

I. Project Title: INTERAGENCY STANDARDIZED MONITORING PROGRAM (ISMP) ASSESSMENT OF ENDANGERED FISH REPRODUCTION IN RELATION TO FLAMING GORGE OPERATIONS IN THE MIDDLE GREEN AND LOWER YAMPA RIVERS.

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III. Project Summary: The goal of Flaming Gorge flow and temperature recommendations (Muth et al., 2000) that were implemented in 2006 was to improve the status and prospects for recovery of endangered fish populations in the Green River. A major emphasis of those recommendations was to enhance the reproductive and recruitment success of endangered fishes in the middle Green River, in particular razorback sucker and Colorado pikeminnow. The primary means to achieve enhanced populations will be to pattern flows after a more natural hydrograph, the timing and duration of which will be based on anticipated annual hydrologic conditions and the biology of the fish. Because of vagaries in timing and runoff patterns within and among various hydrologic scenarios, and uncertainties in anticipated effects of flow and temperature recommendations on endangered fishes, Muth et al. (2000) suggested that real-time data be gathered to guide and fine tune operation of Flaming Gorge dam each year. Two existing studies that have provided data to guide operations of Flaming Gorge Dam in the past are "Basin-wide Monitoring Program for Razorback Sucker" (Project 22C) and "Interagency Standardized Monitoring Program (ISMP) Assessment of Colorado Pikeminnow Reproduction and Larval Abundance in the Lower Yampa River, Colorado" (Project 22f). This proposal, which is an extension of portions of those existing studies, is intended to provide some of the necessary real-time data.

Larvae of razorback sucker *Xyrauchen texanus* and Colorado pikeminnow *Ptychocheilus lucius* were captured in the Green River basin in spring and summer 2010. Razorback sucker sampling was conducted with light traps primarily in the Green River between Jensen and Ouray and Colorado pikeminnow sampling was with drift nets in the lower

Yampa River. Sampling was designed to provide a measure of timing of reproduction and a measure of annual reproductive success of each species. Diel variation in abundance of Colorado pikeminnow larvae in the drift was also assessed. This data will be used to assess effects of flow and temperature regimes on reproduction by razorback suckers and Colorado pikeminnow and to correlate abundance of larvae to abundance of juveniles in autumn. The data gathered in these studies is being used to conduct two syntheses. The first, using data collected during light trap sampling for razorback sucker larvae since 1992, will examine reproductive patterns and their relationship to spring flows in the middle Green River that are intended to assist in recovery of the species in the middle Green River. The second uses Colorado pikeminnow drift sampling data and autumn ISMP sampling data for juveniles to understand trends in abundance and recruitment over time. A draft of the first synthesis has been completed and reviewer comments are being incorporated; the second synthesis is underway, with the drift sampling analysis completed and incorporation of juvenile data is ongoing.

- IV. Study Schedule: It is anticipated that this study will continue and will be a component of studies designed to evaluate operations of Flaming Gorge Reservoir.
- V. Relationship to RIPRAP: Reproduction and recruitment of early life stages are critical components of the life history of endangered razorback sucker and Colorado pikeminnow. Understanding trends in reproductive success may help define status of razorback sucker and Colorado pikeminnow in specific river reaches in the Colorado River Basin and should play a role in determining when recovery has been achieved.

Relationship to specific RIPRAP items:

Green River Action Plan: Mainstem

- I. Provide and protect instream flows--habitat management.
  - I.A. Green River above Duchesne River.
    - I.A.1. Initially identify year-round flows needed for recovery while providing experimental flows.
      - I.A.2.a. Summer/fall flow recommendations.
      - I.A.3. Deliver identified flows.
        - I.A.3.a. Operate Flaming Gorge pursuant to the Biological Opinion to provide summer and fall flows.
        - I.A.3.d. Operate Flaming Gorge Dam to provide winter and spring flows and revised summer/fall flows, if necessary.
    - I.B. Green River below the Duchesne River.
      - I.B.1. Initially identify year-round flows needed for recovery while providing experimental flows.
        - I.B.2. State acceptance of initial flow recommendations.
          - I.B.2.a. Review scientific basis.
  - II. Restore habitat--habitat development and maintenance.
    - II.A. Restore and manage flooded bottomland habitat.
      - II.A.1. Conduct site restoration.
        - II.A.1.a. Old Charlie Wash.

- II.A.1.a.(3) Monitor and evaluate success.
- II.C. Enhance water temperatures to benefit endangered fishes.
- II.C.1. Identify options to release warmer water from Flaming Gorge Reservoir to restore native fish habitat in the Green River.
- V. Monitor populations and habitat and conduct research to support recovery actions--research, monitoring, and data management.
- V.A. Conduct research to acquire life history information and enhance scientific techniques required to complete recovery actions.

Green River Action Plan: Yampa and Little Snake Rivers

- I. Provide and protect instream flows--habitat management.
- I.D. Yampa River below Little Snake River.
- I.D.1. Initially identify year-round flows needed for recovery.
- I.D.2. Evaluate need for instream flow water rights.
- I.D.2.a. Review scientific basis.

Green River Action Plan: Yampa and Little Snake Rivers

- V.A.1. Conduct standardized monitoring.
- V.B.2. Conduct appropriate studies to provide needed life history information.

VI. Accomplishment of FY 2010 Tasks and Deliverables, Discussion of Initial Findings and Shortcomings:

Project Objectives

- 1). Determine timing and duration of spawning by razorback suckers and presence and abundance of larvae in the system as measured by capture of larvae in light traps.
- 2). Determine timing and duration of spawning by Colorado pikeminnow and presence and abundance of larvae in the system as measured by capture of larvae downstream of spawning areas in the lower Yampa River.

**Task Description (FY 2010)**

- I). Collect light trap samples for razorback suckers. The CRFP office in Vernal was be responsible for this task.
- II). Collect drift net samples for Colorado pikeminnow. The Larval Fish Laboratory was responsible for this task.
- III). Identify light trap and drift net samples. Preliminary identifications will be conducted by the responsible sampling entity, with assistance from the LFL, as samples are collected to provide real-time data. Final specimen identification and curation will be conducted by the LFL.
- IV). Summarize specimen data collection in an annual report.

Accomplishments by Task.

- I). Collect light trap samples for razorback suckers. Light trap samples were collected during May, June, and July 2010 by the Vernal CRFP.
- II). Collect drift net samples for Colorado pikeminnow. Drift net samples were collected during June to August 2010 by the Larval Fish Laboratory.
- III). Identify light trap and drift net samples.

**Middle Green River light trap samples, 2010.** Samples sent to the Larval Fish Laboratory have been received and are being identified by the Larval Fish Laboratory.

**Middle Green River light trap samples, 2009.** Samples sent to the Larval Fish Laboratory were identified. A total of 942 razorback sucker larvae were captured in 2009. Abundance trends for razorback sucker larvae captured in light trap samples in the middle Green River, Utah, are reported in Figure 1. The first razorback sucker larvae captured in the middle Green River in 2009 was on 29 May, a relatively average time for first appearance of larvae based on sampling conducted since 1992. The last razorback sucker larva was captured on 1 July. In comparison, razorback suckers spawned relatively late in the Green River due to high and cool flows late in the year. Large numbers of razorback sucker larvae continue to be captured during light trap sampling in the middle Green River since 2004, indicating continued reproductive success of stocked fish.

**Lower Yampa River drift net sampling, 2010.** Samples were collected in the Yampa River about 0.2 to 0.8 km upstream from the Green River, the same site that samples were collected from 1990 to 1996 (Bestgen et al. 1998) and in 1998 to 2009. Samples are being identified at this time and are nearly completed.

**Lower Yampa River drift net sampling, 2009.** The first Colorado pikeminnow captured in 2009 was on 7 July and captures extended through 17 August, a relatively late and protracted spawning period. Late spawning by Colorado pikeminnow was due to relatively high and extended runoff and cooler water temperatures well into summer. A total of 185 Colorado pikeminnow larvae were captured. Abundance trends for Colorado pikeminnow captured in drift nets in the lower Yampa River are reported in Figure 2. The relatively low absolute numbers of larvae captured in 2009 (and 2008) are in part, a function of high flows which reduces density of larvae in the river. When corrected for relatively high river flows, capture rates in 2009 were about the historical average for the lower Yampa River.

No razorback sucker larvae were captured in 2009 in drift net sampling. Three razorback sucker larvae (11.4-13.2 mm TL, plus two questionable identity larvae, plus three possible hybrids) were captured in drift nets in the lower Yampa River from 30 June to 4 July in 2008. Presence of razorback sucker larvae in drift net samples was unusual and likely related to relatively cold and late high flows in the

Yampa River in 2008. Those same flows were responsible for late reproduction by razorback suckers in the middle Green River as well. Continued reproductive success of razorback suckers in the lower Yampa River may merit additional sampling in the future to document their reproductive success there.

- VII. Recommendations: Continue to sample early life stages of razorback sucker and Colorado pikeminnow annually at these sites. This information is critical to establishment of long-term data that can guide informed management decisions regarding population viability and recovery. Data were also used to monitor effects of Flaming Gorge flows and water temperatures in relation to endangered fish reproduction in spring and summer. This information can also be used to make real-time recommendations for flow and temperature regimes for Flaming Gorge Dam during the critical time of reproduction for endangered Colorado pikeminnow. The Recovery Program should increase funding for this project to cover costs for additional sample processing costs incurred for the Green River samples. Sampling may also need to be expanded to assess reproduction by razorback suckers in the Yampa River and potentially the Green River.
- VIII. Project Status: On track and ongoing. This project was approved for funding in 2010-2011. That information, combined with more sophisticated water temperature data acquisition, should provide some tools for making flow and temperature recommendations to guide operation of Flaming Gorge Reservoir and to assist with fulfilling the Green River study plan. A detailed analysis of the razorback sucker capture data gathered with light trap sampling was included in a synthesis report submitted to the Recovery Program staff in March 2010. A detailed analysis of the Colorado pikeminnow capture data will be included in a comprehensive report on long-term trends of Colorado pikeminnow abundance in the Green River. Abundance data for age-0 pikeminnow captured in ISMP sampling in autumn are also being incorporated.
- IX. FY 2010 Budget Status
- A. Funds Provided: \$130,487
  - B. Funds Expended: \$ 94,500
  - C. Difference: 35,987 remaining funds for sample analysis
  - D. Percent of the FY 2010 work completed, and projected costs to complete: About 75% complete.
  - E. Recovery Program funds spent for publication charges: None.
- X. Status of Data Submission (Where applicable): Data will be submitted when identification and analysis is complete.
- XI. Signed: Kevin R. Bestgen 12 Nov. 2010  
Principal Investigator Date  
*(Just put name and date here, since you will be submitting the report electronically)*

APPENDIX: [More comprehensive/final project reports (NOT to be used in place of a complete annual report.). If distributed previously, simply reference the document or report.]

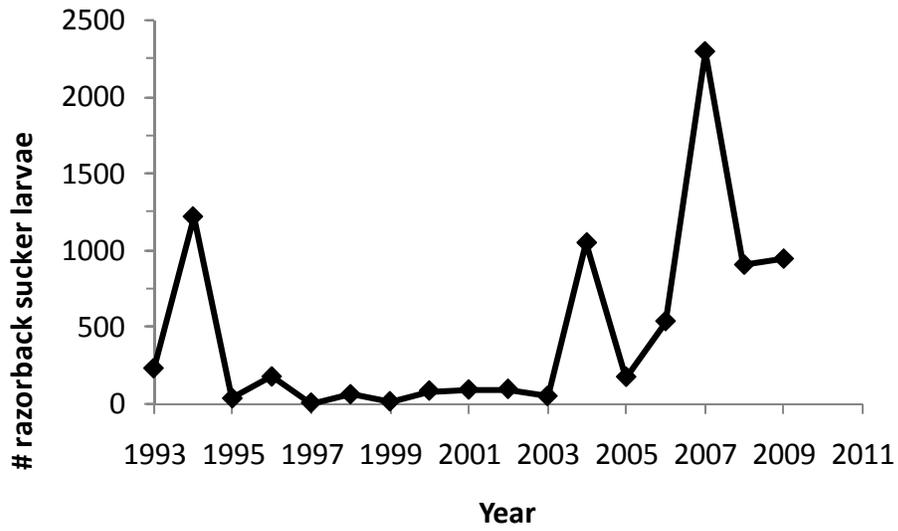


Figure 1. Number of razorback sucker larvae captured from 1993 to 2009 in the middle Green River, Utah, in light traps (all fish including those of questionable taxonomic identity included; 2010 samples being identified).

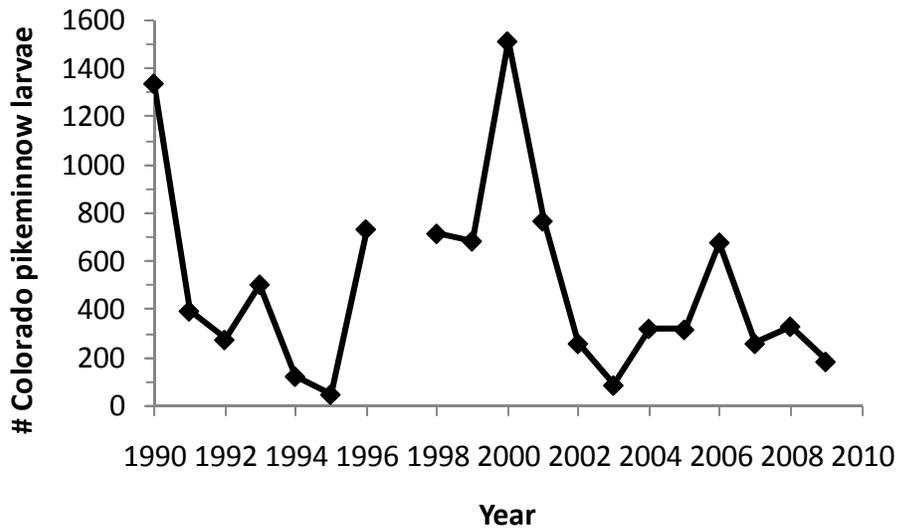


Figure 2. Number of Colorado pikeminnow larvae captured from 1990 to 2009 (no sampling in 1997, includes specimens from all diel samples, 2010 sample identification nearly completed) in the lower Yampa River, Colorado, in drift nets.