

I. Project Title: Evaluation of effects of stage fluctuations induced by hydropower operations on overwinter survival of young Colorado pikeminnow

II. Principal Investigators:

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III. Project Summary:

This project uses mark-recapture procedures to estimate over-winter survival, and movement of age-0 Colorado pikeminnow and relates the observed responses to stage fluctuations in the Green River induced by hydropower operations at Flaming Gorge Dam. Demonstration of a cause-and-effect relationship in a large-scale environmental study like this one is complicated by the inability to apply the experimental treatment (fluctuating hydrograph) to multiple experimental units (Green River). The lack of randomization and replication of experimental treatments places special demands on the argument for cause and effect. This approach will integrate correlative evidence from field investigations as well as experimental evidence from laboratory studies.

FY 2000 was the first of three field seasons for this project. During the winter of 1999-2000, daily stage changes at Jensen of approximately 0.3 feet resulted in little detectable backwater habitat changes in the Ouray nursery area. An ice-jam at the Ouray bridge during early January, however, changed backwater habitats to flow-through areas for a few days (5-10). Surprisingly, many young Colorado pikeminnow remained over-winter in these habitats, although a few fish moved over 2 miles. If ice-jams are common occurrences in the nursery area, their effects on stage changes dwarfs that of flow releases from Flaming Gorge Dam. Construction of a bioenergetics model for age-0 Colorado pikeminnow in winter conditions is proceeding as planned at the Larval Fish Laboratory, Colorado State University.

IV. Study Schedule: 2000-2002

V. Relationship to RIPRAP: V.B.2 – General Recovery Program Support Action Plan: Conduct appropriate studies to provide needed life history information.

VI. Accomplishment of FY 00 Tasks and Deliverables, Discussion of Initial Findings and Shortcomings:

Task 1. Call for the following flow release pattern from Flaming Gorge Dam.

- a) Year 2000 - stable flow through winter.
- b) Year 2001 - 5 d releases of daily fluctuating flows followed by 9 d stable flows to accomplish the following stage changes at Jensen: 0.10 m, 0.20 m, 0.30 m (23-27 October, 0.10 m stage change; 13-17 November, 0.20 m stage change; 18 November-3 December, non-fluctuating flow; 4-8 December, 0.30 m stage change).
- c) Year 2002 - 90 d daily fluctuating flows at a level known to move fish (stage determined from data collected year 2001).

Flow releases from Flaming Gorge Dam for year 2000 were background releases where 24-h stage fluctuations were approximately 0.3 feet (cfs 2000-23000). In the fall of 2000, conversations with the BOR people suggested that scheduled releases like those called for in the scope of work for 2001 would be difficult to meet. And in view of our uncertainty about what changes in elevation would make a meaningful change in habitat, we concurred with a flow pattern similar to year 2000.

Task 2. Estimate population size in a 40-mile reach of nursery habitat in autumn and spring, using capture-recapture methods.

- a) Make three sample passes through each reach
- b) Give a unique mark to fish captured in each 5-mile subreach using syringe-injected elastomer and combinations of color (four) and location (four).
- c) Sample backwaters, embayments, side channels and other seinable habitats and record locations, main channel and habitat temperatures, size, and depth, and numbers of marked and unmarked fish captured.
- d) Record location of each recapture.
- e) Measure total length and weight of a sample of 100 age-0 Colorado pikeminnow.

In autumn of 1999, preliminary sampling (our sampling and ISMP) showed a low catch of young-of-the-year Colorado pikeminnow in the middle Green River and we would unlikely be able to catch enough fish to make a population estimate for the 40 mile reach. As a result, we concentrated our efforts on sampling more intensively a 14 mile reach in Ouray NWR that we could sample throughout autumn, winter, and spring.

In autumn of 2000 we sampled a 40 mile reach from Bonanza Bridge to Ouray Bridge. We made two passes through the reach; the first pass captured, marked, and released 77 fish; the second pass captured 38 unmarked fish that we marked and released and 3 fish marked during the first pass. The third pass could not be made because early cold weather froze the backwaters for the winter.

Task 3. Monitor selected habitats (backwaters, embayments, eddies, main-channel shorelines) for changes in physical characteristics and fish use during flow fluctuations produced by Task 1.

- a) Select a backwater complex consisting of approximately eight backwaters with a range of characteristics (e.g., deep and permanent, or shallow and ephemeral) and containing age-0 Colorado pikeminnow.
- b) Map the complex in autumn, using GPS. Install temperature loggers and staff gages in the selected habitats.
- c) During the period of daily fluctuating flows, conduct hourly sampling of physical habitat characteristics (e.g., backwater area, depth, ice cover and thickness, and DO, describe connectivity) and otherwise characterize habitat changes.
- d) Also on each visit, sample fish with seines, small fyke nets, and minnow traps to determine if young Colorado pikeminnow are present.

Five backwaters were selected for winter monitoring along a 7 mile reach (rm 255-248) of the Green River within Ouray NWR. This reach was selected because it was accessible by road during the winter and contained at least two backwaters that held young-of-the-year Colorado pikeminnow. The backwaters were mapped with GPS, and temperature loggers and staff gauges installed in two backwaters with young-of-the-year Colorado pikeminnow. We visited these backwaters approximately biweekly. We fished seines, minnow, traps, and fyke nets.

Prior to ice up in early December, we captured, marked, and released 118 fish, giving a unique mark for each backwater and date of capture/release. During this sampling, we recaptured 13 marked fish, permitting population estimates for the two backwaters. Seining was by far the most successful method for catching fish. Few fish were captured in minnow traps or fyke nets.

By 5 January 2000, the ice was thick enough on the backwaters that we could sample under ice. On January 10 we noted an ice-jam had formed at the Ouray bridge and backed water up several miles upstream, raising the stage elevations between 0.75 to 1.50 m and turned backwater habitats into flow through areas. By 18 January the ice jam had broken and stage elevation had fallen back to previous level and the flow through areas returned to backwater habitats. Under ice seining captured only one young-of-the-year pikeminnow and a few dozen other fish. The ice-jam episode resulted in four lost temperature loggers and 2 staff gauges.

In the spring after ice out (23 February-5 April 2000), 56 pikeminnow were captured, marked and released; 12 had been marked the previous autumn. Of the 12 recaptures, 11 were captured in the same backwater from which they were originally captured, and one moved downstream 2.3 miles. A fish marked 1 March 2000 was recaptured 35 d later 2.2 miles upstream.

We note that a surprising number of young Colorado pikeminnow remained in the two

backwaters overwinter, despite these habitats turning to flow-through areas during ice

