COLORADO RIVER RECOVERY PROGRAM
FY 2017 ANNUAL PROJECT REPORT **Project No**: 19

I. Project Title: General Hydrology Support

II. Bureau of Reclamation Agreement Number(s): R13PG40019 expires September 30, 2017.

Project/Grant Period: Start date: 1990
End date: Ongoing
Reporting period end date: Ongoing
Is this the final report? Yes _____ No __x__

III. Principal Investigator:

Don Anderson
P.O. Box 25486, Denver, CO 80225-0486
E-mail: donald_anderson@fws.gov
Phone: (303) 236-9883, Cell: (720) 232-6330

IV. Abstract:

The Service's hydrologist provides basic hydrology support to Recovery Program operators and researchers. Accomplishments during FY 2017 include: (1) coordinating and posting temperature data for sites on the Colorado, Green, Yampa, and Gunnison rivers, (2) providing technical hydrology support for a wide range of Recovery Program activities; and (3) supporting the Recovery Program in basic data collection and monitoring of project efforts relating to hydrology.

V. Study Schedule: Initial Year - 1990 Final Year – Ongoing

VI. Relationship to RIPRAP:

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

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

Colorado River Action Plan: Mainstream
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.

VII. Accomplishment of FY 2017 Tasks and Deliverables, Discussion of Initial Findings and Shortcomings:

The Recovery Program's Director's Office (PDO) provides basic hydrology support to Recovery Program researchers and undertakes tasks to support the Recovery Program in basic data collection and monitoring projects. The work provided 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.

1. Stream Temperature Data Collection

One Recovery Program task is the collection of water temperature data in various reaches of Upper Basin rivers. Temperature monitoring duties are divided between the PDO staff in Lakewood and the Colorado River Fishery Project's Grand Junction field station (CRFP-GJ)[1]. PDO staff currently collects data from two locations on the Gunnison River and seven locations on the Yampa and Green Rivers, as described below. CRFP-GJ currently collects water temperature data from five sites on the mainstem Colorado River, four sites on the Gunnison River and one site on the Uncompahgre River, as described in the separate Project #19b annual report. These data are downloaded semiannually, quality-checked, and assembled into an Excel temperature database for use by Recovery Program researchers, following the format used by USGS in their Water Resources Data yearbooks. Julie Stahli of the PDO web-enables them and links them to the Riverdata webpage: http://www.fws.gov/mountain-prairie/riverdata/. GPS locations for each thermograph are available by request; for security purposes the exact locations are not provided on the web page.

Temperature data for FY17 were downloaded in the field in July and October, 2017 by Jim Renne, a volunteer to the Program, accompanied by PDO staff. The data collection went well, with all ten sites yielding what appear to be complete and valid data for the period. The one-hour interval readings from the previous year (FY-16) were converted to daily means, and site-specific daily-mean tables completed (during winter 2016-2017). Temperature data for FY-17 are currently being processed for uploading to the Program website. This work should be completed by the end of calendar year 2017 (FY18).

The PDO also began work in FY17 on a summary table of site information for all known long-term stream temperature monitoring locations in the upper Colorado River basin, including those managed by cooperating entities such as USGS, Colorado State University, and the State of Utah. The purpose is to have a centralized inventory of this information to help address such questions as where temperature data are collected, why those sites were selected, and how the data are used by the Program. The PDO expects to complete work on this table in FY18.

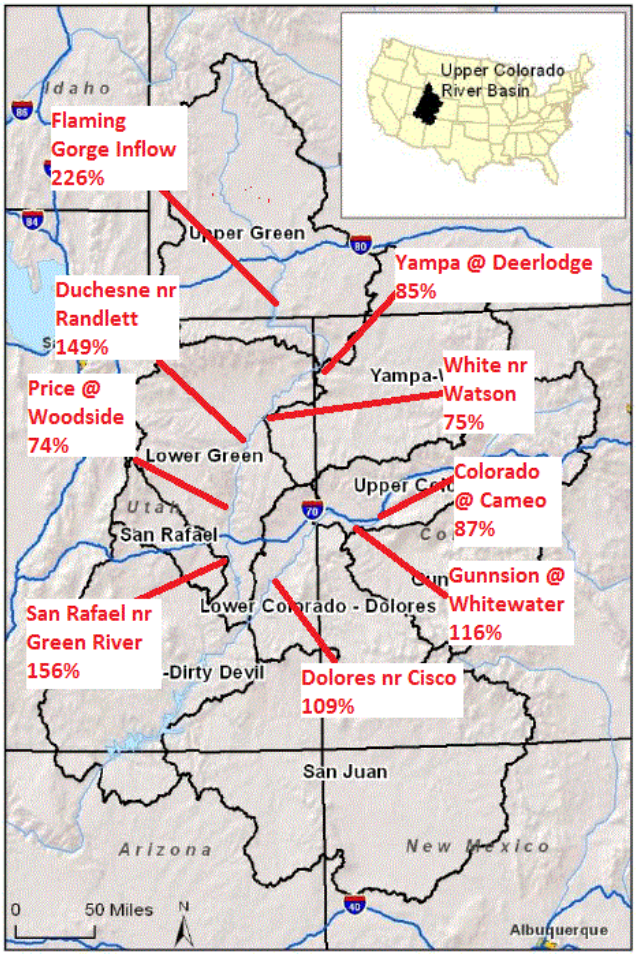
In FY18 the PDO also expects to complete written documentation of the basic procedures

[1] Temperature data collection on the Colorado River by CRFP was consolidated in this Scope of Work beginning in FY- 99 and a separate budget table is included for this work. See annual report 19b General Hydrology Support (CRFP-Grand Junction Contribution). Principal Investigators for 19b are Brendan Crowley and Dale Ryden.

and protocols it uses to establish temperature monitoring sites and collect and process the temperature data. This will be posted to the Program website when completed. That document also will summarize the evolution of the Program monitoring network and procedures over time.

2. Hydrology Support for Program Implementation and Monitoring

Overall, runoff in the Upper Colorado River basin in Water Year 2017 was above-normal, resulting in inflows to Lake Powell that were 110% of average. As of November 6, 2017, the storage content of Lake Powell, at 12.66 million acre-feet, was about 293,000 acre-feet greater than one year earlier, and about 1.77 million acre-feet greater than four years earlier. That said, runoff conditions varied considerably from one sub-basin to the next. April-through-July runoff is measured at various locations around the basin are shown in the graphic below, as percent of average (1981-2010) measured at each site. Peak season runoff was the farthest above normal in in the upper Green River basin (inflow to Flaming Gorge Reservoir), at 226% of average, in the San Rafael River basin (156%), and in the Duchesne River Basin (149%). It was the farthest below normal in the Price River, White River, and Yampa River basins, at 74%, 75%, and 85% of average, respectively.



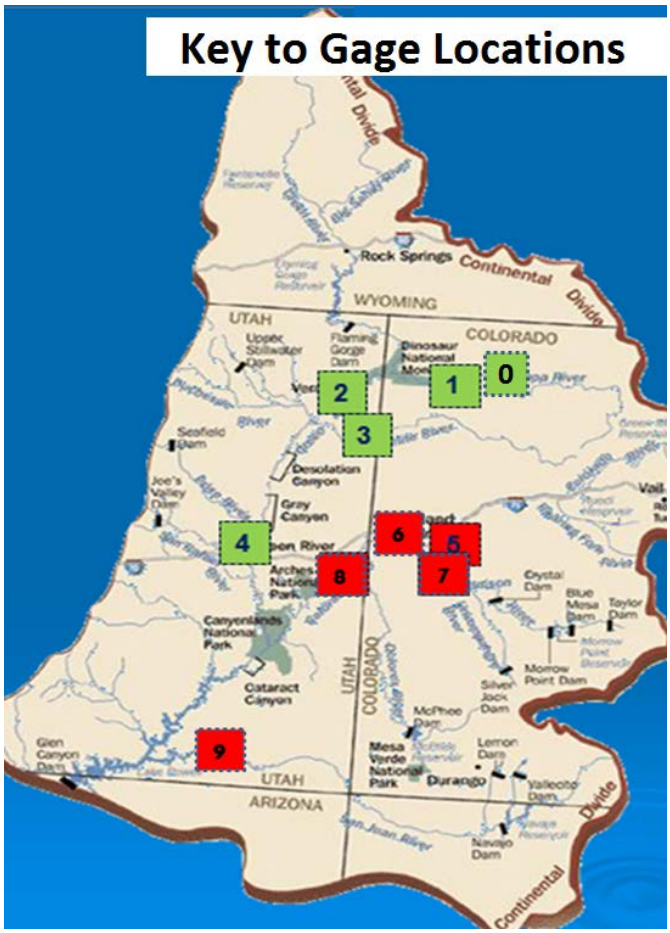
Peak mean daily flows observed at key gaging locations in the upper Colorado River basin are summarized below. Peaks on the Colorado, Green, and Gunnison Rivers were all augmented in 2017 with an intentional, targeted ramp-up of releases from reservoirs within those river basins. A map illustrating these locations follows these tables.

Map Key	River	Location	Historic Mean Daily Peak	2017 Peak	% of Avg Peak
1	Yampa	*Deerlodge Park*	12,500	10,700	86%
2	Green	*Jensen*	16,500	17,200	104%
3	White	*Watson*	2,400	2,130	89%
4	Green	*Green River*	18,500	21,800	118%
5	Colorado	*Cameo*	14,000	16,600	119%
7	Gunnison	*Grand Junction*	8,000	15,900	198%
8	Colorado	*Cisco*	23,000	26,200	114%
9	San Juan	*Bluff*	11,730	8,540	73%

Base flows observed during the August-through-October period of 2017 are summarized in the table below.

Map Key	River	Location	% of Aug-Oct Avg, (1981-2010)	Minimum cfs
0	Yampa	*Maybell*	80%	89
1	Yampa	*Deerlodge Park*	76%**	95
2	Green	*Jensen*	127%	1,910
3	White	*Watson*	77%	114
4	Green	*Green River*	103%	2,080
5	Colorado	*Cameo*	100%	2,150
6	Colorado	*Palisade*	107%*	848
7	Gunnison	*Grand Junction*	110%	1,820
8	Colorado	*Cisco*	96%	3,430
9	San Juan	*Bluff*	65%	525

*Based on WY1990-2010 average; pre-1990 data not available
** Based on WY1982-2010 average; pre-1982 data not available



At this time, considerable uncertainty surrounds next season's snowpack development and resulting runoff into Lake Powell. The forecast for Water Year 2018 unregulated inflow to Lake Powell, issued on October 1, 2017 by the Colorado Basin River Forecast Center, projects a most probable (median) unregulated inflow volume next year of 9.71 MAF (90% of average). The forecast ranges from a minimum probable of 7.0 MAF (65%) to a maximum probable of 17.5 MAF (162%). http://www.usbr.gov/uc/water/crsp/cs/gcd.html

Other support provided by the Program Hydrologist under this task item in FY17 included the following:

Mainstem Colorado 15-Mile Reach:

- Participation in weekly 15-Mile Reach coordination calls throughout the spring (peak flows & CROS operations) and summer/fall (base flow operations).
- Requests for releases of endangered fish water from FWS pools in Ruedi, Granby, and Wolford Mountain Reservoirs to support summer base flows in the 15-Mile Reach. A total of 32,825 acre-feet were released from endangered fish accounts at these reservoirs between August 3 and October 20, 2017. In addition, 46,215 acre-feet were released for this purpose from the Green Mountain Reservoir HUP Surplus account.
- Continued work on the PBO compliance review document for the 15-Mile Reach.
- Preparation of a press release for the June 2017 CROS operations, and preparation of a follow-up article on the same for the Recovery Program field report.

Yampa River**:**

- Decision in early May to not lease additional water from Elkhead Reservoir for Yampa instream flow purposes in 2017, beyond the 5,000 AF Elkhead account already available.
- Initiation of Yampa Flow Coordination calls in mid-summer 2017, with releases requested from from FWS's Elkhead Reservoir endangered fish account between August 25 and October 2 to support base flows. A total 4,173 AF of the 5,000 AF Elkhead account was used in 2017 for this purpose. Provisional gage data indicate that daily average instream flow at the Yampa-Maybell gage fell below 93 cfs (the dry year target) on 4 days, and below 134 cfs (the average year target) on 26 days, in spite of Elkhead releases of up to 75 cfs on these days.
- Completion of the document '*Procedures for Releasing and Administering Water from Elkhead Reservoir to Augment Yampa River Flows for Endangered Fish*'. This document is posted at http://www.coloradoriverrecovery.org/documents-publications/section-7-consultation/yampaPBO/ElkheadResProc.pdf.

Green River:

- Participation in GRUWAT calls to help evaluate the assumptions and interpretations underlying Utah's depletions modeling.
- Coordination with environmental interests, Reclamation, and additional 'federal family' interests to consider potential impacts of Reclamation's proposed 'ultimate phase water' contracting actions in Utah.

Price River:

- Representation of the Recovery Program on conference calls exploring options for enhancing Price River base flows and habitat to benefit native fish (including possible Olsen and Garley Wash Reservoir actions). See the Annual Report for task FR-171 for additional description.

White River:

- Participation in White River Workgroup meetings to review hydrologic analyses and determine next steps in the development of flow targets & recommendations. Overall coordination of this effort was led by FWS hydrologist Tom Econopouly.

Other/General:

- Chaired the Water Acquisition Committee and participated in GRUWAT, GREAT, and FGTWG discussions.
- Presented the 2017 plan for Ruedi releases to the public in Basalt, Colorado, August 10. Coordinated with CWCB to manage releases of the 6,000 acre-feet of water they leased in Ruedi from the Ute Water District.
- Coordinated with USGS/CU to collect hydrophone data on the White River, summer 2017.
- Staffed the Recovery Program's trade booth at the annual Colorado Water Congress meeting in January.

VIII. Additional Noteworthy Observations:

The work provided supports other research projects and 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.

IX. Recommendations:

We recommend continuation of the current data collection efforts at the established gaging sites. Consideration should be given to the potential installation of a couple of additional temperature monitoring sites on the White River.

X. Project Status: Ongoing and on-track.

XI. FY 2017 Budget Status:
A. Funds provided: $141,521
B. Funds expended: $141,521
C. Difference: - 0-

XII. Status of Data Submission: Data submitted as completed

XIII. Signed: Don Anderson November 30, 2017
Principal Investigator Date