

**COLORADO RIVER RECOVERY PROGRAM
FY 2018 ANNUAL PROJECT REPORT**

Project No: 19

I. Project Title: General Hydrology Support

II. Bureau of Reclamation Agreement Number(s): R18PG40023

Project/Grant Period: Start date: 10/1/2017
End date: 9/30/2022
Reporting period end date: Ongoing
Is this the final report? Yes _____ No x

III. Principal Investigator:

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IV. Abstract:

The Service's hydrologist provides basic hydrology support to Recovery Program operators and researchers. Accomplishments during FY 2018 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.

Yampa River Action Plan:
I.B.2 Provide augmentation of low flows.

Duchesne River Action Plan:
1.D Coordinate reservoir operation

VII. Accomplishment of FY 2018 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 seven locations on the Yampa and Green Rivers, as described below. Two monitoring sites on the Gunnison River were terminated in 2018 after determining that the original objectives of their 1992 installation were fulfilled (namely, to validate temperature model assumptions). Several new temperature sites were provisionally established on the White River for possible longer-term monitoring, to aid in identifying most productive smallmouth bass removal efforts. 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. 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 FY18 were downloaded in the field in July and September, 2018 by Jim Renne, a volunteer to the Program. The data collection went well, with all seven sites yielding what appear to be complete and valid data for the period. The one-hour interval readings from the previous year (FY17) were converted to daily means, and site-specific daily-mean tables completed during winter 2017-18. Temperature data for FY18 are currently being processed for uploading to the Program website. This work should be completed by the end of January 2019.

The PDO continued compiling a summary table of site information for all known long-term stream temperature monitoring locations in the upper Colorado River basin,

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.

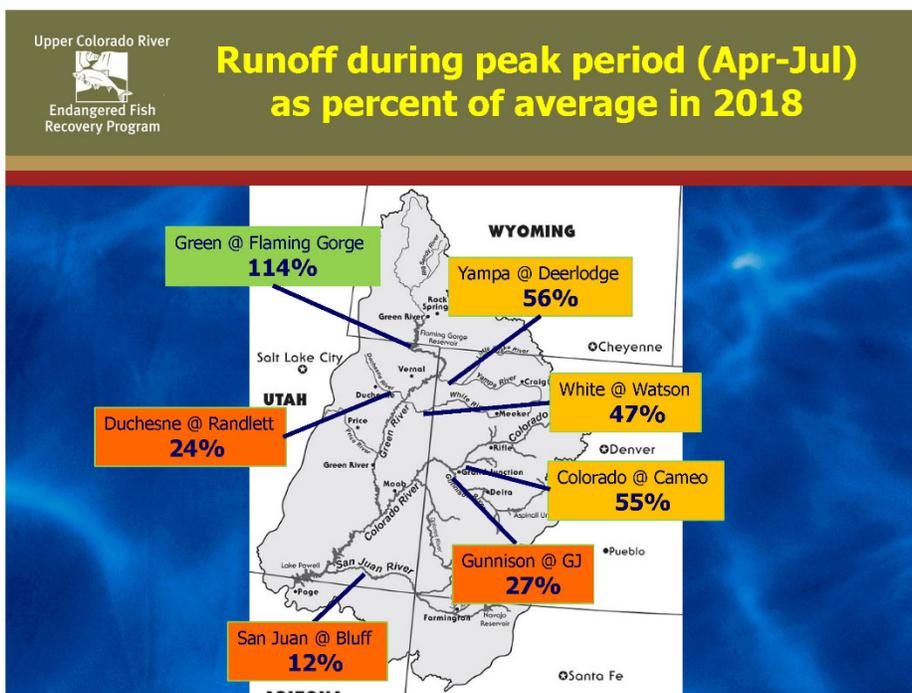
including those managed by cooperating entities such as USGS, Colorado State University, and the State of Utah. The purpose is to have a centralized inventory of this information to help address such questions as where temperature data are collected, why those sites were selected, and how the data are used by the Program. That table is now essentially complete and up-to-date, pending some additional site location updates.

In FY18 the PDO completed written documentation of the basic procedures and protocols the Program uses to establish river temperature monitoring sites and collect and process the temperature data, along with a description of how the Program monitoring network and procedures have evolved over time. This will be posted when the Program website is updated in 2019, as an informational tool for those augmenting, accessing and using the collected data.

2. Hydrology Support for Program Implementation and Monitoring

Overall, runoff in the Upper Colorado River basin in Water Year 2017 was well below-normal, resulting in unregulated inflow to Lake Powell that was 43% of average, the third-driest year on record (the two drier years were 1977 and 2002). As of October 31, 2018, the storage content of Lake Powell, at 10.87 million acre-feet, was 3.65 million acre-feet less than one year earlier, and the lowest for this date in at least the last 10 years (although the Oct 31, 2013 storage was comparable, 10.90 acre-feet).

Runoff conditions varied considerably from one sub-basin to the next. April-through-July runoff measured at various locations around the basin are shown in the graphic below, as percent of average (1981-2010). Peak season runoff was somewhat above normal in the upper Green River basin (inflow to Flaming Gorge Reservoir), at 114% of average. It was below normal throughout the remainder of the upper basin, and was farthest below normal in southern and western areas, with the Duchesne River, Gunnison River, and San Juan River basins at 24%, 27%, and 12% of average, respectively.



Peak mean daily flows observed at key gaging locations in the upper Colorado River basin are summarized below. Naturally elevated spring flow in the Green River at Jensen was augmented in 2018 with an intentional, targeted ramp-up of releases from Flaming Gorge Reservoir aimed at maximizing the entrainment of larval razorback sucker from the Green River into Stewart Lake and other floodplain wetlands. No attempt was made in 2018 to augment peak flows on the mainstem Colorado or Gunnison rivers, due to the dry hydrologic conditions and limited ability to augment peaks.

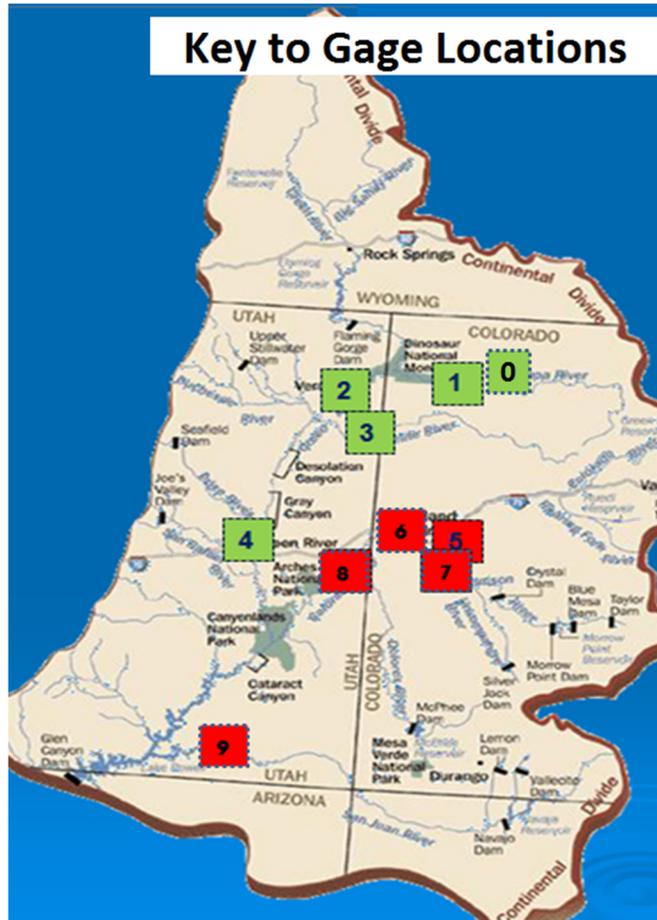
River	Location	Mean Daily Peak	2018 Peak	% of Avg Peak
Yampa	Deerlodge Park	12,500	8,690	70%
Green	Jensen	16,500	12,100	73%
White	Watson	2,400	1,360	57%
Duchesne	Randlett	1,800	105	6%
Gunnison	Grand Junction	8,000	2,030	25%
Colorado	Cameo	23,000	6,650	29%
San Juan	Bluff	11,730	1,380	12%

Base flows observed during the August-through-October period of 2018 are summarized in the table below.

Map Key	River	Location	% of Aug-Oct Avg, (1981-2010)	Minimum cfs
0	Yampa	<i>Maybell</i>	39%	38
1	Yampa	<i>Deerlodge Park</i>	35%**	33
2	Green	<i>Jensen</i>	105%	1,890
3	White	<i>Watson</i>	52%	27
4	Green	<i>Green River</i>	76%	1,710
5	Colorado	<i>Cameo</i>	69%	1,320
6	Colorado	<i>Palisade</i>	44%*	137
7	Gunnison	<i>Grand Junction</i>	57%	920
8	Colorado	<i>Cisco</i>	56%	1,890
9	San Juan	<i>Bluff</i>	37%	361

*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 upper Colorado basin runoff. The Colorado Basin River Forecast Center forecast for Water Year 2019 unregulated inflow to Lake Powell, issued on October 1, 2018, projects a most probable (median) unregulated inflow volume next year of 7.6 MAF (70% of average). Their forecast ranges from a minimum probable of 4.6 MAF (42%) to a maximum probable of 15.6 MAF (142%). <http://www.usbr.gov/uc/water/crsp/cs/gcd.html>

Other support provided by the Program Hydrologist under this task item in FY18 included the following:

Mainstem Colorado 15-Mile Reach:

- Participation in weekly 15-Mile Reach coordination calls during the ‘April Hole’ and throughout summer/fall base flow operations.
- Requests for releases of endangered fish water from FWS pools in Ruedi, Granby/Willow Creek, and Wolford Mountain Reservoirs to support summer base flows in the 15-Mile Reach. A total of 30,909 acre-feet were released from endangered fish accounts at these reservoirs between June 30 and October 20, 2018. This was supplemented with 18,812 acre-feet of maintenance releases from Wolford Mountain Reservoir by the Colorado River District that were protected to and through the 15-Mile Reach. An additional 2,356 acre-feet was released from Green Mountain Reservoir from April 13 to April 21 to augment problematic, temporary low April flows in the 15-Mile Reach. However, in

2018, no surplus water became available and thus no water was released from the Green Mountain Reservoir HUP Surplus account to supplement 15-Mile Reach summer base flows. This was the first time since 2002 that no water was released from Green Mountain Reservoir to support summer base flows (although in three years since then – 2004, 2012, and 2013 – only 119, 298, and 2,514 acre-feet, respectively, were released from Green Mountain for that purpose).

- Continuing work on the PBO compliance review document for the 15-Mile Reach.
- Meeting with GVIC managers (Oct) and Board (Feb) to discuss diversion dam problems and other concerns, followed by GVIC-Reclamation-FWS technical meeting (Feb) to identify possible solutions.
- Reviewing, providing feedback, and shepherding the District-Reclamation-FWS Grand Valley ‘Surplus Capacity’ contract through Ecological Services for FWS’s signature.
- Meeting w/ Audubon representatives regarding possible partnership on floodplain wetland improvements at the ‘Audubon Ponds’ near Grand Junction.

Yampa River:

- Decision in early May (initially 500 AF) and then again in August (remaining 1,500 AF) to lease a total 2,000 AF of additional water from Elkhead Reservoir from CRD for Yampa instream flow purposes in 2018, beyond the 5,000 AF Elkhead account already available. All 7,000 AF was needed and used in 2018 to support summer base flows.
- Initiation of weekly Yampa Flow Coordination calls on July 11, 2018, with releases requested from FWS’s Elkhead Reservoir accounts from July 25 to October 8 to support base flows. A total of 7,000 AF was used in 2018 for this purpose (5,000 permanent pool + 2,000 temporary leased). Provisional gage data indicate that daily average instream flow at the Yampa-Maybell gage fell below 93 cfs (the dry year target) on 47 days, in spite of Elkhead releases of between 20 and 70 cfs on these days.
- Continued participation in discussions related to the Yampa-White-Green Roundtable Yampa River management planning efforts.

Green River:

- Preparation of 2018 Green River / Flaming Gorge Flow Request Letter
- Participation in GREAT team discussions to review flow recommendations, draft report chapters, hydrologic analyses, and draft study and monitoring plans.
- Tracking and providing input on draft contract and draft environmental assessment for Reclamation’s proposed ‘Green River Block’ exchange contract out of Flaming Gorge Reservoir.
- Providing input for DOI’s comments on Water Horse LLC Green River water rights application in Utah.
- Participating with NPS, in coordinating calls with the NASA DEVELOP research team (Fort Collins) that developed the prototype satellite imagery riparian vegetation mapping tool for the Green River.

Price River:

- Participating in conference calls exploring options for enhancing Price River base flows and habitat to benefit native fish. Letters of support prepared for two related funding

requests by non-federal entities. (See the Annual Report for task FR-171 for additional description.)

White River:

- Participation in White River Planning Group meetings to review hydrologic analyses and determine next steps in the development of flow targets & recommendations. Assisted in this effort by FWS hydrologist Tom Econopouly.
- Development, with the Planning Group, of a draft outline for the White River Management Plan.
- Coordination of internal FWS-Solicitor discussions regarding appropriate NEPA for the envisioned White River cooperative agreement with FWS.
- Coordination of efforts to re-work the 2012 Fish Studies and Flow Recommendations document to reflect current information and modeling; updated document disseminated for technical review in September 2018.

Other/General:

- Summarized and presented information on various past, present, and anticipated future hydrologic conditions, issues, successes, deficiencies, and Program decision-making needs for various Biology Committee, Management Committee, and Implementation Committee meetings.
- Presented the 2018 plan for Ruedi releases to the public in Basalt, Colorado, August 9. Coordinated with CWCB to manage releases of the 6,000 acre-feet of water leased out of Ruedi from the Ute Water District.
- Participated in Duschene River IBAT/DRWG spring planning meeting & fall review meetings via phone.
- Participated in Aspinall Unit/Gunnison River spring planning meeting via phone.
- Provided info to and met with Colorado Water Trust to identify possible instream-flow protection opportunities in the upper Colorado River mainstem.
- Prepared press release for the 2018 ExxonMobil Ruedi contract water donation.
- Staffed the Recovery Program's trade booth at the annual Colorado Water Congress meeting in January, the Utah Water Users conference in March, and the NWRA Western Chapter Meeting in Utah in August.

VIII. Additional Noteworthy Observations:

The work provided supports other research projects and activities such as flow delivery, flow quantification, fish monitoring, 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 continued collection of data at one or more of the provisional temperature monitoring sites established in 2018 on the White River.

X. Project Status: Ongoing and on-track.

XI. FY 2018 Budget Status:

A. Funds provided: \$177,786

B. Funds expended: \$177,786

C. Difference: - 0-

XII. Status of Data Submission: Data submitted as completed

XIII. Signed: Don Anderson December 14, 2018
Principal Investigator Date