

COLORADO RIVER RECOVERY PROGRAM

Project #:
126(a)

FY-2011 PROPOSED SCOPE OF WORK for: Colorado River smallmouth bass removal

Lead Agency: Fish and Wildlife Service
Colorado River Fishery Project

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Date: 01 February 2010
Amended: 14 January 2011

<u>Category:</u>	<u>Expected Funding</u>
<u>Source:</u>	
<input type="checkbox"/> Ongoing project	<u>XX</u> Annual funds
<input checked="" type="checkbox"/> Ongoing-revised project	<input type="checkbox"/> Capital funds
<input type="checkbox"/> Requested new project	<input type="checkbox"/> Other (explain)
<input type="checkbox"/> Unsolicited proposal	

- I. Title of Proposal: **Removal of Smallmouth Bass in the Upper Colorado River between Price-Stubb Dam [Government Highline Diversion Dam] near Palisade, Colorado, and Westwater, Utah.**
- II. 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.

III. Study Background/Rationale and Hypotheses:

General

Significant anthropogenic changes to the physical riverine habitat have undoubtedly played an important role in the decline and endangered status of Colorado pikeminnow, humpback chub, bonytail, and razorback sucker, but changes in the biological environment may also have been equally significant. Physical changes in the riverine habitat have been accompanied by the introduction, establishment, and proliferation of nonnative fishes, and concomitant declines in native fishes in the Upper Colorado River basin. The role of nonnative fishes is often identified, in association with habitat changes, as a major obstacle to conservation of native fish communities.

At least 67 nonnative fishes have been introduced actively or passively into the Colorado River system during the last 100 years (Minckley 1982; Tyus et al. 1982; Carlson and Muth 1989; Minckley and Deacon 1991; Maddux et al. 1993). By 1980, more than 50 nonnative fishes had been actively introduced into rivers and reservoirs of the Colorado River basin (Minckley 1982; Tyus et al. 1982; Carlson and Muth 1989). Native big river fishes have disappeared from about three-fourths of their original habitat while introduced fishes have become more widespread and abundant. Former studies have also documented a decline in the abundance of native fish species as nonnative species increased in abundance (Joseph et al. 1977; Behnke 1980; Osmundson and Kaeding 1989; Quarterone 1993).

Many of the nonnative fishes introduced into the Colorado River basin are suspected of adversely affecting the native mainstem fishes in some fashion. Warmwater gamefish are thought to have the greatest adverse effect on endangered native fishes. Centrarchids (e. g., largemouth bass, green sunfish, bluegill, black crappie, and smallmouth bass), ictalurids (e. g., channel catfish and black bullhead), and esocids (northern pike) are frequently listed as contributors to the decline of native fishes. An increasing body of evidence characterizes the negative interactions of nonnative fishes with the endangered big river fishes (Hawkins and Nesler 1991; Minckley et al. 1991; Maddux et al. 1993; Lentsch et al. 1996). Some of this evidence is indirect, including inferences from field data or results from laboratory studies of predation by nonnatives on natives. Laboratory studies have documented agonistic behavior, resource sharing, and vulnerability to predation (Papoulias and Minckley 1990; Karp and Tyus 1990; Ruppert et al. 1993; Johnson et al. 1993). Direct evidence of predation includes native fishes obtained from stomach contents of nonnative fishes and by visual observation of predation. Other means by which nonnative fishes may adversely affect native fishes are by competition for food, which limits the success of razorback sucker (Papoulias and Minckley 1990). The extent of predation pressure by some nonnative fishes on populations of native fishes is not exactly known. Tyus and Saunders (1996) went on to conclude that smallmouth bass along with channel catfish and northern pike were the main threat to juvenile Colorado pikeminnow and razorback sucker. During the 1990s the Yampa River experienced a dramatic increase in northern pike and then smallmouth bass in critical habitat. Predation by these two piscivorous species wreaked havoc on the native fish community. Anderson (2004; 2005) documented significant declines of native fish densities in parts of the Yampa River between 1998 and 2004 coincident with an increase in smallmouth bass abundance. Bioenergetic modeling by Johnson et al. (2008) indicated that smallmouth bass fish consumption was similar to northern pike and about 65 times greater than channel catfish, but if more prey fish were available, piscivory by smallmouth bass could be 10 fold the piscivory by northern pike and channel catfish. They concluded that smallmouth bass presented the greatest predatory threat to native fishes of the Yampa River.

Smallmouth Bass

Until 2003, smallmouth bass were only reported as incidental, rare captures in the Upper Colorado River from Price Stubb Dam (river mile 188.3) to the Colorado/Green River confluence. However, Fish and Wildlife sampling crews involved with the channel catfish removal evaluation recorded and documented the capture of 318 smallmouth bass in main channel riverine habitats in a 39-mile reach of the Upper Colorado River from the Gunnison/Colorado River confluence

to the Utah/Colorado stateline (Burdick 2003(a)). Catch rates (fish/hour and fish/mile) steadily increased throughout the 4-month sampling period (30 June to 31 October) and reached a high of 4.07 fish/hr. The source(s) of these smallmouth bass are unknown.

Upper Colorado River (Colorado)

In the Upper Colorado River between Price-Stubb Dam (river mile [RM] 188.3) and the head of Westwater Canyon, (RM 125), abundance and distribution information is limited for smallmouth bass. However, the increase in the number of smallmouth bass reported during the channel catfish removal evaluation had biologists and managers concerned that smallmouth bass abundance could increase quickly, and further impact recovery of native endangered fishes. Smallmouth bass have the potential to predate or compete with different life stages of the four native endangered fishes.

Fish passage has been restored at the Grand Valley Irrigation Company Diversion Dam near Palisade, the Government Highline Diversion Dam, and recently (March 2008) at the Price-Stubb Diversion Dam. For the first time in over 100 years fish now have upstream access from the Grand Valley to upstream reaches in the Upper Colorado River. Only a fish trap at the Government Highline fish passageway can prevent unimpeded movement upstream. Smallmouth bass are located in Rifle Gap Reservoir and adult smallmouth bass have been reported in the Colorado River between Rifle and Price-Stubb Dam (Anderson 1997; Burdick 2008(a)).

Lower Gunnison River

In the fish trap of the Redlands Dam fish passageway in the Lower Gunnison River, the number of smallmouth bass have increased (19 fish in 2002 and 2003)(Burdick 2002; Burdick 2003(b)) over previous years of monitoring (1996–2001: 1 fish)(Burdick 2001). Nine smallmouth bass were collected in the fish trap at Redlands during 2004 (Burdick 2004) and 21 during 2005 (Burdick 2005a). No smallmouth bass were collected in the fish trap during 2006 (Burdick 2006) or 2007 (Burdick 2007). Four were collected in 2008, one in 2009 (Burdick 2008(b); 2009), and three in 2010 (Burdick 2010). About 1,800 fingerling smallmouth bass were stocked by the Colorado Division of Wildlife (CDOW) in 1973 in the Gunnison River near Delta (Wiltzius 1978) upstream from Redlands Diversion Dam. None of these stocked smallmouth bass have been subsequently captured upstream from the diversion dam (Wiltzius 1978, Valdez et al. 1982; Burdick 1995). Redlands Dam (RM 3.0) provides an effective barrier to smallmouth bass and all other fish attempting to move further upstream in the Gunnison River.

Control of Nonnative Fish by Mechanical Removal

Control of smallmouth bass and other nonnative fish species is a primary emphasis, along with habitat restoration, propagation and stocking, and instream flow management within the Recovery Program for the four endangered fish species. In the strategic plan for the control of nonnative fishes in the Upper Colorado River Basin (Tyus and Saunders 1996), “control” was defined as “reducing the numbers of one or more nonnative species to levels below which they are no longer an impediment to the recovery of endangered fish species.” The goal for nonnative fish control or management in the Upper Colorado River Basin is to reduce the adverse impacts of nonnative fishes on the endangered

fishes which will hopefully increase the distribution and abundance of the endangered fishes and contribute to their recovery. It is not likely that nonnative fishes that have become established in the Upper Colorado River Basin can be eliminated. However, preventive measures and active control programs could be implemented to reduce the abundance of nonnative fishes in riverine and adjacent floodplain habitats. Consequently, then, reducing the abundance of some problematic, nonnative fishes would reduce the potential for predation and competition on native listed and non-listed fishes. Management to promote recovery of listed fish species may have to include long-term or periodic suppression of some problematic nonnatives, such as mechanical removal, that minimizes impacts to remaining native fishes.

IV. Study Goals, Objectives, End Product:

Study Goals/Objectives

The purpose of this proposed study is to remove as many smallmouth bass of all sizes in main channel riverine habitats in a 61-mile reach of the Upper Colorado River between Price-Stubb Dam and Westwater boat landing in eastern Utah. The goal is to reduce the abundance of smallmouth bass as quickly as possible in this reach which will ultimately benefit native listed fishes, and possibly contribute to their recovery. The study objectives are to:

1. remove all sizes of smallmouth bass in the Upper Colorado River by boat and raft-based electrofishing, and
2. obtain an abundance estimate for smallmouth bass juvenile (100-199 mm) and adults (≥ 200 mm) by mark and recapture methods for the Upper Colorado River between GVIC Dam and Loma Boat Landing and the Lower Gunnison River between Redlands Dam and the Colorado/Gunnison river confluence.

FINAL PRODUCT: Computerize and analyze field data;
Prepare annual RIP reports.

- V. Study Area: sixty-five miles of the Upper Colorado River:
Price-Stubb Diversion Dam downstream to Westwater boat landing (RM 188.3 – 127.6) & the Lower Gunnison River (RM 3.0 – 0.7);
Rifle Bridge to Beavertail Mountain (RM 240.4 – 195.7) [added in 2004]
Silt to Rifle (RMs ~ 250.0 – 240.4)[added in 2007][removed for 2009/2010/2011]
Government Highline Diversion Dam to Cameo Bridge (RMs 193.7 – 189.7)[added for 2009]

VI. Study Methods/Approach:

General–Study Direction and Evolution

December 2003. One of the conclusions agreed upon by participants at the December 2003 Nonnative Fish Control Workshop in Grand Junction was that smallmouth bass posed a greater threat to native fishes than other nonnative game fishes (e.g., channel catfish). Northern pike was viewed as the present number one threat to native fishes. At this workshop, the priority was established to start removing smallmouth bass from the Upper Colorado River in western Colorado as soon as possible to head off a possible increase in the abundance of this

species. Recovery of listed native fishes might be more attainable if the threats (i.e., predation and competition) posed by certain nonnative fishes, such as smallmouth bass, could be minimized or eliminated.

FY2006 Study Modifications. The decision was made during the December 14, 2005, Biology Committee meeting to obtain an abundance estimate for smallmouth bass in concentration areas of the Upper Colorado River from Price Stubb Dam to Westwater, Utah. In essence this endeavor entailed marking and releasing smallmouth bass during an initial pass starting in the summer of 2006, and lethally removing and recording previously marked smallmouth bass in all subsequent passes. Smallmouth bass were marked in the river segments from Price Stubb Dam to Fruita State Park in the Upper Colorado River and a 2.3-mile segment of the Lower Gunnison River. These river segments were identified as moderate to high concentrations areas for smallmouth bass based on capture data from the summers of 2004 and 2005. An additional first pass was added to accomplish the marking. Four successive passes were performed during 2006 in the concentration areas to lethally remove smallmouth bass as was conducted in both 2004 and 2005.

Population estimates for smallmouth bass have been performed from 2007-2010, to track population abundance.

The number of removal passes for areas of low densities of smallmouth bass as determined from 2004 and 2005 capture data was reduced during 2006. These river segments included the canyon-bound reaches of Ruby and Horsethief canyons to Westwater, Utah (RM 152.6 – 127.6). The reduced effort in these reaches was re-directed to increase the number of removal passes in river segments where smallmouth bass had proliferated over the past two years. One such river reach was the 45-mile reach of the Upper Colorado River from the Rifle Bridge to Beavertail Mountain and, in particular, the 10 mile river segment from Rifle to Rulison. In 2005, the number of smallmouth bass collected in these reaches increased 11 fold and catch effort increased about 5.5 times. Re-focusing the removal effort resulted in a zero net budget change.

In 2007, study direction was modified again. Four additional removal passes were added for the Grand Valley portion of the project area. Two additional passes were performed by Fish and Wildlife personnel and two by Colorado Division of Wildlife (CDOW) personnel. The last two removal passes performed by the CDOW were in river reaches where high concentration or high abundance of smallmouth bass had been determined during the past five years of sampling. This sampling regime continued into 2008, 2009, and 2010.

A final synthesis report describing results from 2004 to 2006 was completed in January 2008 (Burdick 2008(a)).

Methodology

To date, sampling efforts have focused on a reach and not river-wide scale. For logistical considerations, the entire 61-mile section of the Upper Colorado River from Price-Stubb Dam to the Westwater, Utah, was divided into three different sub-reaches based on hydro-geomorphic features.

Three general sub-reaches were sampled between 2004 and 2010. These included, 1) a 3-mile section between Price-Stubb and Grand Valley Irrigation dams and the 15-mile section that extends from Palisade to the Gunnison/Colorado River confluence (RMs 185.5–171), 2) the 18-mile reach that extends from the confluence of the Gunnison and Colorado rivers to the Loma Boat Landing (RMs 171.0–152.6), and 3) Ruby and Horsethief canyons (RMs 152.6–127.6) which extends from the Loma Boat Landing to the Westwater, Utah. The 15- and 18-mile sub-reaches flow through a wide alluvial section of the lower Grand Valley; the canyon-bound sub-reach is considered a quasi-alluvial sub-reach. The number of sampling occasions (i.e., passes) in the 15-mile reach has been affected by the availability of sufficient water for sampling craft to operate due to extended drought periods. Sampling the 3-mile section between Price-Stubb and Grand Valley Irrigation dams has also been reduced due to poor access and low-water conditions in mid- to late-summer.

A 45-mile reach of the Upper Colorado River from the Rifle Bridge (river mile 240.7) to Beavertail Mountain in Debeque Canyon (river mile 195.7) has been sampled with raft electrofishing all seven years (2004 – 2010) of this study. This river reach was outside the original defined removal area. However, there were unsubstantiated reports that anglers had encountered smallmouth bass in these upstream reaches, and it was determined that a “reconnaissance” sampling trip was warranted to substantiate or refute these claims. Past sampling regime for this 45-mile reach has been two complete passes and a third pass in high concentration areas of smallmouth bass.

FY 2011

***Sampling Protocol.* Based on recommendation no. 6 in the 2010 annual report (RP project no.126(a)), sampling protocol during 2011 will be modified from earlier sampling years (2007-2010). Removal efforts in the 45-mile reach between Rifle Bridge and Beavertail Mountain will be continued but the number of removal passes will be reduced from three to one. The reduced effort in the Rifle to Beavertail reach will be re-allocated to increase removal passes (two total) in some of the Grand Valley reaches of the Colorado River(RMs 185.3-152.6) The principal investigator believes it is imperative to re-allocate this effort from the Rifle to Beavertail Mountain reaches to the Grand Valley reaches for 2011 because the smallmouth bass cohort produced in 2010 in the Grand Valley reaches appeared to be stronger than that of 2007, which was recognized as one of the strongest year classes in the upper Colorado River basin rivers. It is uncertain if this 2010 cohort will overwinter, and that will not be known until the 2011 summer sampling is underway. The Service will be responsible for performing this “re-allocated” effort and will not affect the removal effort (two passes) performed by the CDOW (RP project no. 126(b)), which usually occurs in September. This reallocation of effort will result in no additional costs to the 2011 budget for this project.**

In the Grand Valley reaches of the Upper Colorado and Lower Gunnison rivers, one pass will be devoted to mark juvenile (100 – 199 mm) and adult (≥ 200 mm) smallmouth bass. Three electrofishing craft will be used during the marking pass in the Grand Valley reaches for the purpose of increasing the number of marked smallmouth bass ≥ 100 mm. This will be followed by **ten** passes to lethally remove all centrarchid fishes. **Eight** passes will be performed by FWS and two

by CDOW. The two removal passes to be performed by the CDOW will be within the four highest concentration reaches for smallmouth bass in the Upper Colorado and Lower Gunnison rivers in the Grand Valley as determined by that years catch rate. Marked smallmouth bass will be noted on every removal pass, but only marked smallmouth bass recaptured from the first removal pass will be used for the population estimate. The population estimate will be for 35.3 miles of the Upper Colorado River from Grand Valley Irrigation Company Dam at Palisade (RM 185.6 to the Loma Boat Landing (RM 152.6) and the 2.3 miles of the Lower Gunnison River from the Redlands Dam to the Colorado/Gunnison rivers.

Only one monitoring pass will be performed in the canyon-bound reaches Between the Loma Boat Landing and the Westwater, Utah, BLM ranger station in 2011 to detect if any marked smallmouth bass moved into these reaches post-Marking pass and to detect for any increased smallmouth bass abundance. Fish passage at the Price Stubb Diversion Dam was opened in April 2009. Boat landings were constructed at the Government Highline Diversion Dam and at the Cameo Bridge and hence boat access is now feasible in this short reach. Therefore, in 2011, this reach, as in 2009 and 2010, will again be sampled six times. This is an additional reach that was not accounted for in the 2009, 2010, and 2011 budgets.

Juvenile and adult smallmouth bass collected during the first pass will be marked and released. For the population estimate in 2011, juvenile smallmouth bass (100-199 mm) will be marked by removing the ventral lobe of the caudal fin with scissors. Adult smallmouth bass (≥ 200 mm) will be marked by removing the dorsal lobe of the caudal fin with scissors. Subsequent recaptures of smallmouth bass marked during the marking pass will recorded for determining an abundance estimate. In 2011, field data will be recorded from all juvenile and adult endangered fish collected. They will be also checked for a PIT tag, weighed, measured, and immediately returned to the river.

Fish Disposal. All smallmouth bass (except for fish marked and released during the marking pass) and all other centrarchids plus any inadvertent northern pike, walleye, gizzard shad, grass carp, and yellow perch collected will be lethally removed. Disposal of all the aforementioned fishes will be as follows: following capture, fish will be euthanized afield and preserved with ice. All dead fish will be held on station in freezers and disposed of in the Mesa County landfill southeast of Grand Junction.

Data Analyses. All smallmouth bass captured within each of the sub-reaches will be enumerated in 2011 similar to that during former years (2004 – 2010). Total numbers of smallmouth bass and largemouth bass collected and catch/effort (fish/hr) will be also determined for each sub-reach per sampling pass for each of these 3 years. Length data will be recorded for 2011 similar to that during former years (2004 – 2010) to determine the size structure of smallmouth bass removed. Data summary analyses similar to that employed between 2004 and 2010 will be used to analyze the 2011 field data. During 2011, mark-recapture data will be subjected to an abundance estimator to obtain a population estimate for juvenile (100-199 mm) and adult (≥ 200 mm) smallmouth bass from the 15- and 18-mile reaches and the lower 2.3 miles of the Gunnison River. Chapman's (1951) modification of the Petersen-Lincoln estimator used to determine the abundance of smallmouth bass in 2006 through 2010, and will be used again in 2011. Probability of capture (\hat{p})(after White et al. 1982), the coefficient of variation

(CV: $SE/N\text{-hat} \times 100$ [where N=estimated population size])(Pollock et al. 1990), and exploitation rates will also be computed. All centrarchid fishes captured during the 2011 field work will also be analyzed similar to the data analyzed between 2004 and 2010 for among year comparisons.

VII. Task Description and Schedule

Description

Task 1. Remove all sizes of smallmouth bass and other centrarchid fishes.
 Sub-task 1a. Mark and release smallmouth bass during pass 1.

Task 2. a) computerize field data; b) analyze data; c) prepare annual RIP reports.

Schedule

Task 1. 6/2011 – 10/2011
 Sub-task 1a. 7/2011

Task 2. a) 9/2011-11/2011, b) & c) 11/2011

FY-2011 Work (eighth year of multi-year study)

Deliverables/Due Dates: Annual Report due 11/2011

Budget (actual salary rates w/ benefits provided by CRFP Administrative Officer used for labor; equipment & vehicle expenses maintained at 2009 budget level)

Task 1: remove all smallmouth bass; sub-task 1a: mark & release smallmouth bass on pass 1 for population estimate

1. Labor (salary and benefits)		
Project Leader		
(1-GS-14 @ 2,353/wk or 160 hrs)	4 weeks	\$ 9,412
Project Fishery Biologist		
(1-GS-12 @ 2,246/wk or 1,120 hrs)	28 weeks	\$ 62,888
Seasonal Technicians		
(4-GS-5 @ 654/wk or 2,720 hrs)	17 weeks	\$ 44,472
Administrative Asst.		
(1-GS-9 @ 1,485/wk or 200 hrs)	5 weeks	\$ 7,425
	Subtotal	\$124,197
2. Travel (RP meetings/workshops)	1 week	\$ 1,085
	Subtotal	\$ 1,085
3. Equipment		
Gasoline, 2-cycle outboard oil for outboards; props, jet-pump impellers, liners, parts		\$ 3,100
Maintenance (Boat Motors, Generators, GPPs,		

aluminum boat repair)	\$	7,785
Office (paper, telephones, postage, office supplies, computer software/support, misc.)	\$	1,600
Dip nets; stainless steel spheres, cable, hardware	\$	1,200
Marking equipment (Fiskars® scissors/punches)	\$	110
	Subtotal	\$ 13,795
4. Vehicles (GSA-leased, FWS-owned: gas/tires/maintenance)		
Fish Collections	\$	9,110
	Subtotal	\$ 9,110
Task 1 Subtotal \$148,187		
Task 2. Computerize field data; analyze data; prepare RIP annual report.		
1. Labor (salary and benefits)		
Project Fishery Biologist		
(1-GS-12 @ 2,246/wk or 160 hrs)	4 weeks	\$ 8,984
	Subtotal	\$ 8,984
Task 2 Subtotal \$ 8,984		
FY2009 All Tasks Total \$157,171		

IX. Budget Summary

FY-2011 \$ 157,171
Grand:
Total: \$ 157,171 (**\$ 157,200**)—identical to FY-2009 and FY-2010

X. Reviewers: None

XI. References

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Prepared by Bob D. Burdick, 30 April 2009
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Amended: 14 January 2011 (BDB)