

**I. Project Title:** Chemically Fingerprinting Nonnative Fishes in Reservoirs

**II. Principal Investigator(s):**

Patrick J. Martinez  
Colorado Division of Wildlife  
711 Independent Ave.  
Grand Junction, CO 81505  
Phone: 970-255-6143  
FAX: 970-255-6111  
[pat.martinez@state.co.us](mailto:pat.martinez@state.co.us)

Brett M. Johnson  
Dept. of Fish, Wildlife and Conservation Biology  
Colorado State University  
Fort Collins, CO 80523  
970-491-5002  
970-491-5091  
[brett@warnercnr.colostate.edu](mailto:brett@warnercnr.colostate.edu)

**III. Project Summary:**

This project addresses movement of nonnative fishes (including northern pike, smallmouth bass, largemouth bass, black crappie, and walleye) into river reaches of critical habitat from reservoirs. These species pose a predatory threat to endangered and other native fishes (Tyus and Saunders 1996; Martinez et al. 2001; Johnson et al. 2005). However, it is uncertain to what extent the presence of nonnative species in critical habitat is the result of escapement or illicit transfers from reservoirs. This study is providing the means to assess the proportion of nonnative fishes in these rivers that originate from reservoirs and thereby guide management efforts to reduce this influx of nonnative fishes. We are on track to complete the study in FY09.

**IV. Study Schedule:** FY06-FY09

**V. Relationship to RIPRAP:**

General Recovery Program Support Action Plan:

III. Reduce negative impacts of nonnative fishes and sport fish management activities.  
III.A.2. Identify and implement viable control measures.

Colorado River Action Plan: Main stem

III. Reduce negative impacts of nonnative fishes and sport fish management activities.  
III.A.4.a. Evaluate sources of nonnative fishes and make recommendations.

**VI. Accomplishment of FY 2007 Tasks and Deliverables, Discussion of Initial Findings and Shortcomings:**

Task 1. Field Collections

The renewal of the Animal Care and Use Committee protocol for the project was approved by CSU (protocol no. 06-220A-01). Graduate student Phil Brinkley applied for a scientific collection permit from the state of Colorado and that application was

approved (License no. 07AQ999). This was accomplished to allow the graduate student to supplement the collections made by state, university, and federal crews.

Pat Martinez (CDOW) and Phil Brinkley (CSU) coordinated the sampling program with the respective states and crews operating in the target reservoirs and river reaches. Primary sampling of the reservoirs and river reaches took place from March-September 2007. A total of 836 fish of target species were collected and provided to Phil Brinkley by the end of September 2007 (Table 1). The specimens collected to date will provide a base from which to subsample to achieve acceptable limits of statistical certainty in classification of fish origins, and provide insights into additional sampling required in FY08.

Table 1. Number of nonnative fish of primary concern collected for microchemical analysis of otoliths through September, 2007. NA indicates that that species is not known to occur in that water body, or it is not targeted for sampling at that location. Species codes are: BCR = black crappie, LMB = largemouth bass, NPK = northern pike, SMB = smallmouth bass, WAL = walleye.

Water Body	BCR	LMB	NPK	SMB	WAL	Sum
Colorado River	21	144	0	56	8	229
Crawford Reservoir	20	0	4	1	0	25
Dolores River	0	0	0	15	0	15
Duchesne River	NA	NA	0	15	0	15
Elkhead Reservoir	2	1	12	11	NA	26
Flaming Gorge Reservoir	NA	NA	NA	20	NA	20
Green River, Lower	0	NA	0	4	12	16
Green River, Upper	2	NA	12	45	31	90
Harvey Gap Reservoir	5	12	1	8	NA	26
Juniata Reservoir	NA	NA	NA	16	10	26
Kenney Reservoir	3	NA	NA	NA	NA	3
McPhee Reservoir	NA	0	NA	11	12	23
Paonia Reservoir	NA	NA	6	NA	NA	6
Rifle Gap Reservoir	4	0	90	8	15	117
Rio Blanco Reservoir	13	21	1	0	NA	35
Starvation Reservoir	NA	NA	NA	17	19	36
Yampa River	83	NA	11	34	0	128
Sum	153	178	137	261	107	836

We also received 388 samples of five other nonnative fish species (Table 2) that may also be subsampled for analysis should information on their provenance become a management concern. Agencies providing fish to the project include the Colorado Division of Wildlife (CDOW), Utah Division of Wildlife Resources (UDWR), US Fish and Wildlife Service (USFWS), and the Colorado State University Larval Fish Lab (LFL).

Table 2. Number of “incidental” nonnative fishes collected for microchemical analysis of otoliths through September, 2007. Otoliths from these specimens may be analyzed in the future. Species codes are: BGL = bluegill, GRP = grass carp, GSD = gizzard shad, SNF = sunfish, YPE = yellow perch.

Water Body	BGL	GRP	GSD	SNF	YPE	Sum
Colorado River	33	2	25	180	0	240
Crawford Reservoir	0	0	0	0	37	37
Dolores River	0	0	0	0	0	0
Duchesne River	0	0	0	0	0	0
Elkhead Reservoir	0	0	0	0	0	0
Flaming Gorge Reservoir	0	0	0	0	0	0
Green River	0	0	0	0	0	0
Harvey Gap Reservoir	4	0	0	0	13	17
Juniata Reservoir	0	0	0	0	0	0
Kenney Reservoir	0	0	0	0	0	0
Lower Green River	0	0	0	0	0	0
McPhee Reservoir	0	0	0	0	0	0
Paonia Reservoir	0	0	0	0	0	0
Rifle Gap Reservoir	0	0	0	0	9	9
Rio Blanco Reservoir	20	0	0	0	3	23
Starvation Reservoir	0	0	0	0	0	0
Yampa River	58	0	0	4	0	62
Sum	115	2	25	184	62	388

Task 2. Microchemical Analysis of Otoliths

To date, 305 otoliths have been extracted from the samples and prepped for microchemical analysis. Microchemical analysis is scheduled to begin on 5 November and continue through the winter months. We will be analyzing subsamples of fish of each target species. Our goal is to complete microchemical analyses from 2006 and 2007 collections before the 2008 sampling season begins.

**VII. Recommendations:**

Continue the project as outlined in the Scope of Work.

Task 1. Field Collections

CSU should take over lead responsibility for coordinating field collections. Full scale reservoir and river sampling should be conducted during May through September 2008, with emphasis on waters and species where target sample sizes were not achieved in FY07. Elkhead Reservoir is of particular interest because it is the only reservoir in the study with large numbers of tagged, known provenance fish (smallmouth bass). Equipment problems in 2007 prevented cooperators from obtaining the desired sample size; this reservoir should be a high priority for sampling in 2008.

Results from microchemical analyses (Task 2) performed on samples collected in 2007 will also be considered in determining areas of emphasis for 2008. Phil Brinkley should coordinate sample acquisition with the respective state, university, and federal crews operating in the target reservoirs and river reaches.

Task 2. Microchemical Analysis of Otoliths.

Graduate Student Phil Brinkley will conduct microchemical analysis of otoliths from fish collected in 2006 and 2007 throughout winter and spring 2008, using the results to determine areas of emphasis for sampling in 2008. Otoliths collected during the 2008 sampling season will be analyzed as quickly as contract laboratories allow, following delivery to Colorado State University.

**VIII. Project Status:**

This project will continue through FY 2008 and beyond and it should be considered on track and ongoing. There have been no significant changes in project direction, probability of success, or alignment with RIPRAP objectives and deadlines.

**IX. FY 2007 Budget Status**

- A. Funds Provided: \$42,821.00
- B. Funds Expended: \$29,920.66
- C. Difference: \$12,900.34

The surplus arose because we focused on sample collection in FY07 and deferred sample processing until FY08. Thus we saved funds budgeted for analytical costs, laboratory assistants, and laboratory supplies. These funds will be spent in FY08 in addition to the amount budgeted for FY08, as shown in the project SOW.

- D. Percent of the FY 2007 work completed, and projected costs to complete:  
Lab work (LA-ICPMS): 0% complete. We expect to complete all this lab work on 2007 samples with the leftover funds shown above, during FY08.
- E. Recovery Program funds spent for publication charges: \$0

**X. Status of Data Submission (Where applicable):** N/A

- XI. Signed:** Patrick J. Martinez 11/08/07  
Principal Investigator Date

Brett M. Johnson  
Principal Investigator

11/08/07  
Date

**XII. References:**

Johnson, B. M., G. Whitley, M. Sullivan, and D. Gibson-Reinemer. 2005. Stable isotopes and statistics. Progress report, Colorado Division of Wildlife, Grand Junction, Colorado, 22 pages.

Martinez, P. J., B. M. Johnson, and J. D. Hobgood. 2001. Stable isotope signatures of native and nonnative fishes in Upper Colorado River backwaters and ponds. *The Southwestern Naturalist* 46: 311-322.

Tyus, H. M., and J. F. Saunders, III. 1996. Nonnative fishes in natural ecosystems and a strategic plan for control of nonnatives in the Upper Colorado River basin. Recovery Implementation Program DRAFT REPORT. Cooperative Agreement No. 14-48-006-95-923. U.S. Fish and Wildlife Service, Denver, Colorado.