning success of smallmouth bass, it did not appear that largemouth bass young were as negatively impacted. This may be attributed to differences in spawning habitat and/or timing (temperature conditions) between smallmouth bass and largemouth bass spawning. In the Upper Colorado River, largemouth bass may be spawning in off main channel riverine habitats (e.g. gravel pit ponds) that may shelter young fish from the high velocities of runoff thus increasing survival, whereas young smallmouth bass, which are typically spawned in main channel riverine habitats, may suffer higher mortality during such high flow events. The high

abundance of largemouth bass found during summer removal passes in main channel habitats may be due to young fish that have migrated out of off-channel habitats into main channel habitats following high spring runoff.

There has been no definite trend in largemouth bass abundance (all length sizes) for the Rifle to Beavertail Mountain reaches. The highest catch rate was recorded during 2008 (6.9 fish/hr; Table 2). The second highest year was in 2006 (5.6 fish/hr), the third highest in 2013 (5.5 fish/hr); lowest in 2010 (0.86 fish/hr). In 2007 the catch rate declined to 3.30 fish/hr (Table 2). In 2014, catch effort (0.94 fish/hr) was the third lowest in this eleven-year study. Prior to 2008, spawning success in these reaches appeared not to be as successful as that in the Grand Valley reaches. Mean catch rate for largemouth bass < 100 mm was lowest in 2005 (0.25 fish/hr); the highest during 2008 (6.05 fish/hr; Table 2). In 2014, catch rate (0.4 fish/hr) was the third lowest in this eleven-year study. In 2011, overall catch rate (all length sizes) was 2.14 fish/hr and 2012 brought a reduction in the catch to 1.27 fish/hr.

New effort was expended experimentally, in 2013, from Cisco to Potash, Utah. While the primary species being targeted was walleye, juvenile and adult largemouths were removed from these reaches at a rate of 0.29 fish/hr in 2013 and 0.05 fish/hr in 2014 (Table 2).

Walleye

Walleye catch rates varied amongst reaches when comparing the spring and fall in 2014 (Table 3); however there was a substantial increase in the fall catch rates (2.11 fish/hr) when compared to the spring catch rates (1.13 fish/hr) in the reaches from Cisco to potash, UT. Cisco to Dewey Bridge, UT provided 61% (n=65; Table 3) of our fall 2014 catch and was 90% more productive in the fall when compared to the spring. Coincidently, the Dolores and Colorado River confluence is found in this reach, and Mcphee Reservoir (which spills into the Dolores River) has a large illicitly stocked population of walleye. Otoliths were collected from 2013 to 2014 to hopefully determine the origin of these fish. These fish could also be the result of immigration from Green River sources or Lake Powell, which also house robust populations of walleye.

Population Size.

Increased effort is needed to achieve exploitation rates that the UCRRP has adopted as necessary to achieve smallmouth and largemouth bass population failure. However, a limited amount of funding coupled with logistical constraints (e.g. length of field season, amount of equipment, and staffing) has limited how we can achieve extra effort. In 2014, Grand Junction Colorado River Fishery Project had an increase in crew and equipment because of the Colorado pikeminnow estimate and razorback sucker monitoring in Lake Powell; thus, increased effort was volunteered outside of the 2014 SOW budget. Certainly, this additional effort helped us move nearer to the exploitation rates UCRRP has adopted. During the 2012 non-native workshop, it was determined appropriate to have smallmouth bass removal years (from the Gunnison and Colorado Rivers), set at a predetermined interval (e.g. 2 or 3 years) coupled with abundance estimate years to track population size in an effort to reduce the number of non-natives being collected and returned to the river with a mark and to increase removal effort. Therefore, 2013 and

2014 was a removal year and no abundance estimates were calculated. However, for reference, abundance estimate text and results were included in this report from past years (Table 4).

Smallmouth Bass

During the marking pass performed in July 2012, a total of 132 smallmouth bass (50 juvenile size [100-199 mm], 82 adult size [≥ 200 mm]) were marked and released alive. Seventeen (9 juvenile, 8 adult) of these marked fish were later recaptured during six removal passes (Table 4). Since a 'batch' mark was employed and smallmouth bass were not marked with a serially numbered tag, movements of individual fish were not possible. Eight marked fish (six juvenile, two adult) were recaptured in removal pass 1. One marked fish (one adult) was captured during pass 2, four marked fish (two juvenile, two adult) were captured during pass 3, one marked adult was captured during pass 4, two marked fish (one juvenile, one adult) were captured during pass 5, and one marked adult was captured during pass 6. Crews were instructed to look for marked fish during all six removal passes. Starting in 2010, a different mark was employed and it appeared that this new mark could be more reliably detected throughout all removal passes than previous batch marks employed (e.g., fin punches) which extended from early-August through late-October. All 17 marked smallmouth bass were recaptured within the original marking reaches. The total number of smallmouth bass removed over six removal passes after the marking pass was 201 juveniles (100-199 mm) and 233 adults (≥ 200 mm)(Table 3). During the three pre-marking passes, 70 juveniles and 78 adult smallmouth bass were removed.

The 2012 population point estimate (95% C.I. in parenthesis) was 232 ± 133 (99 –365) for smallmouth bass 100-199 mm and 1,853 ± 1,748 (105 – 3,601) for smallmouth bass ≥ 200 mm. The weighted probability of capture (p-hat) was computed as 0.159 and 0.037, respectively, for these two length groups. The CV was 29.2 % and 48.0 %, respectively, for these two length classes. The CV can be used as a measure of estimate precision and Pollock et al. (1990) suggests a good 'rule of thumb' is to achieve a CV of 20% or less. The proportion or percentage of smallmouth bass of these sizes removed during the first removal pass or the exploitation rate for this first pass based on the population estimate was as few as 10 % (37/365) for juvenile fish 100-199 mm which computes to about an average of 6.6 juvenile smallmouth bass/mile. For smallmouth bass ≥ 200 mm, the proportion or percentage of smallmouth bass of these sizes removed annually or the exploitation rate for this first pass based on the population estimate was a few as 2 % (68/3,601) or an average of 52.5 adult smallmouth bass/mile.

The 2011 population point estimate (95% C.I. in parenthesis) was 1,718 ± 1,115 (603 – 2,833) for smallmouth bass 100-199 mm and 110 ± 108 (2 – 218) for smallmouth bass ≥ 200 mm. The weighted probability of capture (p-hat) was computed as 0.056 and 0.071, respectively, for these two length groups. The CV was 10.4 % and 50.0 %, respectively, for these two length classes. The CV can be used as a measure of estimate precision and Pollock et al. (1990) suggests a good 'rule of thumb' is to achieve a CV of 20% or less. The proportion or percentage of smallmouth bass of these sizes removed during the first removal pass or the exploitation rate for this first pass based on the population estimate was as few as 4 % (117/2,833) for juvenile fish 100-199 mm which computes to about an average of 48.7 juvenile smallmouth bass/mile. For smallmouth bass ≥ 200 mm, the

proportion or percentage of smallmouth bass of these sizes removed annually or the exploitation rate based on the population estimate was a few as 7 % (16/218) or an average of 3.1 adult smallmouth bass/mile.

The 2010 population point estimate (95% C.I. in parenthesis) was 255 ± 196 (59 –451) for smallmouth bass 100-199 mm and 823 ± 671 (152-1,494) for smallmouth bass ≥ 200 mm. The weighted probability of capture (p-hat) was computed as 0.097 and 0.053, respectively, for these two length groups. The CV was 39.3 % and 41.6 %, respectively. The proportion or percentage of smallmouth bass of these sizes removed during the first removal pass or the exploitation rate for this first pass based on the population estimate was as few as 7 % (31/451) for juvenile fish 100-199 mm which computed to about an average of 7.2 juvenile smallmouth bass/mile. For smallmouth bass ≥ 200 mm, the proportion or percentage of smallmouth bass of these sizes removed annually or the exploitation rate based on the population estimate was a few as 4 % (60/1,494) or an average of 23.3 adult smallmouth bass/mile.

The 2009 population point estimate (95% C.I. in parenthesis) was 2,044 ± 2,238 (- 194 – 4,282) for smallmouth bass 100-199 mm and 755 ± 802 (- 471 – 1,557) for smallmouth bass ≥ 200 mm. The weighted probability of capture (p-hat) was computed as 0.014 and 0.017, respectively, for these two length groups. The CV was 55.9% and 54.2%, respectively. The proportion or percentage of smallmouth bass of these sizes removed during the first removal pass or the exploitation rate for this first pass based on the population estimate was as few as 1% (46/4,282) for juvenile fish 100-199 mm which computes to about an average of 57.9 juvenile smallmouth bass/mile. For smallmouth bass ≥ 200 mm, the proportion or percentage of smallmouth bass of these sizes removed annually or the exploitation rate based on the population estimate was a few as 1 % (20/1,557) or an average of 21.4 adult smallmouth bass/mile.

The low number of recaptured marked juvenile and adult smallmouth bass during the first removal pass compared to earlier years obviously contributed to very poor capture probabilities, abundance estimates, and exploitation rates for 2009. The same could be said for the 2011 and 2012 adult smallmouth abundance estimate where only one and two (respectively) adult fish were recaptured in the first removal pass to compute the abundance estimate. This low precision of the abundance estimate was reflected in the high CVs (50 % and greater) for 2009 and 2010 (adults; Table 4). In 2009 as in 2008, declining catch rates reflected a downward trend in relative abundance. The 2009 abundance estimate did not correlate well with the calculated catch effort indices for juvenile and adult smallmouth bass (≥ 100 mm; see Figure 6) during 2009 in the Grand Valley reaches of the Upper Colorado and Lower Gunnison rivers. Therefore, the abundance estimates for 2009, as well as the adult abundance estimate for 2011 and 2012, should be viewed with caution with earlier and future year comparisons.

The 2008 population point estimate (95% C.I. in parenthesis) was 804 ± 423 (381– 1,227; Table 4) for juvenile smallmouth bass (100-199 mm). The weighted probability of capture (p-hat) was computed as 0.10; the CV: 26.9%. The proportion or percentage of smallmouth bass of these sizes removed during the first removal pass or the exploitation rate for this first pass based on the population estimate was as few as 6.7 % (82/1,227) or as many as 21.5% (82/381). This computes to an average of about 22.8 fish/mile. For adult smallmouth bass (≥ 200 mm) the population point estimate (95% C.I. in

parenthesis) was 393 ± 276 (117– 669). The weighted probability of capture was computed as 0.07; the CV: 35.9%. The proportion or percentage of smallmouth bass of these sizes removed during the first removal pass or the exploitation rate for this first pass based on the population estimate was as few as 4.2 % (28/669) or as many as 23.9% (28/117). This computed to an average of about 11.1 fish/mile.

The 2007 population point estimate (95% C.I. in parenthesis) was 1,007 ± 686 (321–1,693)(Table 4) for adult smallmouth bass ≥ 200 mm. The weighted probability of capture (p-hat) was computed as 0.06; the CV: 34.8%. The proportion or percentage of smallmouth bass of these sizes removed during the first removal pass or the exploitation rate for this first pass based on the population estimate was as few as 6.4 % (109/1,693) or as many as 3.4% (109/321). This computed to an average of approximately 28.5 fish/mile.

The 2006 population point estimate (95% C.I. in parenthesis) was 2,295 ± 1,500 (795–3,795)(Table 4) for adult smallmouth bass ≥ 200 mm. The weighted probability of capture (p-hat) was computed as 0.04; the CV: 33.3%. The proportion or percentage of smallmouth bass of these sizes removed during the first removal pass or the exploitation rate for this first pass based on the population estimate was as few as 4.3 % (163/3,795) or as many as 20.5% (163/795). This computed to an average of about 65 fish/mile.

A weak year class of fish produced in 2011 produced a small abundance estimate (232 fish) for juvenile smallmouth bass (100 – 199 mm). Abundance estimates for juvenile (100-199 mm) smallmouth bass peaked in 2011 (1,718 fish) due to a strong year class of smallmouth bass being produced in 2010. Juvenile smallmouth abundance was most similar in 2010 (255 fish) to 2012 in the 35.3 miles of the Upper Colorado and Lower Gunnison rivers in the Grand Valley reaches. Abundance of adult smallmouth bass (≥ 200 mm) slowly decreased from a high of 2,295 fish in 2006, 1,007 in 2007, 393 in 2008, but increased to 823 during 2010. The adult abundance increase in 2010 could be attributed to the strong year class of smallmouth bass produced in 2007. Abundance estimates for both juvenile and adult smallmouth bass in 2009 and adult smallmouth bass in 2011 and 2012 were not included here because of the low number of recaptures necessary to generate a reliable estimate.

Exploitation Rates. Exploitation rates were computed for two length groups (100-199 mm and ≥ 200 mm) of smallmouth bass from the Upper Colorado and Lower Gunnison rivers for 2006 – 2012 (Table 4). Exploitation rates by year and length class were: 2006 (fish ≥ 200 mm): 27.9; 2007 (fish ≥ 200 mm): 39.1; 2008 (fish 100-199 mm): 57.0, (fish ≥ 200 mm): 44.0; 2009 (fish 100-199 mm): 10.7, (fish ≥ 200 mm): 12.8; 2010 (fish 100-199 mm): 55.7, (fish ≥ 200 mm): 35.2; 2011 (fish 100-199 mm): 42.0, (fish ≥ 200 mm): 52.1; . 2012 (fish 100-199 mm): 64.7, (fish ≥ 200 mm): 20.1. This method attempts to reduce bias from fish moving outside the sampling area, mortality during the sampling period, and growth (personal communication, Bruce Haines, USFWS [ret.], Vernal, Utah). This method attempts to extrapolate the exploitation rate over the number of removal passes for the six years abundance estimates have been computed.

Largemouth Bass

2012 was the first year attempting at a mark-recapture population estimate for largemouth bass. During the marking pass performed in July 2012, a total of 41 largemouth bass (32 juvenile size [100-199 mm], 9 adult size [≥ 200 mm]) were marked and released alive. Fifteen (10 juvenile, 5 adult) of these marked fish were later recaptured during six removal passes. Since a 'batch' mark was employed and largemouth bass were not marked with a serially numbered tag, movements of individual fish were not possible. Ten marked fish (7 juvenile, 3 adult) were recaptured in removal pass 1. Three marked fish (2 juvenile, 1 adult) were captured during pass 3, and two marked fish (1 juvenile, 1 adult) were captured during pass 4. All 15 marked largemouth bass were recaptured within the original marking reaches. The total number of largemouth bass removed over six removal passes after the marking pass was 1,616 juveniles (100-199 mm) and 47 adults (≥ 200 mm). During the three pre-marking passes, 17 juveniles and 10 adult largemouth bass were removed.

The 2012 population point estimate (95% C.I. in parenthesis) was 399 ± 219 (180 – 618) for largemouth bass 100-199 mm and 34 ± 20 (14 – 54) for largemouth bass ≥ 200 mm. The weighted probability of capture (p-hat) was computed as 0.258 and 0.471, respectively, for these two length groups. The CV was 27.9 % and 30.1 %, respectively, for these two length classes. The CV can be used as a measure of estimate precision and Pollock et al. (1990) suggests a good 'rule of thumb' is to achieve a CV of 20% or less. The proportion or percentage of largemouth bass of these sizes removed during the first removal pass or the exploitation rate for this first pass based on the population estimate was as few as 17 % (103/618) for juvenile fish 100-199 mm which computes to about an average of 11.3 juvenile largemouth bass/mile. For largemouth bass ≥ 200 mm, the proportion or percentage of largemouth bass of these sizes removed annually or the exploitation rate for this first pass based on the population estimate was as large as 30% (16/54) or an average of 1.5 adult largemouth bass/mile.

Exploitation Rates. Exploitation rates were computed for two length groups (100-199 mm and ≥ 200 mm) of largemouth bass from the Upper Colorado and Lower Gunnison rivers for 2012. Exploitation rates by year and length class were: 2012 (fish 100-199 mm): 83.3, (fish ≥ 200 mm): 97.8. These rates are perplexing considering more fish were actually removed than what were estimated to be in the population, a strong indication that simple closed population models are not suitable to a large complex riverine system.

Walleye

While no mark recapture abundance estimates have been conducted for walleye, we feel that extrapolation using Colorado pikeminnow probabilities of capture is reasonable considering the two species occupy the same niche in the river. Mean probability of capture for adult Colorado pikeminnow in the lower Colorado River reach (Cisco to the confluence of the Green River), during the spring, is 0.065 per pass (Doug Osmundson, *personal communication*). During spring 2013, 268 walleye were removed during three passes, and during spring 2014, 109 walleye were removed during four passes. In spring 2013, an extrapolated 19.5% of the population should have been exploited making the pre-removal abundance estimate 1,374 and post removal abundance estimate 1,106. In spring 2014, an extrapolated 26% of the population should have been exploited making

the pre-removal abundance estimate 559 and post removal estimate 450. Considering the mean estimated abundance for adult Colorado pikeminnow through 2010 in this same reach is 302, there is cause for alarm (Figure 9).

Of the 107 walleye collected in the fall 2014, seventy were dissected to be identified as male or female and the contents of their stomachs were identified. Thirty seven walleye (53%) were male and thirty three (47%) were female. Twenty eight walleye (40%) stomachs were empty, three walleye (4%) stomachs contained single black bullheads, three walleye (4%) stomachs contained young-of-year channel catfish (11, 2, and 3 per stomach), and two walleye (3%) stomachs contained juvenile Colorado pikeminnow (Total Lengths 289mm and 323mm; appended photos). Considering the possibility of non-native walleye occupying the same niche as native endangered Colorado pikeminnow, they are not only a potential competitor they are a potential predator. These two Colorado pikeminnow found in the stomachs of walleye represent a much larger consumptive rate of Colorado pikeminnow and other rare native fishes throughout the year. The lower portions of the Colorado and Green Rivers are important nursery areas for young-of-year and juvenile Colorado pikeminnow and razorback sucker. With large concentrations of piscivorous walleye left unmanaged in these reaches, recovery of these two listed species seems a dim prospect.

Other Nonnative Game Fishes Captured in the Main-stem River (Figure 8).

CPW began, in coordination with the private land owner, an effort to remove non-native fishes from a gravel pit pond between Rifle and Silt, Colorado now referenced as Snyder Pond. While these fish do have opportunities to escape into the river during certain peak flows, they are isolated from the river during lower water years. Therefore, these efforts and results are included in the PPR section at the end of this report. It is possible that the elevated peak flows experienced in 2011, which did connect Snyder Pond with the river, contributed to the increase in catch of northern pike experienced in the main stem in both 2011 and 2012. In 2014, CPW sampled Snyder Pond while the inlet was inundated and fish were able to emigrate and immigrate into and out of the pond. CPW has had great success, in terms of CPE, removing largemouth bass, northern pike, green sunfish, and yellow perch.

Five adult northern pike were removed by CPW and USFWS crews during these projects in 2014 (Figure 8). Three (TL: 596mm, 630mm, and 740mm) were collected in the Grand Valley, and five were collected from Rifle to Beavertail (TL: 392mm, 439mm, 718mm, 745mm, and 795mm). In addition, nine northern pike were removed from the Grand Valley reaches during the spring Colorado pikeminnow project (n = 8) and from the fish trap at the Grand Valley Water User's Fish Ladder (n = 1). All otoliths have been preserved from these fish for future aging and natal origin microchemistry research. Sixteen adult northern pike were collected by CPW near Rifle (RM 238 – 241.8) in 2012. These fish ranged in total length from 434 mm to 825 mm with a mean total length of 712 mm. Ten adult northern pike were captured in the 2011 centrarchid removal efforts by FWS and CPW. Nine of these fish were collected from the Rifle Bridge to Cottonwood Park boat landing near Parachute in mid-October. Three northern pike were captured immediately underneath the I-70 bridge at RM 238.2; seven northern pike were captured between RM 238.2 and the Rifle Bridge. For reference point, Rifle Creek empties into the Colorado River at RM 239.8. One other northern pike was collected in September

between Price-Stubb fishway and GVIC Diversion Dam at Palisade (RMs 187.7-184.9). One other northern pike (680 mm) was captured in the fish trap of the Redlands fishway on the Lower Gunnison River in 2011. All 11 of these fish have had their otoliths removed for future otolith microchemisty analyses. Such analyses can help in determining their possible origin, i.e., had this fish escaped from off-channel riverine habitats such as isolated gravel pits breached by the 2011 high spring flows and now connected to the mainstem river, escaped from nearby reservoirs, or possibly illicitly translocated.

Captures of adult gizzard shad in the Upper Colorado and Lower Gunnison rivers exploded during 2007 (total=179). One hundred thirty-nine adult gizzard shad were collected during the 2007 smallmouth bass removal project. An additional 43 were collected in the fish trap of the Redlands Dam fish passageway. This compares to 12 captured during the smallmouth bass removal study in 2006 and only 3 in the Redlands fish passageway fish trap. One age-0 or age-1 gizzard shad (66 mm) was collected in the Upper Colorado River during 2009.

However, in 2008 the number of gizzard shad collected declined markedly from 2007, almost one magnitude less. Eighteen gizzard shad were collected during 2008, all from Grand Valley reaches of the Upper Colorado and Lower Gunnison rivers. No gizzard shad were found in the fish trap at the Redlands fish passageway in 2008. During the 2009 centrarchid removal, 36 gizzard shad (three juvenile and 33 adult) were collected in the Grand Valley reaches. Three adult gizzard shad were also collected in the fish trap of the Redlands fish passageway during 2009.

In 2010, 40 adult gizzard shad were captured during the centrarchid removal study and five adults were collected in the fish trap at the Redlands fishway. In 2011, no gizzard shad were observed or collected from the centrarchid removal study or Redlands fish trap. No gizzard shad were collected in the Government Highline fish passageway between 2006 and 2011.

In 2012, 72 gizzard shad were collected during centrarchid removal in the Grand Valley reaches. This marks the first year that both juvenile and adult shad were found in our catch with total lengths ranging from 53 to 485 mm and a mean total length of 413 mm. In 2012, 22 adult gizzard shad were collected Redlands fish trap.

Both juvenile and adult gizzard shad were collected in all reaches sampled in 2013 from the Grand Valley (n = 97; TL range 54 – 468 mm) to Ruby Horsethief (n = 1; TL 167 – 467 mm) and Cisco to Potash (n = 11; 78 – 580 mm). In 2013, 10 adult gizzard shad were collected Redlands fish trap and one adult gizzard shad was collected and GVWUs fish trap. It appears that drought years allow for the upstream expansion of gizzard shad's range in the Colorado and Gunnison Rivers.

Both juvenile and adult gizzard shad were collected in all reaches sampled in 2014 from the Grand Valley (n = 283; TL range 48 – 463 mm) to Ruby Horsethief (n = 24; TL 62 – 300 mm) and Cisco to Potash (n = 324; 53 – 453 mm). In 2014, 19 gizzard shad were collected at Redlands fish trap and ten gizzard shad were collected and GVWUs fish trap. It appears that drought years allow for the upstream expansion of gizzard shad's range in the Colorado and Gunnison Rivers.

In 2012, 614 white sucker and white sucker hybrids were removed from the Grand Valley reaches. Their total length ranged from 53 to 519 mm with a mean total length of 255 mm. Our effort in 2013 removed 2,627 white sucker and white sucker hybrids (TL ranged from 80mm to 510mm) from all sampled reaches, and our effort in 2014 removed 3,787 white sucker and white sucker hybrids (TL ranged from 34mm to 518mm) from all sample reaches. These fish were removed opportunistically when white sucker catch wouldn't overwhelm the crew's primary focus on centrarchid removal.

VIII. Additional noteworthy observations:

During most years, we don't collect and handle Colorado pikeminnow during the centrarchid removal project. However, in an effort to increase the number of juvenile Colorado pikeminnow tagged in the system, 43 additional fish were captured during the non-native removal project. 27 were previously untagged juvenile fish. During 2013, 384 individual razorback sucker, 4 humpback chub, and 130 bonytail were collected by CPW and USFWS crews while working on projects 126a and 126b. For endangered fish tag histories see Tables 5 & 6.

An important observation to consider from fall 2014 is that our catch rates increased for walleye after rain events when the water was more turbid. Perhaps, a walleye team should be ready to deploy extra effort in these concentration reaches on the descending limb of these hydrologic spikes. This extra effort will need to come from more than one office, it is our hope to have multiple agencies and institutions redirect some of their efforts in other reaches to these reaches.

IX. Recommendations:

1. Continue to collect and lethally remove all centrarchids from the Colorado and Gunnison rivers during all station sampling efforts, which includes sampling on the Colorado and Gunnison rivers.

2. During years when we're conducting a population estimate, continue using three electrofishing craft during the marking pass in an attempt to capture, mark, and release more smallmouth bass $\geq$ 100 mm.

3. Investigate and implement management measures to prevent escapement of smallmouth bass and other piscivorous fishes into riverine areas from bodies of water known to be occupied by species that could negatively impact native riverine fishes.

4. Target specific in-river features that provide habitat for centrarchid fishes. These include but are not limited to beaver lodges, tree stumps and logs, rock piles, and concrete rip-rap. Sampling these features with electrofishing may increase catches of centrarchid fishes.

5. Continue having CPW sample the Upper Colorado reaches from Silt to Beavertail Mountain in Debeque Canyon.

6. Continue with three nonnative fish removal passes in river reach between the Loma Boat Landing and Westwater Ranger Station, Utah, to determine if 2013 and 2014's

extremely high catch rate of smallmouth bass was an anomaly or if the population is expanding.

7. Evaluate the feasibility of sampling floodplain ponds in addition to Snyder's (specifically those tied to gravel pit operations and others that have hydrologic connections directly to the Colorado River) in the Silt and Rifle areas to determine fish species presence and abundance/density.

8. Complete otolith microchemistry analyses to determine the origin of northern pike and walleye collected in the Colorado River, and evaluate other potential habitable locations these fish may have occupied beyond their origination.

9. Suspend all electrofishing operations when it is determined that Colorado pikeminnow show signs of preparing to spawn, e.g., mid- to late-June. Electrofishing will be suspended during this period to eliminate the likelihood of harassment, interference, and injury to spawning Colorado pikeminnow.

10. Downstream from Price-Stubb fish passage, electrofishing should commence following cessation of spawning of Colorado pikeminnow which should be sometime in mid- to late-July.

11. Considering a large recruitment year (1150 Smallmouth bass < 100 mm TL) in 2013, increase the number of passes back up to eight (or more) to eradicate potential future spawners in the Upper Colorado River.

12. With adult Colorado pikeminnow estimated abundances falling in both the Green and Colorado Rivers in concert with the expansion of the walleye population, it is imperative that we have a 'surge' type effort in the lower rivers (important nursery areas for young-of year and juvenile Colorado pikeminnow and razorback sucker) in both the spring and fall in future years if we wish to see recovery of Colorado pikeminnow and razorback sucker.

X. Project Status: On track and ongoing

XI. FY 2014 Budget Status

A. Funds Provided: $168,456
B. Funds Expended: $168,456
C. Difference: -0-
D. Percent of the FY 2014 work completed, and projected costs to complete: 100%
E. Recovery Program funds spent for publication charges: -0-

XII. Status of Data Submission (Where applicable): Will be submitted to UCRRP database by January 2014.

XIII. Signed: Travis Francis 11/19/2014
Principal Investigator Date

APPENDIX:

Literature Cited:

Burdick, B. D. 2008. Removal of smallmouth bass and four other centrarchid fishes from the Upper Colorado and Lower Gunnison Rivers: 2004–2006. Final Report prepared for the Upper Colorado River Endangered Fish Recovery Program.

Recovery Program Project Number 126. U. S. Fish and Wildlife Service, Colorado River Fishery Project, Grand Junction, Colorado. 61 pp + appendices.

Chapman, A. D. 1951. Some properties of the hypergeometric distribution with applications to zoological sample censuses, University of California Publ. Stat. 1(7):131–160.

Hangsleben, M. A., M. S. Allen, and D. C. Gwinn. 2013. Evaluation of Electrofishing Catch per Unit Effort for Indexing Fish Abundance in Florida Lakes. Transactions of the American Fisheries Society 142:247–256.

Ricker, W. E. 1975. Computation and interpretation of biological statistics of fish populations. Dept. of Environment, Fisheries and Marine Service, Ottawa, Canada, 382 pp.

Pollock, K. H., J. D. Nichols, C. Brownie, and J. E. Hines. 1990. Statistical inference for capture-recapture experiments. Wildlife Monographs 107.

Attachments:

7 tables attached
9 figures attached
2 photos attached

Table 1. Catch/effort (CPE, fish/hr) comparison by year for four different length classes (total length) of smallmouth bass (< 100mm = age-0; 100–199 mm = juveniles; > 200 mm = adults; > 325 mm = piscivore) for the Upper Colorado River Silt to Beavertail Mountain reaches (river miles 248.0– 195.7), the Upper Colorado River from Government Highline Dam to the Westwater Wash, Utah (river miles 193.7.7 – 124.8) and the Lower Gunnison River from the Redlands Diversion Dam to the Colorado/Gunnison River confluence (river miles 3.0 – 0.7), and the Upper Colorado River from Cisco to Potash, Utah (river miles 111.0 – 47.2) from 2004 – 2014. Note: a) all removal passes and all reaches were combined within years for the Silt to Beavertail Mountain and Government Highline Dam to Westwater, Utah, plus the Lower Gunnison River reaches, and the Cisco to Potash reaches b) Silt to Rifle reach sampled only during 2007, 2008, and 2014, and c) Government Highline to Cameo XCEL Bridge reach added in 2009, d) in 2011, some reaches were not sampled which included Black Rocks to Westwater Ranger Station, Government Highline to Cameo, and Cottonwood Park boat landing to Beavertail Mountain, e) some reaches not sampled in 2012 include the 2.3- mile section of the Lower Gunnison River from the Redlands Diversion Dam to the Colorado/Gunnison River confluence, the additional reach between the Government Highline Dam and the Cameo Bridge, from Cameo Bridge to GVIC, and Parachute to Debeque , f) Cisco to Potash, Utah reaches were added in 2013, and g) Westwater Ranger Station to Westwater Wash was added in 2014.

	Smallmouth Bass												
River Section	Length Class (mm)		Year										
			2014	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004
		No. of fish	8	4	1	0	57	0	21	17	36	58	3
	< 100												
		C/E	0.14	0.07	0.02	0	0.72	0	0.25	0.2	0.96	1.46	0.15
		No. of fish	5	29	1	6	0	3	29	28	2	54	4
Rifle Beavertail Mountain	100-199												
		C/E	0.08	0.53	0.02	0.48	0	0.05	0.34	0.32	0.05	1.36	0.2
		No. of fish	13	1	3	5	39	12	32	45	41	118	14
	> 200												
		C/E	0.22	0.02	0.05	0.01	0.49	0.19	0.37	0.52	1.09	2.96	0.71
		No. of fish	2	0	not calculated	not calculated	not calculated	not calculated	not calculated	not calculated	not calculated	not calculated	not calculated
	> 325	C/E	0.03										
		No. of fish	86	1,213	761	226	2,054	191	185	1,358	261	254	93
	< 100												
Government		C/E	0.17	3.33	2.62	0.55	5.82	0.55	0.63	4.15	1.61	1.46	0.55
Highline Dam Westwater, Utah + Lower Gunnison River		No. of fish	399	1,281	316	611	159	137	214	250	54	345	618
	100-199	C/E	0.78	3.52	1.09	1.47	0.45	0.39	0.73	0.76	0.33	1.98	3.66
		No. of fish	566	754	423	147	188	177	135	429	449	768	456
	> 200												
		C/E	1.11	2.07	1.46	0.35	0.53	0.51	0.46	1.31	2.77	4.39	2.7
		No. of fish	31	41	not calculated	not calculated	not calculated	not calculated	not calculated	not calculated	not calculated	not calculated	not calculated
	> 325	C/E	0.06	0.11									
		No. of fish	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA
	< 100												
		C/E	0	0									
Cisco Potash Utah		No. of fish	3	3	NA	NA	NA	NA	NA	NA	NA	NA	NA
	100-199	C/E	0.02	0.04									
		No. of fish	38	21	NA	NA	NA	NA	NA	NA	NA	NA	NA
	> 200	C/E	0.26	0.29									
		No. of fish	20	5	not calculated	not calculated	not calculated	not calculated	not calculated	not calculated	not calculated	not calculated	not calculated
	> 325	C/E	0.14	0.07									

Table 2. Catch/effort (CPE, fish/hr) comparison by year for four different length classes (total length) of largemouth bass (< 100mm = age-0; 100–199 mm = juveniles; > 200 mm = adults, > 325 = piscivore) for the Upper Colorado River Silt to Beavertail Mountain reaches (river miles 248.0 – 195.7), the Upper Colorado River from Government Highline Dam to the Westwater Wash, Utah (river miles 193.7.7 – 124.8) and the Lower Gunnison River from the Redlands Diversion Dam to the Colorado/Gunnison River confluence (river miles 3.0 – 0.7), and the Upper Colorado River from Cisco to Potash, Utah (river miles 111.0 – 47.2) from 2004 – 2014. Note: a) all removal passes and all reaches were combined within years for the Silt to Beavertail Mountain and Government Highline Dam to Westwater, Utah, plus the Lower Gunnison River reaches, and the Cisco to Potash reaches b) Silt to Rifle reach sampled only during 2007 and 2008, and 2014, and c) Government Highline to Cameo XCEL Bridge reach added in 2009, d) in 2011, some reaches were not sampled which included Black Rocks to Westwater Ranger Station, Government Highline to Cameo, and Cottonwood Park boat landing to Beavertail Mountain, e) some reaches not sampled in 2012 include the 2.3- mile section of the Lower Gunnison River from the Redlands Diversion Dam to the Colorado/Gunnison River confluence, the additional reach between the Government Highline Dam and the Cameo Bridge, from Cameo Bridge to GVIC, and Parachute to Debeque , f) Cisco to Potash, Utah reaches were added in 2013, and g) Westwater Ranger Station to Westwater Wash was added in 2014.

	Largemouth Bass												
River Section	Length Class (mm)		Year										
			2014	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004
	< 100	No. of fish	24	232	37	9	24	36	462	122	125	10	53
		C/E	0.4	4.25	0.66	0.71	0.3	0.58	6.05	1.4	3.33	0.25	2.68
Rifle Beavertail Mountain	100-199	No. of fish	18	53	35	13	31	29	90	109	71	10	11
		C/E	0.3	0.97	0.62	1.03	0.39	0.47	1.05	1.26	1.89	0.25	0.56
	> 200	No. of fish	14	15	0	5	13	5	43	56	15	17	2
		C/E	0.24	0.28	0	0.4	0.16	0.08	0.5	0.64	0.4	0.43	0.1
	> 325	No. of fish	1	2	not calculated	not calculated	not calculated	not calculated	not calculated	not calculated	not calculated	not calculated	not calculated
		C/E	0.02	0.04									
	< 100	No. of fish	1,071	467	3,484	2,463	4,281	1,952	1,272	1,507	573	465	173
Government		C/E	2.1	1.28	12	6.05	12.1	5.58	4.32	4.61	3.54	2.66	1.03
Highline Dam Westwater, Utah + Lower Gunnison River	100-199	No. of fish	188	323	1,674	712	1,141	609	344	1,332	487	86	85
		C/E	0.37	0.89	5.766	1.72	3.23	1.74	1.17	4.07	3.01	0.49	0.5
	> 200	No. of fish	67	62	69	102	29	32	39	43	36	38	21
		C/E	0.13	0.17	0.24	0.25	0.08	0.09	0.13	0.13	0.22	0.22	0.12
	> 325	No. of fish	20	5	not calculated	not calculated	not calculated	not calculated	not calculated	not calculated	not calculated	not calculated	not calculated
		C/E	0.04	0.01									
	< 100	No. of fish	3	1	NA	NA	NA	NA	NA	NA	NA	NA	NA
		C/E	0.02	0.01									
Cisco Potash Utah	100-199	No. of fish	5	4	NA	NA	NA	NA	NA	NA	NA	NA	NA
		C/E	0.03	0.05									
	> 200	No. of fish	1	13	NA	NA	NA	NA	NA	NA	NA	NA	NA
		C/E	0.01	0.23									
	> 325	No. of fish	0	2	not calculated	not calculated	not calculated	not calculated	not calculated	not calculated	not calculated	not calculated	not calculated
		C/E	0	0.03									

Table3. Catch/effort (CPE, fish/hr) comparison by year for four different length classes (total length) of walleye (< 200mm = age-0; 200-299 mm = juveniles; 200–374 mm = adults, > 375 = piscivore) for the Upper Colorado River Cisco to Dewey Bridge reach (river miles 112.3 – 94.6), Dewey Bridge to takeout Beach reach (river miles 94.6 – 74.2), Takeout Beach to Potash, UT reach (river miles 74.2 – 47.2), and Potash, UT to the confluence of the Green River reach (river miles 47.2 – 0.0). Catch/effort data is partitioned by spring work (Colorado pikeminnow estimate) and experimental fall work (non-native removal). Note: a) Effort hasn't been electronically entered into a spreadsheet for Spring 2013 data, and b) spring collections occur by two methods; electrofishing and backwater scare and snare with trammel nets, catch/effort is reported only for electrofishing.

			Walleye			
River Section	Length Class (mm)		Fall 2014	Spring 2014	Fall 2013	Spring 2013 No Effort Key Punched
Cisco UT to Dewey Bridge	< 200	No. of fish	0	0	0	0
		E-fish C/E				
	200-299	No. of fish	0	0	0	0
		E-fish C/E				
	200-374	No. of fish	1 E-fish	0	0	0
		E-fish C/E	**0.02**			
	> 375	No. of fish	64 E-fish	(5 total) 4 E-fish	19 E-fish	20
		E-fish C/E	1.32	0.1	0.62	NA
Dewey Bridge to Takeout Beach (Professor Valley)	< 200	No. of fish	0	0	0	0
		E-fish C/E				
	200-299	No. of fish	0	0	0	0
		E-fish C/E				
	300-374	No. of fish	0	0		0
		E-fish C/E				
	> 375	No. of fish	8 E-fish	(19 total) 18 E-fish	3 E-fish	67
		E-fish C/E	**0.44**	**0.29**	**0.18**	NA
Takeout Beach to Potash, UT	< 200	No. of fish	0	0	0	0
		E-fish C/E				
	200-299	No. of fish	0	0	0	0
		E-fish C/E				
	300-374	No. of fish	0	1 E-fish	0	0
		E-fish C/E		**0.02**		
	> 375	No. of fish	34 E-fish	(45 total) 39 E-fish	1 E-fish	94
		E-fish C/E	**0.35**	**0.74**	**0.04**	NA
Potash, UT to the confluence of the Green River	< 200	No. of fish	No sample	0	No sample	0
		E-fish C/E				
	200-299	No. of fish	No sample	0	No sample	1
		E-fish C/E				
	300-374	No. of fish	No sample	0	No sample	2
		E-fish C/E				
	> 375	No. of fish	No sample	(39 total) 31 E-fish	No sample	84
		E-fish C/E		**0.35**		

Table 4. Population estimate with 95% confidence intervals (CI) and other statistics for smallmouth bass (100-199 mm and > 200 mm) for the 15- and 18-mile reaches (river miles 185.6 to 152.6) of the Upper Colorado River and 2.3 miles of the Lower Gunnison River (Redlands Diversion Dam to the Colorado/Gunnison River confluence) for the summers of 2006 - 2014. Note: length of the area for the population estimate was 35.3 miles.

Year	Fish Length Size (mm)	Pop Estimate with 95% CI	SE	SM Bass/ mile	Number Marked; No. Removed 1st Removal	Number Recaptured on 1st Removal Pass	Total Number Recaptured on all removal passes	Total Number of Removal Passes	Total Number of SM Bass Removed on all removal passes	Percentage Removed on all removal passes	CV (%)	p-hat (weighted)
2004/ 2005	NO POPULATION ESTIMATE PERFORMED											
2006	100-199	No Pop Est.	- - -	- - -	25; 18	0	0	4	54	- - -	- - -	- - -
	≥ 200	2,295 ± 1,500	765	65.0	97; 163	6	8	4	449	19.6	33.3	0.043
2007	100-199	No Pop Est.	- - -	- - -	13; 16	0	0	8	250	- - -	- - -	- - -
	≥ 200	1,007 ± 686	350	28.5	54; 109	5	14	8	429	42.6	34.8	0.060
2008	100-199	804 □ 423	216	22.8	96; 82	9	10	8	214	26.6	26.9	0.101
	≥ 200	393 ± 276	141	11.1	67; 28	4	17	8	135	34.4	35.9	0.073
2009	100-199	2,044 ± 2,238	1,142	57.9	86; 46	1	6	8	138	6.8	55.9	0.014
	≥ 200	755 ± 802	409	21.4	71; 20	1	4	8	178	23.6	54.2	0.017
2010	100-199	255 ± 196	100.2	7.2	31; 31	3	11	8	159	62.4	39.3	0.097
	≥ 200	823 ± 671	342	23.3	53; 60	3	9	8	188	22.8	41.6	0.053
2011	100-199	1,718 ± 1,115	569	48.7	101; 117	6	10	10	611	35.6	10.4	0.056
	≥ 200	110 ± 108	55.1	3.1	12; 16	1	3	10	147	135	50.0	0.071
2012	100-199	232 ± 133	67.7	6.6	50; 37	6	9	6	201	86.6	29.2	0.159
	≥ 200	1,853 ± 1,748	889	52.5	82; 68	2	8	6	233	12.6	48.0	0.037
2013	NO POPULATION ESTIMATE PERFORMED											
2014	NO POPULATION ESTIMATE PERFORMED											

Table 5. 2014 razorback sucker captured during non-native fish removal projects 126a & b stock event histories.

Stock Year	# Captured during 126a & b 2014	Source Hatchery	Stock River	Stock RMI	Location Description	Notes
2000	2	Grand Jct.	CO	177.4	Corn Lake Boat Launch	
2001	3	Grand Jct.	CO	177.4	Green River State Park	
2002	1	Grand Jct.	CO	152.6	Loma Boat Launch	
2002	2	Grand Jct.	GU	57.1	Delta, CO	
2003	1	Grand Jct.	GR	120	Green River State Park	
2004	2	Grand Jct.	CO	177.4	Corn Lake Boat Launch	
2004	3	Grand Jct.	CO	152.6	Loma Boat Launch	
2005	1	Grand Jct.	CO	177.4	Corn Lake Boat Launch	
2005	2	Grand Jct.	CO	166.7	Redlands Parkway boat	
2005	5	Grand Jct.	CO	152.6	Loma Boat Launch	
2006	1	Grand Jct.	CO	184.9	Palisade, CO	
2006	2	Grand Jct.	GU	13	Butch Craig Wetland	
2007	1	Grand Jct.	CO	166.7	Redlands Parkway boat	
2007	1	Grand Jct.	GU	57.1	Delta, CO	
2007	3	Vernal	GR	121	Green River State Park	
2008	3	Grand Jct.	CO	185.1	Palisade, CO	
2008	6	Grand Jct.	CO	177.4	Corn Lake Boat Launch	
2008	3	Grand Jct.	CO	166.7	Redlands Parkway boat	
2008	1	Grand Jct.	GU	42.6	Escalante Boat Ramp	
2008	1	Vernal	GR	262	Ouray National Fish	
2008	1	Grand Jct.	GR	120	Green River State Park	
2009	1	Grand Jct.	CO	240.7	Rifle, CO	
2009	7	Grand Jct.	CO	185.1	Palisade, CO	
2009	6	Grand Jct.	CO	177.4	Corn Lake Boat Launch	
2009	3	Grand Jct.	CO	166.7	Redlands Parkway boat	
2010	3	Grand Jct.	CO	227.6	Battlement Mesa, CO	
2010	8	Grand Jct.	CO	183.6	Palisade, CO	
2010	2	Grand Jct.	GU	57.1	Delta, CO	
2010	2	Vernal	GR	255.4	Ouray National Wildlife	
2010	1	Grand Jct.	GR	120	Green River State Park	
2011	4	Grand Jct.	CO	240.7	Rifle, CO	
2011	12	Grand Jct.	CO	227.6	Battlement Mesa, CO	
2011	14	Grand Jct.	CO	184.7	Palisade, CO	
2011	8	Grand Jct.	CO	177.3	Corn Lake Boat Launch	
2011	1	Grand Jct.	GU	57.1	Delta, CO	
2011	1	Grand Jct.	GU	12.7	Butch Craig Wetland	
2011	3	Vernal	GR	120	Green River State Park	
2012	10	Grand Jct.	CO	240.7	Rifle, CO	
2012	14	Grand Jct.	CO	183.6	Palisade, CO	
2012	1	Vernal	GR	255.4	Ouray National Wildlife	
2012	3	Vernal	GR	120	Green River State Park	
2013	37	Grand Jct.	CO	240.7	Rifle, CO	
2013	27	Grand Jct.	CO	183.6	Palisade, CO	
2013	27	Grand Jct.	CO	157.1	Fruita State Park Launch	
2013	13	Grand Jct.	GU	57.1	Delta, CO	
2014	86	Grand Jct.	CO or GU			Stock data incoming
	21	Grand Jct.				Fish data absent in database
	24	Grand Jct.				Fish tagged during field work 2008 through 2014

Table 6. 2014 rare fish captures (excluding razorback sucker) captured during non-native fish removal projects 126a & b stock event histories. Note: BT = bonytail, CS = Colorado pikeminnow, HB = humpback chub, RT = roundtail chub, FR = flannelmouth X razorback sucker hybrid.

Species	# Captured during 126a & b 2014	Field Tagging Year	Stocking Year	River	RMI
BT	2		2014	DO	RIO MESA CENTER
BT	112		2014	Data incoming	
CS	1	2007		CO	121.8
CS	1	2008		CO	43
CS	1	2008		CO	176.6
CS	2	2013		CO	107.2
CS	1	2013		CO	79.5
CS	9	2014		Data incoming	
HB	1	2011		CO	136
RT	2	2004		CO	120
RT	1	2007		CO	123.4
RT	1	2008		CO	136
RT	1	2011		CO	123.4
FR	1	2014		Data incoming	

Table 7. Nonnative fish removal effort on the Colorado and Gunnision Rivers in 2014.

River Reach	River Miles	# of passes	Dates fished	Agency
Silt to Beavertail Tunnel	248.0 to 195.7	1	17 July to 22 July	CPW
Rifle to Parachute	240.4 to 222.2	1	11 September	CPW
GVWU Dam to Riverbend Park	193.7 to 184.6	8	30 June to 24 October	FWS
Riverbend Park to Redlands Parkway	184.6 to 166.7	11	17 July to 30 September	FWS
Redlands Diversion Dam to Redlands Parkway	3.0 (Gunnison River) to 0.8 and 170.9 (Colorado River) to 166.7	10	16 July to 14 October	FWS
Redlands Parkway to Fruita State Park	166.7 to 157.1	9	14 July to 20 October	FWS
Fruita State Park to Loma Boat Launch	157.1 to 152.6	10	15 July to 24 October	FWS
Loma Boat Launch to Westwater Ranger Station	152.6 to 127.6	2	29 July to 27 August	FWS
Westwater Ranger Station to Westwater Wash	127.6 to 124.8	9	18 July to 4 September	FWS
Cisco to Dewey Bridge	111.0 to 94.6	3	9 September to 16 October	FWS
Dewey Bridge to Takeout Beach	94.6 to 74.2	1	23 September to 24 September	FWS
Takeout Beach to Potash	74.2 to 47.2	3	7 October to 30 October	FWS

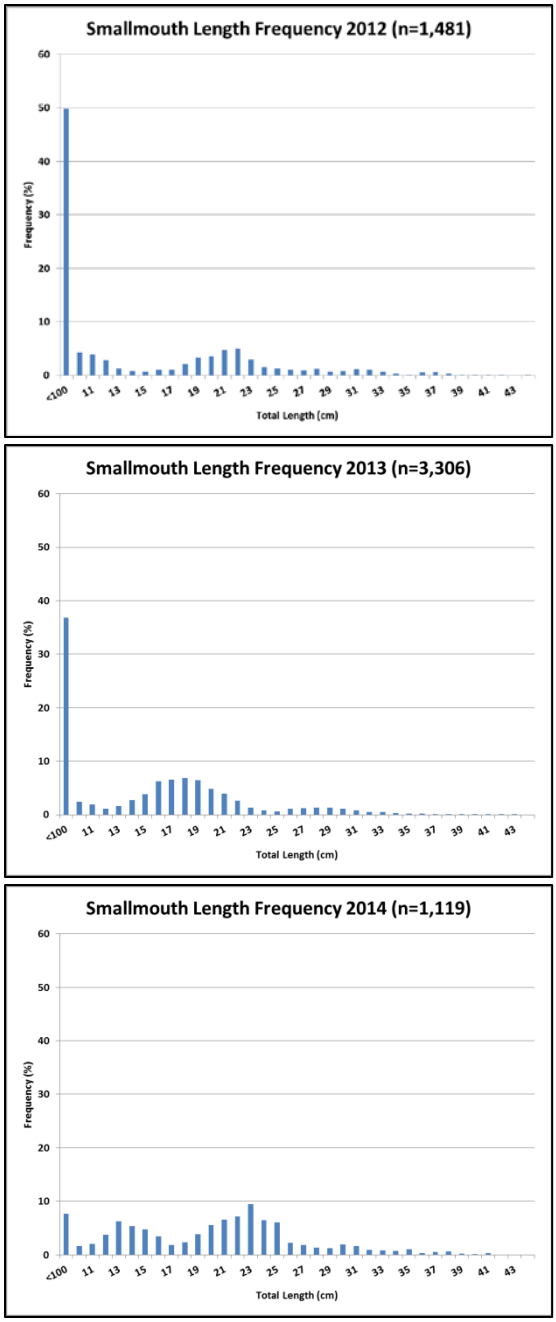

Figure 1. Length frequency histograms for smallmouth bass removed from the Colorado River from Silt, CO to the confluence of the Green River (RMI 0.0), UT from 2012 through 2014.

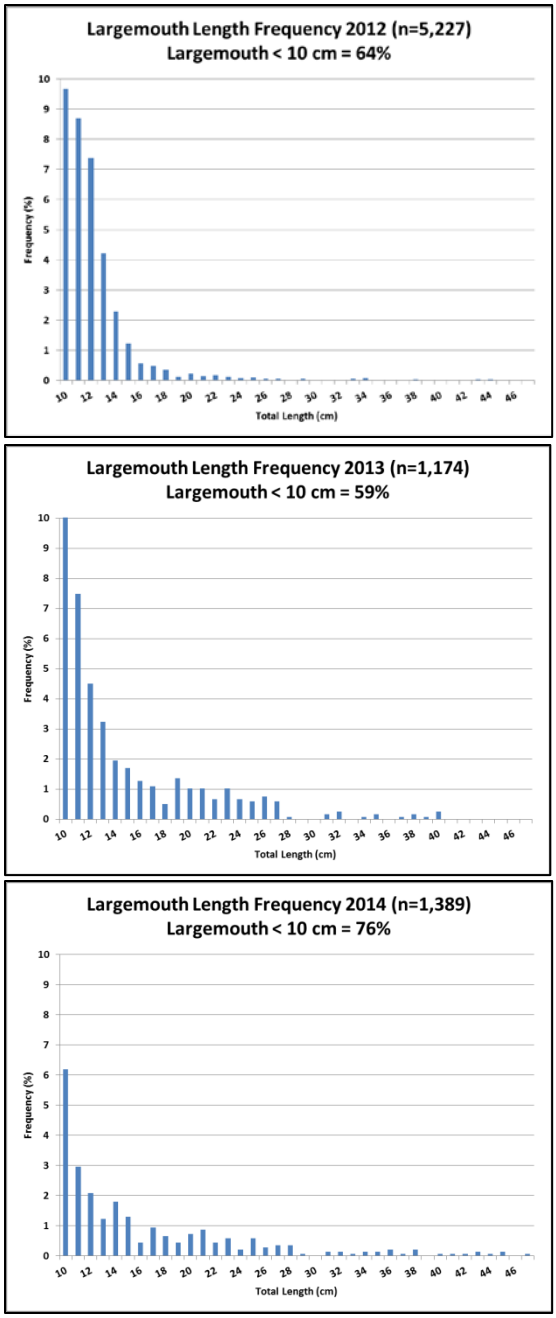

Figure 2. Length frequency histograms for largemouth bass removed from the Colorado River from Silt, CO to the confluence of the Green River (RMI 0.0), UT from 2012 through 2014.

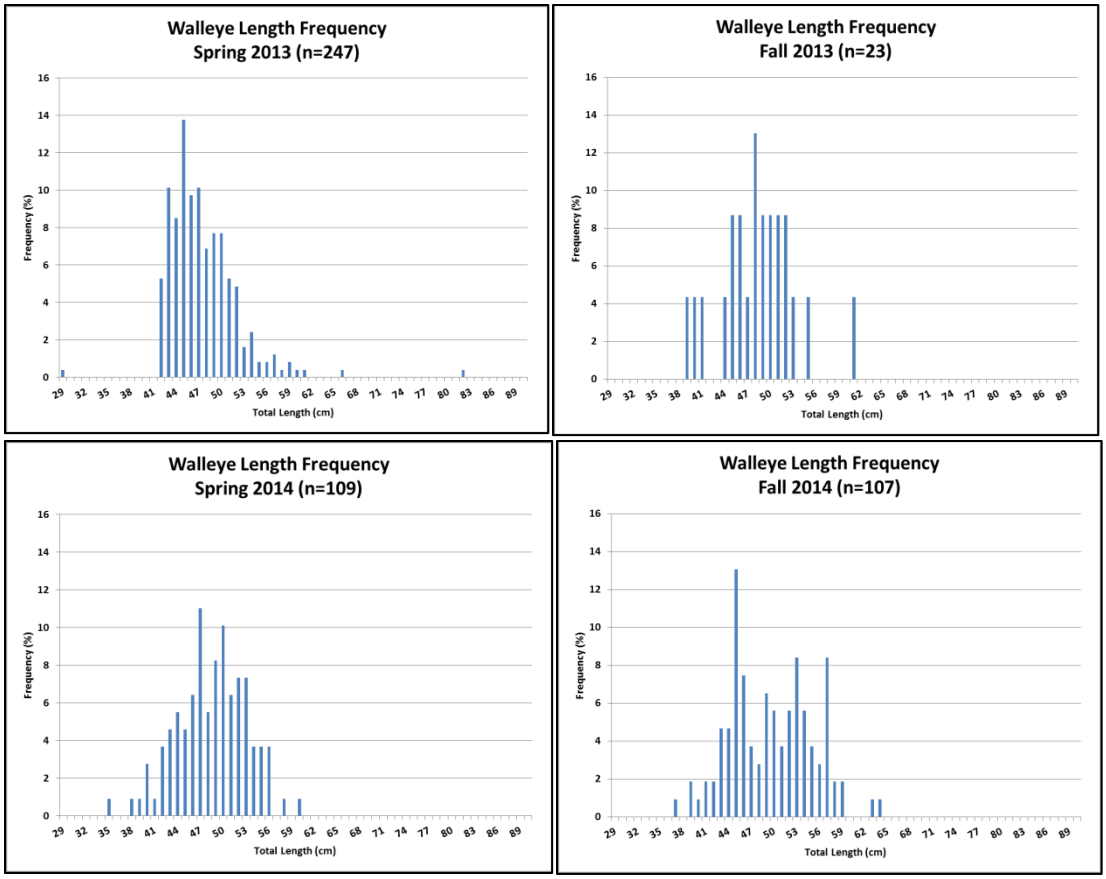

Figure 3. Length frequency histograms for walleye removed from the Colorado River from river mile 112.6 to the confluence of the Green River (RMI 0.0), UT 2013 through 2014.

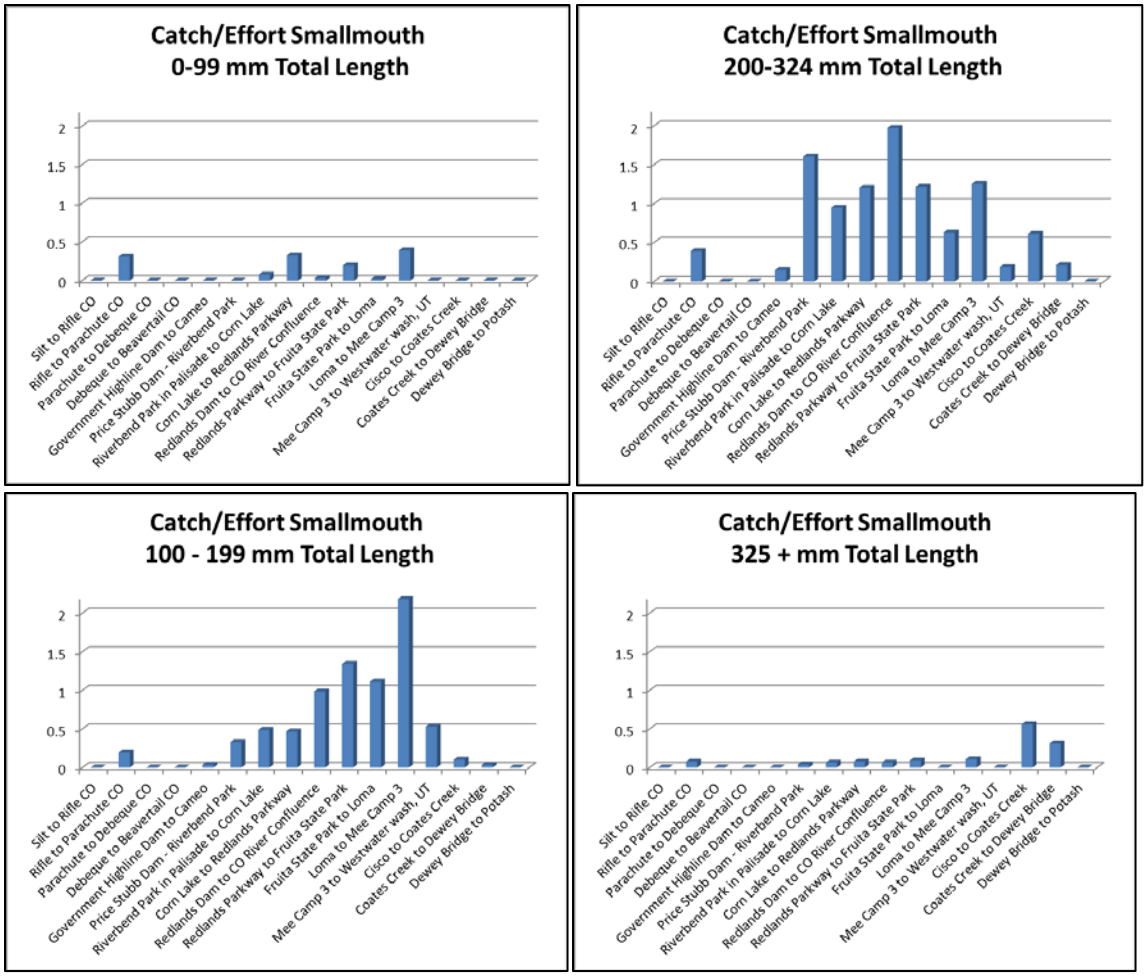

Figure 4. Catch/Effort (number of fish caught per hour electrofishing) by reach for smallmouth bass removed from the Colorado River from Silt, CO (RMI 248.0) to Potash, UT (RMI 47.2), UT during 2014. Smallmouth less than 100 mm are young-of-year, 100-199 mm are juvenile fish, > 200 mm are adults, and > 325 mm are 'piscivorous'.

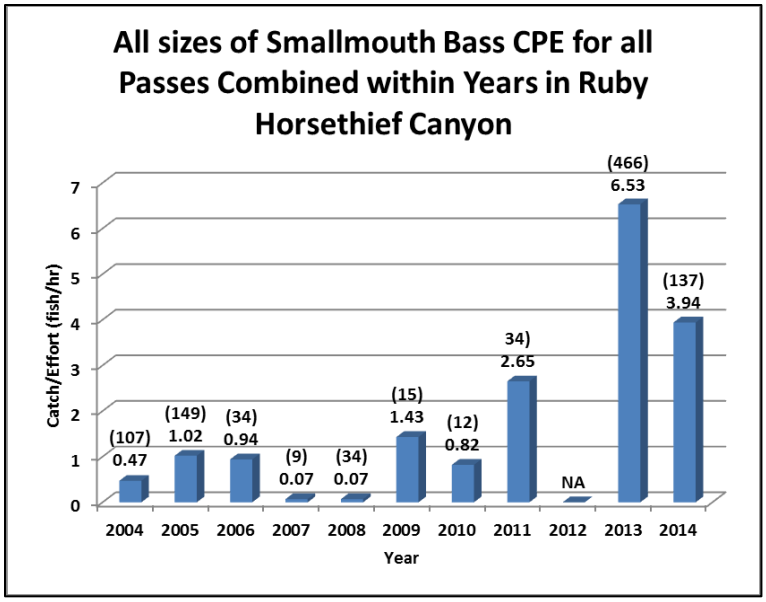

Figure 5. Eleven year comparison of catch/effort (fish/hr) for young-of-year, juvenile and adult smallmouth bass, 2004-2014, for Ruby Horsethief Canyon of the Upper Colorado River. Note: numbers of smallmouth bass collected in parentheses.

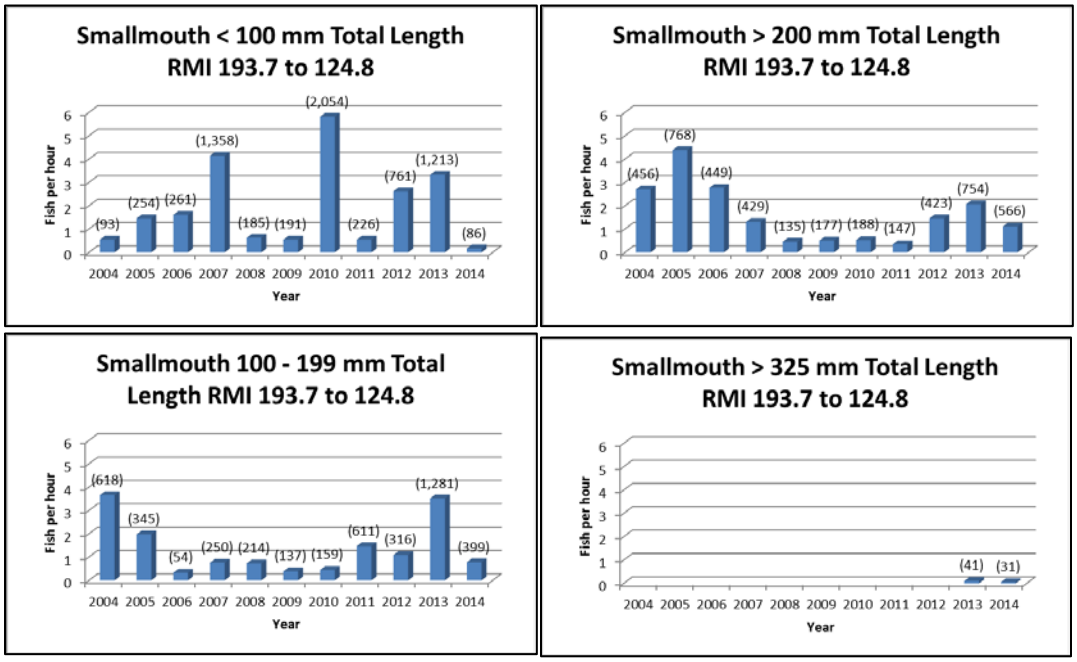

Figure 6. Catch/Effort (number of fish caught per hour electrofishing) by year for smallmouth bass removed from the Colorado River from Government Highline Dam, CO (RMI 193.7) to Westwater Wash, UT (RMI 124.8), UT during 2014. Smallmouth less than 100 mm are young-of-year, 100-199 mm are juvenile fish, > 200 mm are adults, and > 325 mm are 'piscivorous'.

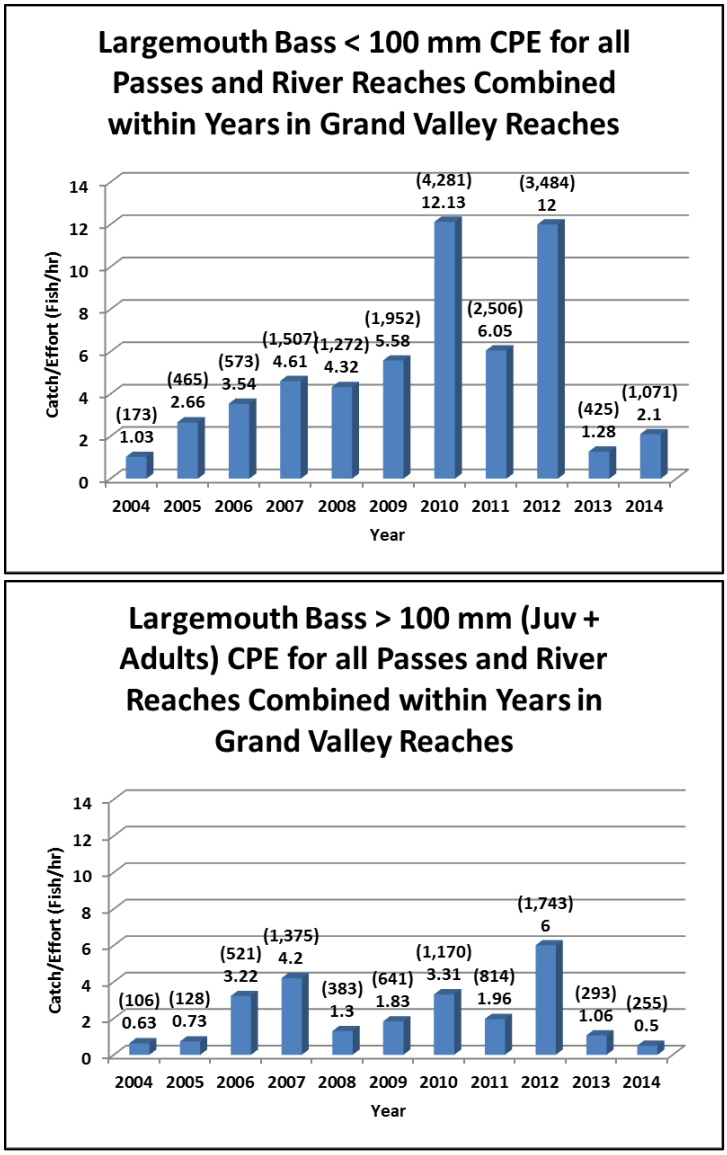

Figure 7. Eleven year comparison of catch/effort (fish/hr) for largemouth bass (< 100 mm) (upper) and juvenile and adult largemouth bass (≥ 100 mm) (lower), 2004-2014, for the Grand Valley reaches of the Upper Colorado and Lower Gunnison rivers. Note: numbers of largemouth bass collected in parentheses.

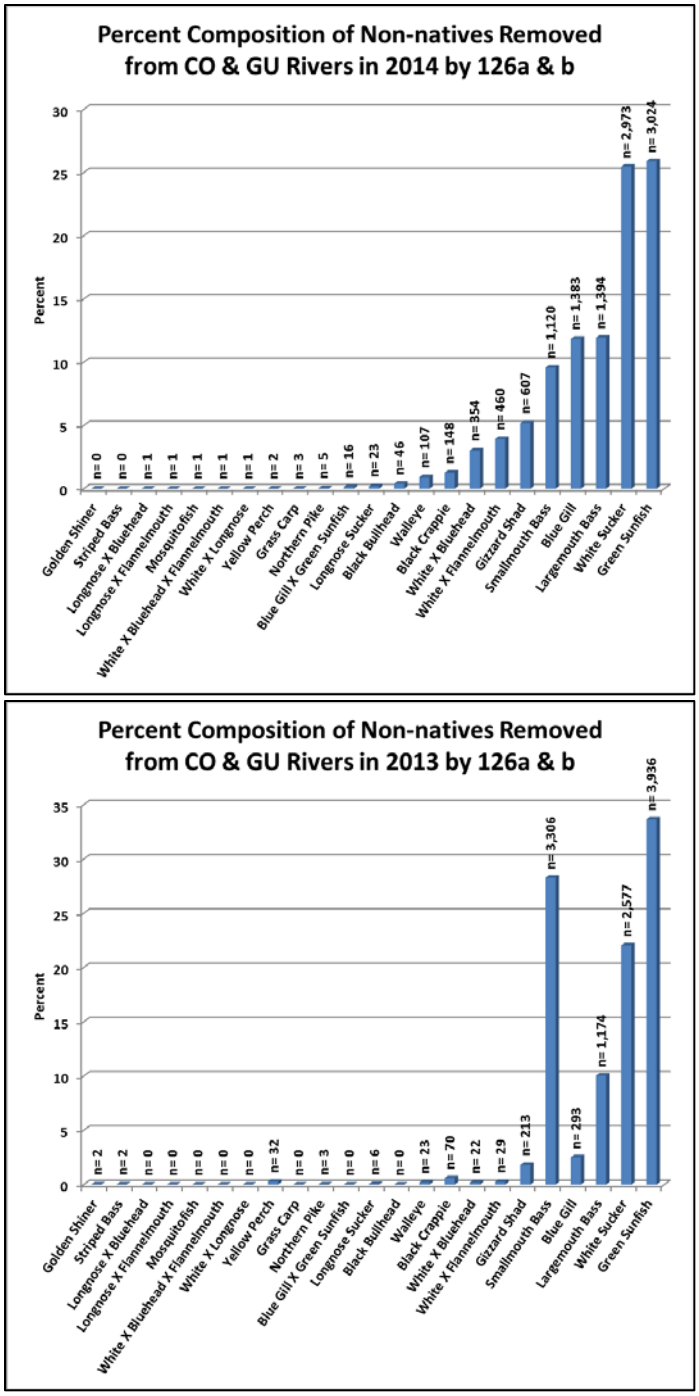

Figure 8. Percent composition of non-native fish removed from the Colorado (river mile 240.7 to 47.2) and Gunnison (river mile 3.0 to 0.0) rivers in 2013 and 2014. Note: numbers of fish collected above bars.

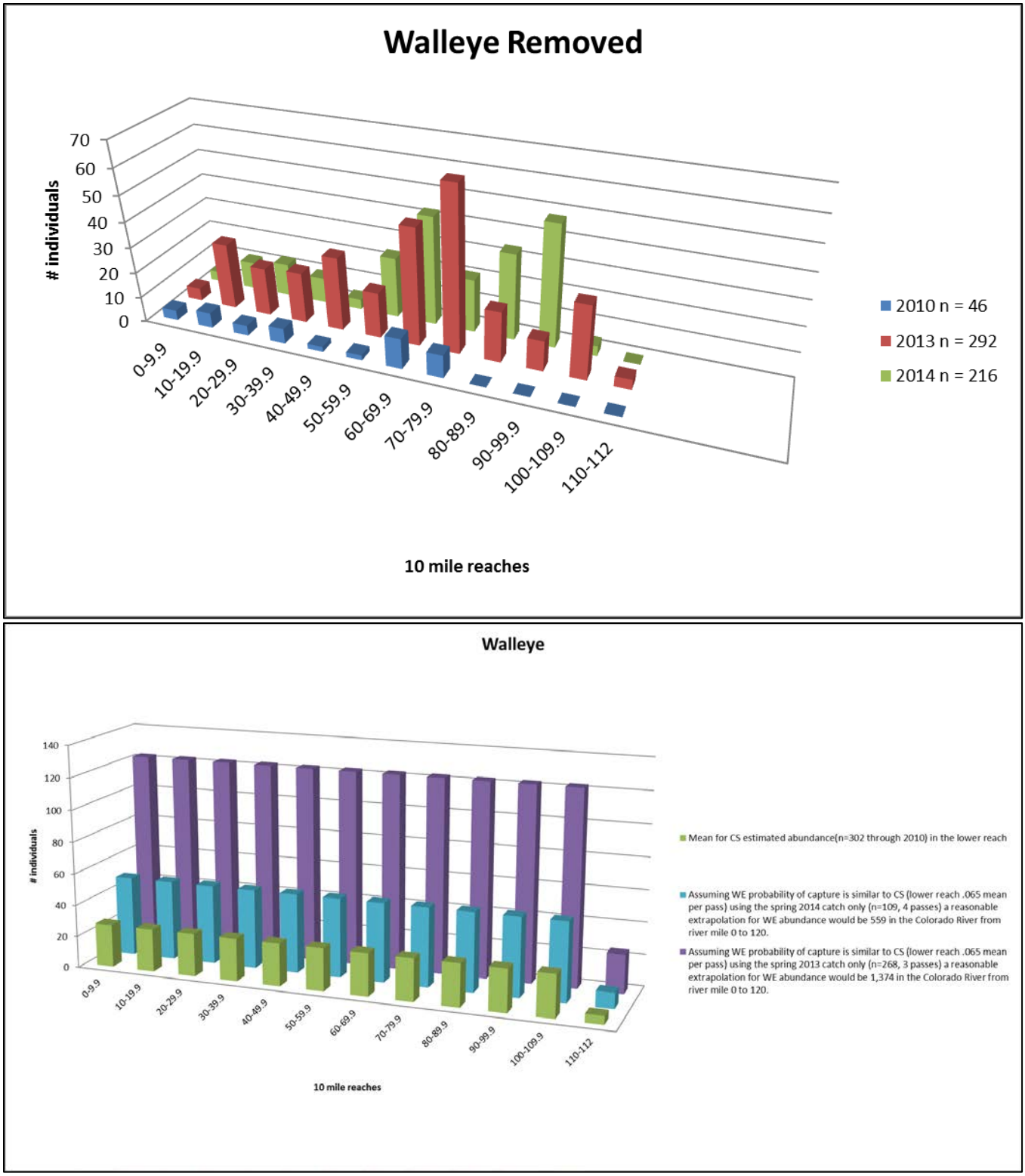

Figure 9. Top figure - distribution of WE captured during both the CS estimate and non-native removal projects, broken down into 10 mile reaches (Cisco, UT to the confluence of the Green River) in 2010, 2013 and 2014. Bottom figure the confluence of the Green River) in 2010, 2013 and 2014moval projects, broken down into 10 mile reaches to 0.0) rivers in 2013the Upperwalleye and Colorado pikeminnow, in 2013 and 2014, by ten mile reach.

Walleye captured with Colorado pikeminnow in their stomachs. Top photo taken 10/8/2014 by Travis Francis. Bottom photo taken 10/15/2014 by Brendan Crowley

.

For projects where more than one agency/entity receives funds from the Bureau of Reclamation, append one PPR from each agency/entity. Otherwise, delete.

ANNUAL PERFORMANCE PROGRESS REPORT (PPR)

BUREAU OF RECLAMATION AGREEMENT NUMBER: __R13AP002B_

UPPER COLORADO RIVER RECOVERY PROGRAM PROJECT NUMBER: 126b

Project Title: **Colorado River and White River Supplemental lethal removal of smallmouth bass and northern pike**

Principal Investigator: Lori Martin, Aquatic Biologist
Colorado Parks & Wildlife
711 Independent Ave.
Grand Junction, CO 81505
970-255-6126
lori.martin@state.co.us

Jenn Logan, Native Aquatic Species Biologist
Colorado Parks & Wildlife
0088 Wildlife Way
Glenwood Springs, CO 81601
970-947-2923
jenn.logan@state.co.us

Project/Grant Period: Start date (Mo/Day/Yr): July 7, 2013
End date: (Mo/Day/Yr): September 30, 2017
Reporting period end date (Mo/Day/Yr): September 30, 2014
Is this the final report? Yes _____ No _X_

Performance:

Summary of CPW's Project 126b: Colorado River Centrarchid, Etc. Removal for 2014

- The Colorado River was sampled between Silt (RM 248.0) and Beavertail Tunnel (RM 195.7) by CPW crews as part of Project 126b. Crews used two, 16' rafts equipped with ETS mounted electrofishing gear to complete the project. Rafts electrofished downstream along both shorelines, and utilized experimental gill nets at the mouths of and within backwaters to complete "block and shock" sampling. Fish captured were measured in length to the nearest millimeter and weighed to the nearest gram. Non-native, non-salmonid fish captured were lethally removed, with the exception of catostomids and common carp which were released alive. Otoliths will be extracted from the northern pike collected to assist in determination of fish origination.

- One electrofishing pass was completed from Silt (RM 248.0) to Beavertail Tunnel (RM 195.7). This was the first time CPW was able to sample the Colorado River from Parachute (RM 222.2) to Debeque (RM 209.7). In previous years, this reach was inaccessible to CPW crews, mainly due to low river flows prohibiting crews from crossing a dangerous river diversion (Bluestone Ditch) upstream of Debeque. This pass included sampling the main channel and backwaters via electrofishing. In general, northern pike, black bullheads, yellow perch, and most centrarchids were all captured within backwater/slackwater/eddy habitats.

- A second electrofishing pass was completed from Rifle (RM 240.4) to Parachute (RM 222.2), where only backwater/slackwater/eddy habitats were targeted utilizing electrofishing and the "block and shock" technique.

- CPW crews also completed two mark-recapture population studies across two areas in the Colorado River. These population studies were completed by CPW crews in addition to the efforts completed under Project 126b. Native, non-listed fishes were the primary interest of these population studies. The "upper" section of the Colorado River included two, 2.0 river mile reaches within the Silt (RM 248.0) to Beavertail Tunnel area (RM 195.7). Reach 1 was between Rifle (RM 240.4) and Rulison (RM 230.0), while Reach 2 was between Parachute (RM 222.2) and the Una bridge (RM 216.6). The "lower" section of the Colorado River included two river mile reaches (one reach was 2.7 river miles; the other reach was 2.2 river miles) within the Grand Valley area. Reach 3 was between Palisade (RM 184.2) and Corn Lake (RM 177.5), while Reach 4 was between Corn Lake (RM 177.5) and the 29 Road bridge (RM 174.0). Each of the four reaches were sampled twice, once on the marking pass and once on the recapture pass. The reaches were sampled by CPW crews via three, 16' rafts equipped with ETS mounted electrofishing gear. Rafts electrofished downstream along both shorelines, as well as the middle of the river. Backwaters were also electrofished, but the "block and shock" technique was not utilized during this sampling. Fish captured were measured in length to the nearest millimeter and weighed to the nearest gram. Black bullhead, bluegill, green sunfish, largemouth bass, northern pike, smallmouth bass, and yellow perch were lethally removed. Longnose sucker, white sucker, and their hybrids were lethally removed on the recapture pass in the "lower" section to be consistent with actions of FWS crews also working within this section of the Colorado River. Otoliths will be extracted from the northern pike collected to assist in determination of fish origination.

- Total Number of Fish Removed in the "upper" area of the Colorado River as part of Project 126b and the mark-recapture study = 401

  Total Number of Black Bullhead = 37 (Total length ranged from 51mm-192mm)
  Total Number of Bluegill = 9 (Total length ranged from 59mm-137mm)
  Total Number of Green Sunfish = 263 (Total length ranged from 39mm-155mm)
  Total Number of Largemouth Bass = 59 (Total length ranged from 52mm-339mm); 25 fish $\leq$ 100mm; 8 fish > 100mm and < 150mm; 26 fish $\geq$ 150mm
  Total Number of Northern Pike = 5 (Total length ranged from 392mm-795mm)
  Total Number of Smallmouth Bass = 27 (Total length ranged from 48mm-376mm); 8 fish $\leq$ 100mm; 0 fish > 100mm and <150mm; 18 fish $\geq$ = 150mm; 1 fish not measured
  Total Number of Yellow Perch = 1 (Total length = 82mm)

- Total Number of Fish Removed in the "lower" area of the Colorado River as part of the mark-recapture study= 141

  Total Number of Largemouth Bass = 1 (Total length = 182mm)
  Total Number of Smallmouth Bass = 2 (Total length ranged from 272mm-334mm)
  Total Number of Longnose Sucker = 18 (Total length ranged from 177mm-400mm)
  Total Number of White Sucker = 48 (Total length ranged from 146mm-387mm)
  Total Number of Longnose and/or White Sucker Hybrids = 72 (Total length ranged from 188mm-514mm)

- Total Electrofishing Effort Expended Overall = 73.5 hours

  During Project 126b in the "upper" area of the Colorado River = 44.20 hours
  During the mark-recapture study in the "upper" area of the Colorado River = 15.22 hours
  During the mark-recapture study in the "lower" area of the Colorado River = 14.08 hours

- Centrarchid CPUE for Project 126b in the "upper" area of the Colorado River = 5.90 fish/hour;

  Green Sunfish = 4.23 fish/hour
  Largemouth Bass = 0.95 fish/hour
  Smallmouth Bass = 0.61 fish/hour
  Bluegill = 0.11 fish/hour

- Centrarchid CPUE for the mark-recapture study in the "upper" area of the Colorado River = 6.37 fish/hour;

  Green Sunfish = 4.99 fish/hour
  Largemouth Bass = 1.12 fish/hour
  Smallmouth Bass = 0.00 fish/hour
  Bluegill = 0.26 fish/hour

- Northern Pike CPUE for Project 126b in the "upper" area of the Colorado River = 0.068 fish/hour

  Northern Pike CPUE for the mark-recapture study in the "upper" area of the Colorado River = 0.13 fish/hour

Summary of CPW's Project 126b: Snyder Pond (Mamm Creek/Lafarge/United Pit) Centrarchid, Etc. Removal for 2014

- Snyder Pond (also known as the Mamm Creek/Lafarge/United Pit) at approximately 37 surface acres was sampled by CPW crews using both active (a 16' hard bottom jet boat equipped with Smith Root mounted electrofishing gear) as well as passive (fyke and gill nets) sampling gears. Electrofishing was completed during the day and evening in the spring of 2014 Day electrofishing was also completed across one day in the fall of 2014. In the spring and concurrent with day/night electrofishing, six fyke nets were strategically

placed along the shorelines, and used to capture fish throughout the day and night hours. Both methodologies were used across four days in March (24th-27th), and across two days in April (3rd and 4th). In addition, gill nets were deployed during daylight hours while concurrently electrofishing on two days in May (29th and 30th) and across one day in September (16th). Fish captured were measured in length to the nearest millimeter and weighed to the nearest gram. All non-native, non-salmonid fish captured were lethally removed, with the exception of several common carp that were captured and released.

- The Colorado River breached the pond inlet notch during high flows in spring and early summer 2014. Surveys on May 29th and 30th were conducted during this time. The pond outlet was also actively spilling on these dates. Suckers and large common carp were seen swimming up the pond outlet from the Colorado River. A debris fence largely blocked fish from moving through the pond inlet in any direction. Gill nets were set at both the inlet and outlet areas and day electrofishing was conducted. Prior to pond inundation (March and April surveys), suckers and common carp were rarely captured in the pond. On the two days in May, 110 adult non-native suckers were captured and removed. Nine common carp were also captured. These species accounted for over 50% of our catch across those two days in May. Many of these fish were in spawning condition. In addition, 62 flannelmouth suckers were also captured and returned to the Colorado River. This information is presented to illustrate the introduction of a new food source to the pond that had previously been exhausted by resident northern pike. Northern pike captured prior to pond inundation appeared to be in poor body condition, and few fish reached spawning condition this year likely due to a poor prey base.

- Total Number of Fish Removed = 1,318 fish

  Total Number of Black Crappie = 1 (Total length = 360mm)
  Total Number of Common Carp = 20 (Total length ranged from 85mm-725mm); 18 released alive
  Total Number of Green Sunfish = 90 (Total length ranged from 28mm-117mm)
  Total Number of Largemouth Bass = 243 (Total length ranged from 42mm-481mm); 96 fish $\leq$ 100mm; 74 fish > 100mm and < 150mm; 73 fish $\geq$ = 150mm
  Total Number of Northern Pike = 134 (Total length ranged from 147mm-988mm);
  21 fish <200mm;
  20 fish $\geq$ 200mm and < 400mm;
  7 fish $\geq$ 400mm and < 500mm;
  41 fish $\geq$ 500mm and < 600mm;
  36 fish $\geq$ 600mm and < 700mm;
  6 fish $\geq$ 700mm and < 800mm;
  3 fish $\geq$ 800mm
  Total Number of Smallmouth Bass = 1 (Total length = 472mm)
  Total Number of Yellow Perch = 721 (Total length ranged from 64mm-206mm)
  Total Number of White Sucker = 95 (Total length ranged from 89mm-534mm)
  Total Number of White Sucker Hybrids = 31 (Total length ranged from 393mm-552mm)

- Total Effort Expended (Electrofishing Hours = 9.2 hours), (Fyke Net Hours = 652.4 hours), and (Gill Net Hours = 23.8 hours) = 676.2 hours overall

  Centrarchid Electrofishing CPUE = 34.6 fish/hour;
  Largemouth Bass = 24.9 fish/hour
  Green Sunfish = 9.5 fish/hour

  Northern Pike CPUE = 0.20 fish/hour;
  Electrofishing CPUE = 6.6 fish/hour
  Gill Netting CPUE = 1.01 fish/hour
  Fyke Netting CPUE = 0.08 fish/hour

  Yellow Perch CPUE = 1.05 fish/hour;
  Electrofishing CPUE = 33.3 fish/hour
  Fyke Netting CPUE = 0.63 fish/hour
  Gill Netting CPUE = 0.21 fish/hour