I. Project Title: General Hydrology Support

II. Principal Investigator:

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III. Project Summary:

The Service's Division of Water Resources provides basic hydrology support to Recovery Program researchers and undertakes tasks to support the Recovery Program in basic data collection and monitoring projects. Accomplishments during FY 2005 include: 1) collecting temperature data at 10 sites on the Green River and four sites on the Gunnison River, and assembling a temperature database for use by Recovery Program researchers; 2) coordinating development of a sediment monitoring program; 3) providing technical hydrology support for a wide range of Recovery Program activities on a year-to-year basis; and 4) coordinating other Recovery Program efforts relating to hydrology and temperature analysis.

IV. Study Schedule: Initial Year - 1990, Final Year - Ongoing.

V. Relationship to RIPRAP:

General Recovery Program Support Action Plan
I.A.4.b. Conduct needed Geomorphology research and monitoring.

Green River Action Plan: Mainstem
I.A.3. Deliver identified flows

Colorado River Action Plan: Mainstem
I.E. Evaluate and revise as needed flow regimes to benefit endangered fish populations.

Colorado River Action Plan: Gunnison River
I.D. Evaluate and revise as needed flow regimes to benefit endangered fish populations.

VI. Accomplishments of FY 2005 Tasks and Deliverables, Discussion of Initial Findings and Shortcomings:

A. Temperature Data Collection

Temperature data collection went well during FY-2005. No thermographs were stolen and very few data were lost due to thermographs being out of the water. We had a problem with thermographs being lost because of entanglement in large snags on the Gunnison River below delta. This thermograph location was moved upstream near a bridge because of the snag problem and a change in land owners. We continue to have problems near the Redlands diversion dam because of sedimentation. To solve this problem we have installed new thermographs near the outlet culvert from the Redlands fish screen.

We provided data to the biologist and consultants working on other Scopes of Work and related projects. A notable project in 2005 was the coordination of flows and temperature from Flaming Gorge Dam with the flow and temperatures in the Yampa River. One of the recommendations of the report "Recommendations for Endangered Fish in the Green River Downstream of Flaming Gorge Dam" is that temperatures in the Green River be maintained within levels which are advantageous to avoid thermal shock to drifting Colorado Pikeminnow. The report targets water temperatures of 18˚ C or greater for 2 to 5 weeks in upper Lodore Canyon beginning at the onset of base flows. The report recommends that the temperature of the Green River be no more than 5˚ C older than the Yampa River at the confluence during the summer base-flow period to prevent cold shock to drifting Colorado pikeminnow larvae. During the past summer thermograph data from the Green and Yampa Rivers were used by a coordinating committee to request temperature increases from Flaming Gorge Dam to mitigate temperature below the Yampa and Green confluence.

Routine temperature data collection continued in 2005; in addition, we prepared 2005 data for archiving and publishing on the web. The yearly process involves downloading data from the thermographs in the field in March, July, and October, graphically plotting the data, visually checking the data, and preparing presentation quality graphs using Excel spreadsheets. The spreadsheets are then web enabled and linked to the Riverdata web page. The temperature data can be accessed and downloaded from the River data web page at http://www.r6.fws.gov/riverdata/ or by email request from FWS Division of Water Resources (address above). An interactive map, included on the web page, displays the general location of each thermograph and links to temperature data for each of three rivers (Green, Yampa, and Gunnison). GPS coordinates for each thermograph are available by request; however, for security reasons the exact locations are not provided on the web page.

Grand Junction CRFP continued data collection in 2005 and converted the raw 2-hour interval data into daily means. In 2003, 1994 and 2005, the Grand Junction

CRFP office has converted all their data to USGS standard page format and posted the pages to the Recovery Program Riverdata web site. Temperature information was used during our food-web studies (Project 48) to help explain, along with food distribution, the distribution of pikeminnow in the mainstem Colorado River. The paper, 'Dispersal patterns of subadult and adult Colorado squawfish in the upper Colorado River', published in Transactions of the American Fisheries Society in 1998 utilized this data. We converted mean daily temperatures into thermal units for pikeminnow growth and summed them by year and location to make comparisons of annual thermal units (ATU) among different locations on the river to assess relative suitability for growth. These analyses led to developing predictions of the extent of suitable habitat for pikeminnow in currently unoccupied river reaches (above diversion barriers). We found that areas with less than about 40 ATUs (average across years) were unsuitable for pikeminnow to establish year-round home ranges.

B. Hydrology Support for Biological Opinion Development and Monitoring

General: I help monitor water releases from Flaming Gorge, Ruedi, and the Aspinall Unit for endangered fish during the spring runoff and post runoff period. I represented the interests of the Recovery Program at quarterly operational meetings, where I provided input on flow patterns and protection of water for endangered fish. I also provided support to researchers working on flow recommendations, management plans and related reports. Specific work accomplished is addressed under the appropriate work task below.

Green River: I occasionally attended meetings of the Flaming Gorge Work Group and represented the Recovery Program at a public information meeting held in Vernal Utah. I periodically providing the Recovery Program with input on how the Flaming Gorge Work Group could manage flow to implement the Flaming Gorge Biological Opinion.

Gunnison River: I continue to work with Reclamation and other water users in support of the Aspinall EIS process. I coordinated peer reviews of Gunnison River scopes of work for geomorphology work and provided peer review comments on the Gunnison River Transit Loss Study.

I worked with Recovery Program staff and CWCB to set up procedures and accounting methods for tracking depletions under the Colorado River Programmatic Biological Opinion (PBO).

I worked with Recovery Program staff and ES staff in developing the working draft of the Yampa River Basin PBO. Work consisted of extracting sections of the Colorado River PBO and reformatting and rewiring sections specific to the Yampa River.

Duchesne River: I worked with Service staff and the Duchesne River Work Group to begin implementing flow measures set out in the Duchesne River Biological Opinion. I coordinated O & M of Duchesne river gages, worked with USGS and the

DRWG to set up a suspended sediment study to refine the peak flow recommendations.

C. Hydrology Support for Development of Flow Recommendations

During 2005 two reports were received and sent to the Geomorphology Peer Review Panel for comments. The reports and peer review comments were consolidated and presented to the Biology Committee.

Considerable work went in to implementing a Habitat Monitoring program suspended sediment data collection. The historic data retrospective effort finally got underway in late September 2005 after several contracting issues were clarified between USGS and Reclamation. The Recovery Program purchased automated sediment collection equipment which it transferred to USGS, so data collection can begin before spring runoff in 2005. The USGS has provided a separate annual report on this project.

I continued work with Mike Carpenter and Ed Wick, retired Service volunteers, to maintain sediment bed load monitoring equipment on razorback sucker spawning bars near Jensen Utah and at the Echo Park bar, on the Yampa River in Colorado. Work included obtaining monitoring permits from the National Park Service, downloading data and maintaining the equipment put in place in 2001 and 2002. I also spent considerable time preparing a report to document the results of the work; the report is now under review by the Program Director's Office.

I continued work on developing flow recommendations for the Little Snake River. A draft report has been prepared and reviewed by the Program Director's Office.

VII. Recommendations:

The work undertaken by Service's Region 6 Division of Water Resources is, for the most part, in support of other research projects or activities such as flow delivery, flow quantification, and habitat restoration, all of which have a direct impact on the recovery of the Colorado River endangered fish. The direct quantification of the success of many of the activities is difficult because most of the activities are long-term in nature.

VIII. Project Status: Ongoing and on-track.

IX. FY 2005 Budget Status:

A. Funds provided:	$ 77,500
B. Funds expended:	$ 77,500
C. Difference:	$ 0

X. Status of Data Submission: Not applicable.

XI. Signed: *George Smith* November 16, 2005
Principal Investigator Date:

APPENDIX: Reports, the temperature data collection, and database for water year 2005 are placed on the Recovery Program's Home Page for access by researchers within two weeks of collection, with the exception of data for the Colorado and Gunnison rivers, which is posted once a year.

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