

- 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 the recently approved Flaming Gorge flow and temperature recommendations (Muth et al., 2000) 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* (formerly, Colorado squawfish) were in the Green River basin in spring and summer 2004. 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.

- 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 2004 Tasks and Deliverables, Discussion of Initial Findings and Shortcomings:

Project Objectives

- 1). To 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). To 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 2004)**

- I). Collect light trap samples for razorback suckers. The CRFP office in Vernal will be responsible for this task.
- II). Collect drift net samples for Colorado pikeminnow. The Larval Fish Laboratory will be 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 and June 2004 by the Vernal CRFP.
- II). Collect drift net samples for Colorado pikeminnow. Drift net samples were collected daily from 26 June until 12 August 2004 by the Larval Fish Laboratory. A total of 180 samples were collected during this time period, which includes some diel net sets.
- III). Identify light trap and drift net samples. Ongoing.

**Middle Green River light trap samples.** Samples sent to the Larval Fish Laboratory will be identified and verified in early 2005.

**Lower Yampa River drift net sampling.** 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 2003. A total of 180 samples were collected between 26 June and 12 August 2004. These included samples collected at the typical dawn time period as well as samples collected on several days at dawn, noon, dusk, and midnight to detect diel variation in drift abundance.

Preliminary identification of some samples has been completed, but identification of many other samples and questionable or difficult specimens has not yet been completed, nor has curation. We expect final verification to be completed in early February or March 2005. This data will be integrated in an analysis of young-of-year captures of pikeminnow in backwaters in autumn to determine if the two metrics are related.

**2003 light trap and drift sampling data.** Only preliminary data were available from 2003 light trap samples at the time of the November 2003 report deadline so we present that data now. A total of 47 razorback sucker larvae were captured in light traps and an additional 4 were captured in seine hauls (including several specimens classified as razorback sucker?). Razorback sucker larvae were captured in light traps from 27 May to 18 June. Number of larvae captured on any single day of sampling peaked at 23 on 2-3 June. Seine haul captures were from 2 and 3 July in Green River near Ouray. Larvae in light trap samples ranged in size from 10.0 to 13.5 mm TL. Razorback suckers captured with seines were 18 to 26 mm TL. The 2003 captures represented some of the largest body length early life stages of razorback suckers captured in the main channel of the Green River since sampling conducted in 1994, another low flow year.

About half ( $n = 29$ ) of the razorback sucker larvae captured in 2003 were from samples collected prior to or on the peak Green River flow day of 3 June. In recent years, captures of razorback sucker larvae in light trap samples have been mostly after flows in the Green River peak and after connections with the flood plain have ceased.

Similar to the razorback sucker data, Colorado pikeminnow drift net capture data for 2003 were not available for reporting in the 2003 annual report so we do that now. Only 87 Colorado pikeminnow larvae were captured in drift nets in 2003 and represents the lowest total since 1990, with the exception of 1995. In 1995, only 49 larvae captured, but abundance of larvae was doubtless much higher because the very high flows present during that time reduced the amount of water that was sampled by capture nets and reduced capture efficiency. In 2003, only 32 larvae were captured in the standard dawn samples, and an additional 55 were captured in diel net sets at various times of the day. In summer 2003, flows were moderately high and much higher than conditions in 1994 when dawn Colorado pikeminnow drift net captures were also very low (N = 35) and captures during all time periods totaled 124. Thus, low flows or excessively high flows do not seem to be a reason for low numbers of larvae captured in 2003. Reductions in the number of larvae captured seem to mirror apparent reductions in the abundance of adult Colorado pikeminnow in the Green River Basin from 2000 to 2003.

**Temperature monitoring.** Temperature differences between the Green and Yampa rivers in Echo Park are potentially important because of potential for cold shock of Colorado pikeminnow larvae drifting from the Yampa into the normally colder Green River. Warmer water temperatures in the Green River also increase the likelihood of spawning by rare native fishes upstream of the Yampa River. Temperature data gathered in the Green and Yampa rivers in Echo Park were compared to determine if temperature differences fall within recommended constraints that the Green be no more than about 5°C colder than the Yampa River (Muth et al. 2000). In 2000, water temperatures in the Green River were relatively cool and exceeded 20°C for only a couple of days. Average water temperature in the Green River from 1 June to 30 September was 17.0°C compared to 19.7°C in the Yampa River for the same period (Table 1). In 2001 to 2003, average water temperatures in the Green River were warmer and averaged about 19°C in each year. Average summer water temperatures in the Yampa River from 2001 to 2003 were about 1.5 to 2.1 C warmer than the Green River during the same period. In seven instances (twice in 2000, once in 2001 and four times in 2002, none in 2003) water temperatures exceeded the recommended maximum summer difference of 5°C. None of those days were within the period when Colorado pikeminnow were drifting downstream from the Yampa River. In 2002, summer water temperatures in the Green River upstream of the Yampa River were likely the highest observed since Flaming Gorge Reservoir filled. In 2003 water temperatures in the Green River in Lodore Canyon were also warm and exceeded 20C on most days from early July through early September. Preliminary data through July 2004, showed that water temperatures exceeded 20C for only about a 2-week period beginning in early July.

- 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. Verification of yet unidentified sucker specimens may shed additional light on the prevalence of razorback sucker larvae in the Yampa River.

VIII. Project Status: On track and ongoing. This project was approved for funding in 2004 and perhaps beyond. 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.

IX. FY 2004 Budget Status

- A. Funds Provided: \$97,245
- B. Funds Expended: \$79,951
- C. Difference: 17,294, remaining funds for sample analysis
- D. Percent of the FY 2004 work completed, and projected costs to complete: About 82% 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 10 Nov. 2004  
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.]*

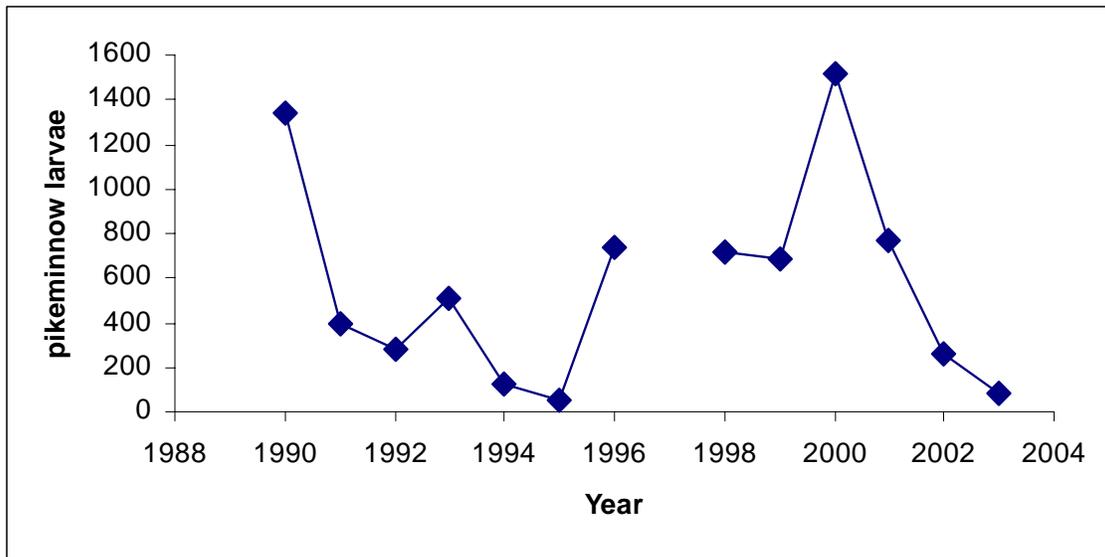


Figure 1. Number of Colorado pikeminnow larvae captured from 1990 to 2003 (no sampling in 1997) in the lower Yampa River, Echo Park, Colorado, in drift nets set during all diel time periods.

Table 1. Average daily summer (1 June to 30 September) water temperature (maximum) of the Green and Yampa rivers, Echo Park, Dinosaur National Park, Colorado, 2000 to 2002. Number of days where temperature of the Green River was 5°C or more cooler than the Yampa River is also shown; none of those days were in the period when Colorado pikeminnow larvae were drifting from the Yampa River.

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Year	<u>Mean summer water temp C (maximum)</u>		Number of days difference exceeded 5°C
	Green River	Yampa River	
2000	17.0 (20.7)	19.7 (24.1)	2
2001	19.0 (23.4)	20.5 (25.6)	1
2002	18.5 (24.5)	20.4 (25.3)	4
2003	18.7 (23.2)	20.1 (25.9)	0

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