I. Project Title:

Non-native fish control in backwater habitats in the Colorado River

II. Principal Investigator:

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III. Project Summary:

The purpose of this study was to evaluate seining as a method for removing small, non-native cyprinids from backwaters and other low velocity habitats. The study has progressed on schedule. Backwaters were sampled within two reaches of the upper Colorado River near Grand Junction, Colorado, in late June and early July. Depletion estimates were made of non-native fishes in backwaters and catch-per-effort was compared among sample passes and will be compared with data from the Interagency Standardized Monitoring Program (ISMP) for the same reaches when those data are available early in the year 2000.

IV. Study Schedule:

a. Initial Year: 1999
b. Final Year: 2001

V. Relationship to RIPRAP:

III.A.5. Remove small nonnative cyprinids from backwaters and other low velocity habitats.

VI. Accomplishment of FY99 Tasks and Deliverables, Discussion of Initial Findings and Shortcomings:

Task 1: Sampling and Removal of Fish

A total of 65 backwaters were sampled during this study, including 38 in the 15-mile reach and 27 in the 18-mile reach (Table 1). Of the 65 backwaters, seine samples from 21 contained 50% or more native fishes and samples from 44 contained fewer than 50%

Table 1. Number of backwaters sampled with and without a predominance of native fishes in the two reaches of the Colorado River near Grand Junction, Colorado.

Reach[1]	50% Natives	<50% Natives	Totals
15-Mile	16	22	38
18-Mile	5	22	27
Totals	21	44	65

[1]15-Mile Reach = River Mile 171.0-185.4 (Gunnison River to Grand Valley Diversion)
18-Mile Reach = River Mile 152.0-171.0 (Loma Boat Launch to Gunnison River)

native fishes. Over three times as many backwaters with 50% or more native fishes were sampled in the 15-mile reach than in the 18-mile reach.

Of the 65 backwaters sampled, only 22 (34%) met the definition of the ISMP (i.e., >100 m^2, >1 foot deep). The remainder were considered marginal, with some having a small amount of flow through the habitat. Because the study was conducted from late June and early July, when river flows were decreasing, many backwaters sampled in the first and second passes were desiccated or unsuitable for fish (i.e., too shallow or isolated). River flow decreased from about 11,500 cfs on June 29 to 8,000 cfs 7 days later on July 5, and the availability of backwaters generally increased. However, this changing condition reduced the availability of the same backwaters during subsequent sampling passes, and limited analyses of fish depletions in specific backwaters to 14. Few backwaters persisted from one sample pass to the next, which were only 1 to 3 days apart. The changing flows resulted in dynamic habitat conditions, and significant redistribution of fishes, which likely affected study results.

Seining of backwaters was scheduled for March in the original SOW, but was conducted in late June and early July because of persistently high spring flows that precluded formation of backwaters earlier in spring. Sampling was originally scheduled for March to prevent accidental capture of larvae of endangered Colorado pikeminnow (*Ptychocheilus lucius*), which spawn during June and July. Colorado pikeminnow were not captured during this study, despite sampling during the spawning period.

Task 2: Interim Progress Report

An interim progress report (attached) was submitted September 25, 1999. That report contained a summary of data collected and a preliminary analysis of total numbers and biomass of fish in backwaters.

Task 3: Annual Progress Report

A total of 16 different fish species were captured in backwaters during this study (includes only backwaters with <50% native fishes), including five native species (flannelmouth sucker, *Catostomus latipinnis*; bluehead sucker, *C. discobolus*; roundtail chub, *Gila robusta*; speckled dace, *Rhinichthys osculus*; and mottled sculpin, *Cottus bairdi*) and 11 non-native species. No endangered fishes were captured; i.e., Colorado

pikeminnow; razorback sucker, *Xyrauchen texanus*; humpback chub, *G. cypha*; and bonytail, *G. elegans*. The most common fishes captured were sand shiner (*Notropis stramineus*; 42.4% of total number captured) and red shiner (*Cyprinella lutrensis*; 28.4%). The four next most common fishes were roundtail chub (8.4%), fathead minnow (*Pimephales promelas*; 6.0%), speckled dace (5.7%), and flannelmouth sucker (3.7%).

Estimated total numbers of fish per backwater varied from 19 to 9,930 (mean = 1,015), using a maximum likelihood depletion estimator. Fish biomass in backwaters varied from 0.5 to 2,427 g/m^3 (mean = 106 g/m^3).

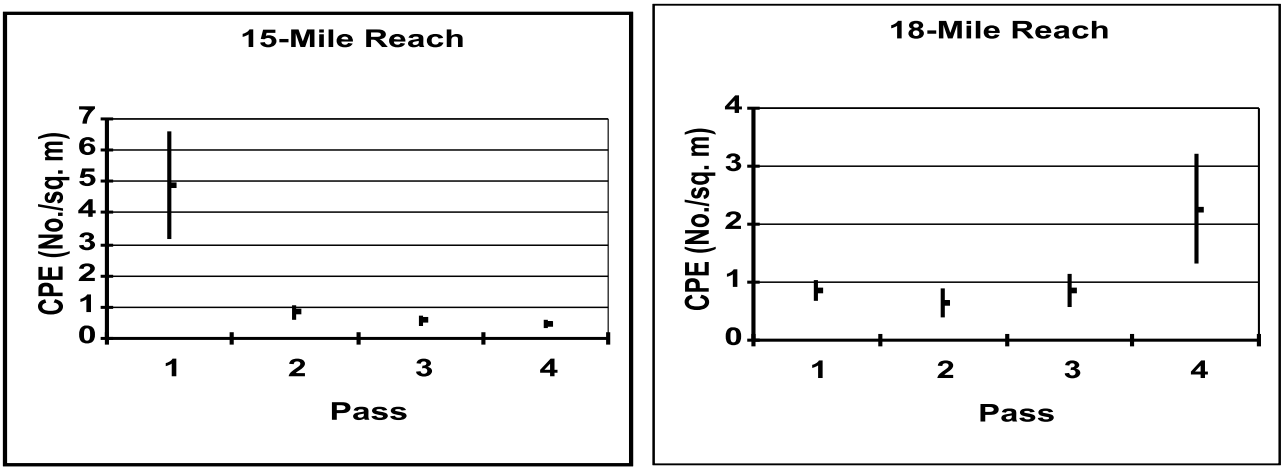

Figure 1. Catch rate of non-native fishes by sampling pass for backwaters of the 15-mile reach (A, left) and the 18-mile reach (B, right). Arithmetic mean catch rates are shown with 95% confidence intervals.

Total catch rate and catch rate of non-native fishes decreased in 11 of 14 backwaters resampled 1-3 days apart. The ratio of native to non-native fish catch rates remained similar between passes, with all backwaters having greater than 56% non-natives in pass 1 and greater than 63% non-natives in pass 2. Mean percentage catch rate of non-native fishes in the 14 backwaters was 80.5% in pass 1 and 84.5% in pass 2.

Catch rates of non-native and native fishes in the 15-mile reach decreased significantly (p 0.05) following the first of four passes (Figure 1A). Catch rates in passes 2 , 3, and 4 were all significantly different from catch rate in pass 1, but there was no significant difference among passes 2-4. Conversely, catch rate of non-native fishes in the 18-mile reach increased significantly with the last of four passes (Figure 1B). Catch rates in passes 1, 2 , and 3 were all significantly different from catch rate in pass 4, but there was no significant difference among passes 1-3. Catch rate of native fishes in the 18-mile reach decreased significantly (p 0.05) from pass 1 to pass 2, but was not significantly different among passes 2-4.

Results of seining backwaters in the 15-mile and 18-mile reaches yielded contradictory results. Catch rate of non-native fishes in the 15-mile reach decreased significantly after the first pass, but there was no significant difference among passes 2-4. Conversely, catch rates of non-native fishes in the 18-mile reach did not differ significantly among passes 1-3, but were significantly different from the last pass. For native fishes, catch rates decreased after the first pass in both the 15-mile and 18-mile reaches. Since non-native fishes were disposed of following sampling and native fishes were released live to the respective sample backwater, the decrease in catch rate of both groups indicates that environmental changes led to an overall reduction in abundance of fish in shallow-water habitats. We conjecture that densities of non-native fishes were higher during high spring flows in response to fish seeking quiet, shallow habitats; low river flows enabled fish to disperse to more low-velocity habitats.

The results of this study are inconclusive with respect to the efficacy of seines in removing small non-native cyprinid fishes from backwaters and other shallow-water habitats. The 15-mile and 18-mile reaches of the Colorado River are characterized by an open, cobble channel which provides expansive areas of shallow-water habitats. This provides small non-native cyprinid fishes with a large number of alternative habitats. Most of these habitats are difficult to sample, particularly to remove significant numbers of fishes.

Data from this study will be compared with data from the ISMP. The ISMP sampling was conducted in late September and fish samples are being identified and processed at the Larval Fish Laboratory at Colorado State University, Fort Collins, Colorado. Results of these are expected to be available early in the year 2000. Data from this study will be compared with the ISMP data to evaluate changes in catch rates of native and non-native fishes as a result of removal efforts by this study.

VII. Recommendations:

1. Conduct seining at relatively stable river flows. In order for this study to properly evaluate seining as an effective removal method in the 15-mile and 18-mile reaches, seining of backwaters should take place when river flows are relatively stable at less than about 5,000 cfs. Flows during March and April are usually too high and variable, and the best time for removal seining is in late September and early October, which is the same time as ISMP sampling. This sampling would conflict with ISMP, unless the efforts are coordinated. Since the numbers of age-0 Colorado pikeminnow are low in these reaches, combining these efforts during ISMP may be possible. We recommend a second team to work collaboratively with the ISMP team to conduct the first pass. A second removal pass can be conducted 1-2 weeks later.

2. Evaluate seining as a removal method in other river reaches. The Colorado River near Grand Junction is a broad, cobble-lined channel that is characterized by large expanses of shallow-water habitats. This habitat mosaic allows fish to occupy many alternative habitats, and make effective removal virtually impossible. Other river reaches, where backwaters are more defined with fewer alternative habitats

may be more conducive to this removal method. One significant determination from this study may be the recognition that seining as a removal method of small non-native cyprinids may be ineffective in broad, alluvial, cobble-lined channels.

3. Redirect removal efforts to other non-native fishes. If collaboration with ISMP is not feasible and if the determination presented in Recommendation 3 above is correct, it would be most beneficial to redirect the efforts of this study to alternative methods of controlling non-native fishes. Capture and live removal of northern pike from the Yampa River has been identified as a possible effective means of removing that large predator from habitat occupied by the endangered fishes.

VIII. Project Status:

This project is scheduled to continue with seining of backwaters in the year 2000. The project is on track, except for the analysis described in Task 3, which will compare catch rates from this study with catch rates from ISMP for the same river reaches. The ISMP data are expected to be available early in 2000, and will be analyzed and compared as quickly as possible; a comprehensive Annual Report will be submitted at that time. Funding needs for this study should not change from the original budget if similar seine sampling is conducted.

IX. FY99 Budget Status:

	Budgeted	Expended[1]	Balance Remaining[1]
Task 1:	$36,523.00	$36,505.27	$ 17.73
Task 2:	$ 5,495.00	$ 3,548.46	$1,946.54
Task 3:	$10,000.00	$ 6,000.00	$4,000.00
Totals:	$52,018.00	$46,053.73	$5,964.27

[1]Amount expended and balance remaining do not reflect amount to be expended in analysis to compare data of this study with data from ISMP, when available in 2000.

X. Status of Data Submission:

Data will be submitted to the database manager with submission of this report. The data will include a spreadsheet with field-specific data entries taken from field data sheets similar to the ISMP field data sheets.

XI. Signed: Richard A. Valdez 12/2/99
Principal Investigator Date

APPENDIX:

Attached is an interim progress report that was submitted September 25, 1999. A more comprehensive Annual Report will be submitted in 2000 following comparison with the ISMP data.