

COLORADO RIVER RECOVERY PROGRAM
FY-2007-2008 PROPOSED SCOPE OF WORK for:
Colorado River smallmouth bass removal

Project #: 126a

Note: 2/3 of the budget and field effort (2 weeks) were re-allocated from RP Project No.: 121a, Evaluation of Stocked Razorback Sucker and Colorado Pikeminnow in the Gunnison River, to RP Project No.: 126 for FY-2007.

Note: a portion of the funding (\$ 12,834) from RP Project No. C-4b-GV was re-allocated to RP Project No.: 126 for FY-2007 to increase the number of lethal removal passes in high concentration areas for smallmouth bass and perform additional reconnaissance sampling in the Upper Colorado River between Silt and Rifle.

Lead Agency: Fish and Wildlife Service
Colorado River Fishery Project

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Date: 25 January 2007; revised 21 March 2007 by BDB

Category:

- Ongoing project
- Ongoing-revised project
- Requested new project
- Unsolicited proposal

Expected Funding Source:

- Annual funds
- Capital funds
- Other (explain)

I. Title of Proposal: **Removal of Smallmouth Bass in the Upper Colorado River between Price-Stubb 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.

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)(Table 1). The source(s) of these smallmouth bass is unknown.

Table 1. Number, catch effort (fish/hr and fish/mile) for largemouth bass and smallmouth bass collected from main channel habitats in the Upper Colorado River with electrofishing from river mile 171.0 to 132.0 (Colorado/Gunnison River confluence to the Utah/Colorado stateline), 30 June to 31 October 2003. Note: data for the Upper Reach (Colorado/Gunnison River confluence to the Loma Boat Landing) and Lower Reach (Loma Boat Landing to the Colorado/Utah stateline) were combined. Total effort (hrs) = 132.82; total miles sampled = 293.

	<u>Largemouth Bass</u>			<u>Smallmouth Bass</u>		
	<u>No.</u>	<u>Fish/hr</u>	<u>Fish/Mile</u>	<u>No.</u>	<u>Fish/hr</u>	<u>Fish/Mile</u>
Pass 1	8	0.27	0.11	39	1.34	0.53
Pass 2	13	0.42	0.17	41	1.31	0.54
Pass 3	6	0.06	0.14	33	1.94	0.76
Pass 4	41	1.43	0.70	96	3.35	1.63
Pass 5	46	1.72	1.07	109	4.07	2.54
Totals	114	0.86	0.39	318	2.39	1.09

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 for smallmouth bass is limited. However, the recent apparent increase in the numbers of smallmouth bass as reported during the channel catfish removal evaluation has biologists and managers concerned that smallmouth bass abundance may 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.

Price-Stubb Dam presently acts as an effective upstream movement barrier for all fishes. 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). No “naturally occurring” Colorado pikeminnow have been reported upstream of Price-Stubb Dam during fishery investigations over the past 23 years (Valdez et al. 1982; Wydoski 1994; Anderson 1997). The last wild razorback sucker captured upstream of Price-Stubb Dam was at RMs 205, 220.7, and 223.7 in 1980 and 1981 (Valdez et al. 1982). However, both wild and domestic-reared Colorado pikeminnow along with domestic-reared razorback sucker have been stocked in the Upper Colorado River upstream of Price-Stubb Dam between 1999 and 2001 (Burdick 2002).

Adult Colorado pikeminnow have been captured in the reach between Grand Valley Irrigation Diversion Dam (RM 185.3) and Price-Stubb Dam. Burdick (1999) collected 10 adult Colorado pikeminnow between 19 August and 24 September during 1998. Eight

adult pikeminnow were collected between 29 April and 22 June 1999 and seven were collected in 2000 between 27 April and 19 May (personal communication, Douglas B. Osmundson). One radio-tagged Colorado pikeminnow was detected at the base of Price-Stubb Dam between mid-July and late-September in 1986 and 1987 (Osmundson and Kaeding 1989). Adult Colorado pikeminnow presently occupy the 15- and 18-mile reaches of the Colorado River in the Grand Valley and reaches downstream. Some of the last wild razorback sucker were captured in the 15-mile reach. Domestic-reared razorback sucker stocked near Parachute have been found in backwaters in the 15- and 18-mile reaches (Burdick 2002).

Lower Gunnison River

In the fish trap of the Redlands Dam fish passageway in the Lower Gunnison River, the number of smallmouth bass have recently increased (19 fish in 2002 and 2003)(Burdick 2003(a)) 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 2004a) and 21 during 2005 (Burdick 2005a). No smallmouth bass were collected in the fish trap during 2006 (Burdick. 2006(a)). 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.

2004 Study Results

Total number of fish collected with boat and raft-based electrofishing by species during the 2004 smallmouth bass removal were, smallmouth bass: 1,165; largemouth bass: 277; black crappie/green sunfish/bluegill in the aggregate: 761 (Burdick 2004b).

There did not appear to be an obvious reduction in the abundance using catch effort indices (fish/hour and fish/mile) for smallmouth bass, largemouth bass, or the three other centrarchid fishes (black crappie, bluegill, and green sunfish) during the 2-month removal period in 2004. Overall mean catch effort for all these fishes actually increased with each subsequent pass in 2004. Therefore, during the summer of 2004, we did not show a depletion for either smallmouth bass or largemouth bass in main channel habitats of the Colorado River in western Colorado and eastern Utah and the Lower Gunnison River in western Colorado.

We also concluded that there was no statistically significant ($\alpha=.05$) decline in the size (i.e., mean total length) of smallmouth bass over the four passes during the summer of 2004. Also, it was apparent from collections, that in some river segments (18-mile reach [Colorado/Gunnison River confluence to the Loma Boat Landing]), smallmouth bass reproduced during 2004.

The number of smallmouth bass recently collected as compared to those collected during investigations from previous years now leads researchers to believe that this species is

quickly emerging as an abundant nonnative fish in the Grand Valley and Ruby and Horsethief canyons in the Upper Colorado River. And apparently, according to catch effort analyses between 2003 and 2004, smallmouth bass abundance is still increasing in the Grand Valley and Ruby and Horsethief canyons of the Upper Colorado River. It also appears that the abundance of smallmouth bass and largemouth bass collected with electrofishing in main channel habitats during the summer of 2004 was considerably greater than the number collected during the channel catfish removal evaluation that was conducted in the summer of 2003 and during the population monitoring for Colorado pikeminnow performed in the spring of 2004.

2005 Study Results

Total number of fish collected with boat and raft-based electrofishing by species during the 2005 smallmouth bass removal from Price Stubb Dam to the Westwater, UT, ranger station and the Lower Gunnison River was, smallmouth bass: 1,366; largemouth bass: 589; black crappie: 41; green sunfish: 643; bluegill: 316. Abundance for all five centrarchid fishes during 2005 increased from 2004. Abundance of smallmouth bass increased 11 fold from 21 to 230 fish from Rifle to Beavertail Mountain (Burdick 2005b).

There did not appear to be an obvious reduction in abundance using catch effort indices (fish/hour and fish/mile) for smallmouth bass, largemouth bass, or the three other centrarchid fishes (black crappie, bluegill, and green sunfish) during the 2-month removal period in 2005. Therefore, during the summer of 2005, as was the case during the summer of 2004, we did not show a depletion for either smallmouth bass or largemouth bass in main channel habitats of the Colorado River in western Colorado and eastern Utah and the Lower Gunnison River in western Colorado. Overall mean catch effort for smallmouth bass increased in 2005 from 2004 (6.91 to 7.38); largemouth bass increased from 1.64 to 3.37; and black crappie/bluegill/green sunfish aggregate catch/effort increased from 4.51 to 8.07.

We also concluded that there was no statistically significant ($\alpha=.05$) decline in the size (i.e., mean total length) of smallmouth bass between 2004 and 2005 in five river reaches of the Upper Colorado and Lower Gunnison rivers. Also, it was apparent from collections, that in some river segments (18-mile reach [Colorado/Gunnison River confluence to the Loma Boat Landing]), smallmouth bass reproduced during 2005 as they did during 2004.

The number of smallmouth bass recorded during 2004 and 2005 compared to those collected during investigations from previous years indicates that not only has this species emerged as an abundant nonnative fish but is proliferating in some river segments of the Grand Valley, Ruby and Horsethief canyons, and between Rifle and Rulison in the Upper Colorado River. And apparently, according to catch effort analyses from the summer of 2003, 2004, and 2005, smallmouth bass abundance is still increasing in the Grand Valley and Ruby and Horsethief canyons of the Upper Colorado River.

2006 Study Results

Total number of fish collected with boat and raft-based electrofishing by species during the 2006 smallmouth bass removal from Price Stubb Dam to the Westwater, Utah, ranger station and the Lower Gunnison River was, smallmouth bass: 751; largemouth bass: 1,094; black crappie: 70; green sunfish: 1,395; bluegill: 307. Numbers of smallmouth bass declined by 45% from 2005 and 36% from 2004 in the Grand Valley river reaches and decreased 66% from Rifle to Beavertail Mountain. On the other hand, largemouth bass numbers in 2006 increased 86% from 2005 and 295% from 2004 in the Grand Valley reaches. From Rifle to Beavertail Mountain, largemouth bass numbers in 2006 increased 455% from 2005. Green sunfish numbers in 2006 increased 33% in the Grand Valley reaches over 2005 but declined 19% between Rifle and Beavertail Mountain; black crappie numbers increased 71% in the Grand Valley reaches. Bluegill numbers declined in both the Grand Valley reaches (3%) and Rifle to Beavertail Mountain reaches (70%)(Burdick 2006(b)).

We also detected a decline in abundance of smallmouth bass in 2006 from the previous two years using catch effort indices (fish/hour and fish/mile) in main channel habitats of the Colorado River in western Colorado and eastern Utah and the Lower Gunnison River. In the Grand Valley reaches, overall mean catch effort for smallmouth bass declined in 2006 (4.64) from 2005 (7.83) and 2004 (6.91). However, largemouth bass catch rate was the highest in 2006 (6.76) compared to 3.37 in 2005 and 1.64 in 2004. Green sunfish/black crappie/bluegill aggregate catch rate was the highest during 2006 (10.94) compared to 8.07 (2005) and 4.51 (2004). Between Rifle and Beavertail Mountain, smallmouth bass catch rate in 2006 (2.10) declined from 2005 (5.78); largemouth bass catch rate increased in 2006 (5.62) from 2005 (0.95) and 2004 (3.29).

A statistically significant increase ($\alpha=.05$) in mean total length was detected in 3 of 5 river segments which may be due in part to the loss of smallmouth bass between 100 and 180 mm. Also, it was apparent from collections, that 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], and Rifle to Beavertail Mountain), smallmouth bass reproduced during 2006 as they did during 2004 and 2005.

The abundance for smallmouth bass (≥ 100 mm) in the 18- and 15- mile reaches plus the 2.3 miles of the Lower Gunnison River for 2006 was estimated to be $3,197 \pm 2,100$ (95% CI) individuals.

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 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: Draft Synthesis Report to coordinator: 3/01/2007
Draft Report to peer reviewers/BC: 4/01/2007
Revised Report for BC consideration: 6/15/2007

- V. Study Area: sixty-one miles of the Upper Colorado River:
Price-Stubb 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]

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.

The budget was increased to account for the additional manpower and other resources necessary to accomplish the objective of marking smallmouth bass during the initial pass in 2006. It was estimated that about 7 additional days (1.4 weeks) entailing about 35-person days was required for this additional initial pass to mark fish. Some marking equipment was also required.

The number of removal passes for areas of low densities of smallmouth bass as determined from 2004 and 2005 capture data were 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 have 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.

Methodology

This is a 5-year study with 4 years dedicated to field work and 1 year for writeup of the field data. A synthesis report will report on the data from 2004–2006. 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 in 2004, 2005, and 2006. 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 may be affected by the availability of sufficient water for sampling craft to operate due to extended drought conditions. Sampling the 3-mile section between Price-Stubb and Grand Valley Irrigation dams may be 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) was sampled with raft electrofishing between August 23–26, 2004, mid-July 2005, and mid-July and mid-September 2006. 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 confirm or refute these claims. One pass of this 45-mile reach was accomplished during 2004. In 2005, and 2006 two passes were performed in the reaches where high concentrations of smallmouth bass occurred.

Each sub-reach between Price-Stubb Dam and Westwater, Utah, during 2004 and 2005 was sampled at least three times with electrofishing. Some sub-reaches where high concentrations of smallmouth bass were collected during the first three passes were sampled a fourth time. The study utilized jon boat and raft-based electrofishing to remove smallmouth bass. Each electrofishing craft was equipped with a Smith-Root (Model GPP 5.0) electrofishing unit. Actual time spent electrofishing (actual circuit time) was also recorded. Main channel habitats sampled included mostly shorelines and backwaters. Two electrofishing craft were used concurrently to collect fish. All smallmouth bass collected were removed and sacrificed. All smallmouth bass collected were provided to Pat Martinez of the Colorado Division of Wildlife for use in the analyses of origin (stable-isotope) study. Samples were preserved according to criteria provided by CDOW.

All other centrarchid fishes collected (e.g., largemouth bass, green sunfish, bluegill, and black crappie) were also sacrificed and preserved for the CDOW analyses of origin study. Other introduced game species (e.g. walleye and northern pike) inadvertently collected were sacrificed and provided to the CDOW. Additionally, Pat Martinez requested that up to 100 channel catfish be sacrificed for another CDOW study. FWS crews were able to provide Pat Martinez about 110 channel catfish requested during the summer of 2005 and 2006.

All juvenile and adult endangered fish collected were checked for a PIT tag, weighed, measured, and immediately returned to the river.

FY 2007

Sampling Protocol. During 2007, the sampling protocol will be similar to that performed in 2006. An initial pass will again be performed to mark and release all smallmouth bass collected in the moderate to high concentration areas of the Upper Colorado River from GVIC Diversion Dam to Loma Boat Landing and the lower 2.3 miles of the Gunnison River. Smallmouth bass collected during the first pass will be marked with a Fiskars® hole punch (1/4-inch diameter) in the dorsal part of the caudal fin. Up to **seven and possibly eight (as time allows)** subsequent removal passes will follow. Subsequent recaptures of smallmouth bass marked during the marking pass will be recorded for determining an abundance estimate. In 2007 field data will again be recorded from all juvenile and adult endangered fish collected. They will also be checked for a PIT tag, weighed, measured, and immediately returned to the river. Aluminum boat and raft electrofishing will again be used to collect fish during 2007. Sampling will occur in Garfield and Mesa counties during July, August, and September. **Additional passes from Rifle to Beavertail Mountain will be added in 2007 in sub-reaches where high concentrations of smallmouth bass have in detected in the past and in earlier passes performed during 2007. Reconnaissance sampling in the Upper Colorado River from Silt to Rifle will also be conducted in 2007 to determine if smallmouth bass reside in this sub-reach.**

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. Up to 20 specimens from some of these fishes of various minimum sizes, identified by Pat Martinez in an earlier e-mail transmission, will be provided to the CDOW for their work with fingerprinting nonnative fish in reservoirs (RP Project No. C18/19). Disposal of all the aforementioned fishes will be as follows: following capture, fish will be euthanized afield and preserved with ice. Except for those fish destined for CDOW use, 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 were enumerated in 2004, 2005, and 2006. Total numbers of smallmouth bass and largemouth bass collected and catch/effort (fish/hr) were also determined for each sub-reach per sampling pass for each of these 3 years. Length data were recorded for 2004, 2005, and 2006 to determine the size structure of smallmouth bass removed. This protocol will continue during 2007.

Data analyses similar to that employed for the 2004, 2005, and 2006 field results will be used to analyze the 2007 data, too. During 2007, mark-recapture data will be subjected

to an abundance estimator to obtain a population estimate for 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 was used to determine the abundance of smallmouth bass in 2006 and will most likely be used again in 2007. Probability of capture (\hat{p}) (after White et al. 1982) and the coefficient of variation (CV: $SE/\hat{N} \times 100$ [where N =estimated population size]) (Pollock et al. 1990) will also be computed. All centrarchid fishes captured during the 2007 field work will also be analyzed similar to the data analyzed for 2004, 2005, and 2006 for among year comparison.

The synthesis report will summarize by various abundance indices (actual numbers, fish/hr, fish/mile, population estimate) smallmouth bass captured by sub-reach, and determine any changes in mean individual size of smallmouth bass from 2004 to 2006.

VII. Task Description and Schedule

Description

Task 1. Remove all sizes of smallmouth bass.

Sub-task 1a. Mark and release smallmouth bass during pass 1 in 2006

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

Task 3. Write a) draft and b) final synthesis report.

Schedule

Task 1. 7/2005 – 10/2005; 7/2006 – 10/2006; 7/2007 – 10/2007

Sub-task 1a. 7/2006; 7/2007

Task 2. 11/2006; 11/2007

Task 3. a) 11/2006 – 1/2007; b) 1/2007 – 6/2007

VIII. FY-2007 Work (year four of multi-year study)

Deliverables/Due Dates:

Annual Report due 11/2007

Budget (actual salary rates w/ benefits provided by CRFP Administrative Officer used for labor; equipment & vehicle expenses adjusted by 3% from 2006 budget and by re-allocating costs for these items from RP project no. 121a **and RP project no. C-4b-GV**)

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 @ 2,180)	4 weeks	\$ 8,720
Project Fishery Biologist (1-GS-12 @ 1,965)	24.4 weeks	\$ 47,946
Seasonal Technicians		
GS-5 @ 613 (4)	17 weeks	\$ 41,684
Administrative Asst. (1-GS-9 @ 1,365)	5 weeks	\$ 6,825
	Subtotal	\$105,175
2. Travel (RP meetings/workshops)		
	1 week	\$ 1,000
	Subtotal	\$ 1,000
3. Equipment		
Gasoline, 2-cycle outboard oil for outboards; props, jet-pump impellers, liners, parts		\$ 2,900
Maintenance (Boat Motors, Generators, GPPs, aluminum boat repair)		\$ 7,335
Office (paper, telephones, postage, office supplies, computer software/support, misc.)		\$ 1,510
Dip nets; stainless steel spheres, cable, hardware		\$ 1,125
Marking equipment (Fiskars® scissors/punches)		\$ 100
	Subtotal	\$ 12,970
4. Vehicles (GSA-leased, FWS-owned: gas/tires/maintenance)		
Fish Collections		\$ 8,814
	Subtotal	\$ 8,814
	Task 1 Subtotal	\$127,959

Task 2. Analyze data; prepare RIP annual report.

1. Labor (salary and benefits)		
Project Fishery Biologist (1-GS-12 @ 1,965)	2 weeks	\$ 3,930
	Subtotal	\$ 3,930
	Task 2 Subtotal	\$ 3,930

Task 3. Analyze data; prepare draft and final synthesis report.

1. Labor (salary and benefits)		
Project Fishery Biologist (1-GS-12 @ 1,965)	5 weeks	\$ 9,825
Administrative Asst. (1-GS-9 @ 1,365)	1 week	\$ 1,365
	Subtotal	\$ 11,190

2. Travel (per diem only) (RIP meetings/workshops)		<u>\$ 1,195</u>
	Subtotal	\$ 1,195
3. Equipment Office (paper, telephones, postage, office supplies, computer software/support, misc.)		<u>\$ 1,195</u>
	Subtotal	\$ 1,195
4. Other (Printing and distribution of final report)		<u>\$ 1,545</u>
	Subtotal	\$ 1,545
	<u>Task 3</u>	<u>Subtotal</u>
		\$ 15,125

FY2007 All Tasks Total \$147,014

FY-2008 Work (fifth year of multi-year study)

Deliverables/Due Dates:

Annual Report due 11/2008

Budget (actual salary rates w/ benefits provided by CRFP Administrative Officer used for labor)

Task 2. Analyze data; prepare RIP annual report.

1. Labor (salary and benefits) Project Fishery Biologist (1-GS-12 @ 2,025)	2 weeks	<u>\$ 4,050</u>
	Subtotal	\$ 4,050
2. Travel (attend RIP meetings/workshops)		<u>\$ 500</u>
	Subtotal	\$ 500
	<u>Task 2 Subtotal</u>	<u>\$ 4,550</u>

IX. Budget Summary

FY-2007	\$ 147,014
<u>FY-2008</u>	<u>\$ 4,550</u>
Grand:	
Total:	\$ 138,730

X. Reviewers:

XI. References

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Prepared by Bob D. Burdick, 25 January 2007
Revised: 21 March 2007 by BDB
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