

10-2007

# Reclamation, Managing Water in the West, Annual Report of Operations for Flaming Gorge Dam, Water Year 2007

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# RECLAMATION

*Managing Water in the West*

## **Annual Report of Operations for Flaming Gorge Dam Water Year 2007**



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# **Annual Report of Operations for Flaming Gorge Dam Water Year 2007**

## **Introduction**

Pursuant to the February 2006 Record of Decision for the Operation of Flaming Gorge Dam (ROD) and as described in the Operation of Flaming Gorge Dam Final Environmental Impact Statement (FEIS), this report details the operations of Flaming Gorge Dam during water year 2007. This is the second year of operations of Flaming Gorge Dam under the ROD and this report is the second annual report produced under authority of the ROD.

## **Operational Decision Process for Water Year 2007**

In 2007, the operational process developed in 2006 was used for making operational decisions at Flaming Gorge Dam. This process was developed based on descriptions provided in the FEIS (Section 1.5) and the ROD (Sections III, VI, and VII). A detailed description of this process can be found in Appendix A and a timeline of how this process was implemented in 2007 can be found in Appendix B. The four steps of the process are described below:

### **Step 1: Request for Research Flows**

No specific flow request for the spring of 2007 was made by the Upper Colorado River Endangered Fish Recovery Program (Recovery Program). A letter stating that no spring runoff research flows would be requested for the Green River was received by the Bureau of Reclamation (Reclamation) and the Flaming Gorge Technical Working Group on February 23, 2007. A copy of this letter can be found in Appendix C.

### **Step 2: Development of Spring Proposal**

In 2006, as directed by the ROD, a Flaming Gorge Technical Working Group was established to provide proposals to Reclamation on what flow and temperature regimes would best achieve ROD objectives based on current year hydrologic conditions and the conditions of the endangered fish. The Flaming Gorge Technical Working Group was also charged with integrating, to the extent possible, any flow requests from the Recovery Program into the flow proposal so that Recovery Program research could also be facilitated. The Flaming Gorge Technical Working Group is represented by technical staff from the U.S. Fish and Wildlife Service, Western Area Power Administration, and Reclamation. This group also serves as the informal consultation body for Endangered Species Act compliance as has occurred historically and as directed by the ROD.

The Flaming Gorge Technical Working Group met on March 5, 2007, to begin the development of a flow proposal for the spring of 2007. The intent of the flow proposal was to integrate, to the extent possible, any flow request from the Recovery Program with a flow regime consistent with the ROD. Since no specific flow request was made by the Recovery

Program, the flow proposal for 2007 was based solely on an interpretation of the ROD. The flow proposal for 2007 described three possible flow regimes that were consistent with the ROD and FEIS (see Appendix D for details). Depending upon the outcome of hydrologic conditions during spring runoff, the intent was to achieve one of these proposed flow regimes.

### **Step 3: Solicitation of Comments**

Meetings of the Flaming Gorge Working Group (Working Group) are conducted as a public process with regularly scheduled meetings usually held in Vernal, Utah, in mid-April and mid-August of each year. This forum is where Recovery Program, Western Area Power Administration, and any other requests for specific flows, as well as Flaming Gorge Technical Working Group proposals, are presented for public comment. On April 19, 2007, Reclamation presented the 2007 flow proposal to the Working Group. The main purpose of this Working Group meeting was to clearly describe the proposed flow regime for the Green River and the intended operation of Flaming Gorge Dam for the spring and summer of 2007, and to receive comments from stakeholders and the public regarding the impacts this operation might have on the resources of Flaming Gorge. Meeting minutes were recorded and written comments were invited to be received by Ed Vidmar (Chairperson of the Flaming Gorge Working Group) no later than April 26, 2007.

### **Step 4: Final Decision**

After reviewing the Flaming Gorge Technical Working Group proposal and all public input that was received, Reclamation determined that the proposed flow regime for 2007 could be achieved within normal operating parameters. Reclamation made the decision to operate during the spring of 2007 to achieve a flow regime in Reach 2 with an instantaneous peak flow in the Green River at Jensen, Utah, of at least 8,300 cubic feet per second (cfs) and also with a sustained peak flow of at least 8,300 cfs for at least 7 days. This was the “most likely” flow regime proposed by the Flaming Gorge Technical Working Group. Additionally, as described in the proposal, Reclamation agreed to maintain powerplant capacity releases to sustain flows above 12,000 cfs if four specific conditions occurred. The first condition was that the peak flow in Reach 2 achieved at least 12,000 cfs when releases from Flaming Gorge Dam were at powerplant capacity. The second condition was observation of larval fish in the Green River at the time of these high flows. The third condition was sufficient connection between specific floodplain habitats and the river channel for entrainment of larval fish during these high flows. Finally, Reclamation agreed to maintain powerplant capacity releases beyond the 7-day peak flow window if the first three conditions were met and sufficient water was also available for release from Flaming Gorge Reservoir.

## **Hydrology**

Snowpack conditions in the Upper Green River and Yampa River Basins were well below average throughout the snow accumulation season (October 2006 through April 2007). The Upper Green River Basin snowpack condition was below normal on January 1, 2007, at 76 percent of average. On April 1, 2007, the snowpack condition in the Upper Green River Basin had declined to 67 percent of average. The Yampa River Basin snowpack condition

was also below normal on January 1, 2007, at 81 percent of average. On April 1, 2007, the snowpack condition in the Yampa River Basin had declined to 70 percent of average. River flow forecasts issued by the Colorado Basin River Forecast Center for Flaming Gorge Reservoir and the Yampa River are shown in Table 1. Early seasonal forecasts indicated that hydrologic conditions would likely fall into the moderately dry hydrologic condition (as defined in the FEIS) during the spring of 2007. The April forecast indicated that Flaming Gorge Reservoir would have sufficient inflows to achieve a peak elevation of 6,029.8 feet above sea level by August 2007. However, inflows did not materialize as forecasted and the peak elevation that occurred in water year 2007 was 6,026.3 feet above sea level which occurred in early May. By the end of August, the elevation of Flaming Gorge Reservoir had declined to 6,023.1 feet above sea level. The end of water year 2007 elevation for Flaming Gorge Reservoir was 6,023.35 feet above sea level.

**Table 1 – 2007 Forecast Progression – April Through July Unregulated<sup>1</sup> Volume in Thousand Acre-Feet (KAF)**

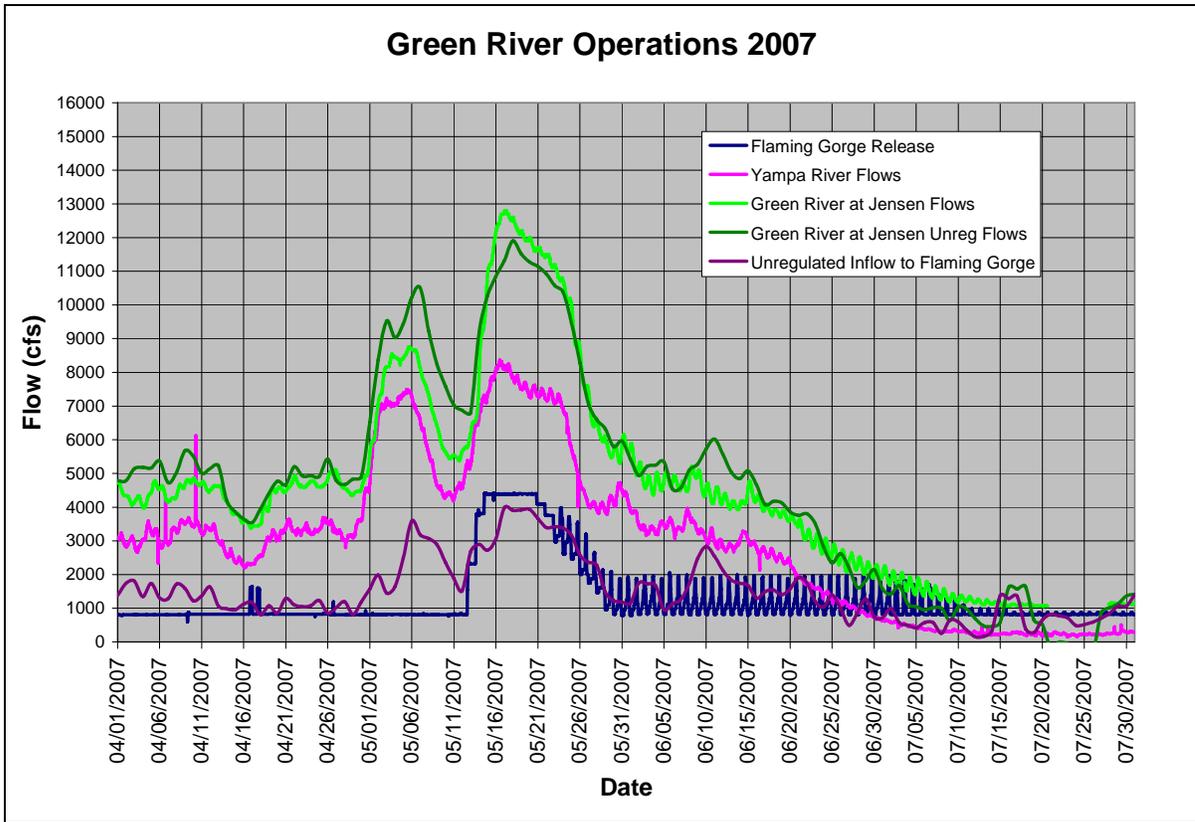
Issuance Month	Flaming Gorge Reservoir		Yampa River near Maybell, CO		Little Snake River near Lily, CO	
	Volume (KAF)	% of Normal	Volume (KAF)	% of Normal	Volume (KAF)	% of Normal
January	900	76	860	87	290	79
February	750	63	690	70	220	60
March	710	60	760	77	250	68
April	525	44	570	58	185	51
May	500	42	540	55	180	49
June	410	34	520	53	178	49
July	378	32	---	---	---	---
<b>Actual</b>	<b>369</b>	<b>31</b>	<b>561</b>	<b>57</b>	<b>174</b>	<b>48</b>

During water year 2007, the turbine runner for Unit #2 at Flaming Gorge Powerplant was replaced. This was the second turbine runner replaced at Flaming Gorge Powerplant since the powerplant became operational in 1963. In 2006, the turbine runner for Unit #3 was replaced. As a result of these replacements, the release capacity of Flaming Gorge Powerplant was reduced by approximately 200 cfs, to 4,400 cfs. In 2008, the turbine runner for the final unit (Unit #1) will be replaced and will likely reduce the release capacity of Flaming Gorge Powerplant to approximately 4,300 cfs.

Powerplant capacity releases (~4,400 cfs) began on May 13, 2007, and were maintained until May 20, 2007. These releases were made in order to maintain flows in Reach 2 above 8,300 cfs for at least 7 days for the purpose of providing some in-channel habitat maintenance in Reaches 2 and 3 of the Green River. Figure 1 shows the spring release hydrograph and corresponding Yampa River and Green River hydrographs that occurred below Flaming Gorge Dam. The unregulated flow hydrograph of the Green River near Jensen, Utah, is also

<sup>1</sup> Unregulated inflow is defined as the actual inflow to the reservoir adjusted for change in storage and evaporation in reservoirs upstream. In the case of Flaming Gorge Reservoir, unregulated inflow accounts for change in storage and evaporation at Fontenelle Reservoir only.

shown in relation to the actual flow hydrograph. At the time of the peak releases from Flaming Gorge Dam, the release rate was very nearly equal to the unregulated inflow to Flaming Gorge Reservoir.



**Figure 1 – 2007 Spring Release and Flow Hydrographs of the Green and Yampa Rivers**

On May 23, 2007, during the downramp from powerplant capacity, releases from Flaming Gorge Dam resumed within-day fluctuations for power generation. For 6 days during the downramp, releases fluctuated for power generation. On May 30, 2007, releases from Flaming Gorge Dam averaged 1,200 cfs per day with a single daily peak fluctuation for power generation. This release regime remained in place until the end of June when it became apparent that the spring inflow volume would likely move the hydrologic classification from moderately dry to dry (as defined in the FEIS). Based on this change in the forecast, the Flaming Gorge Technical Working Group proposed that the Reach 2 target baseflow be set at 1,000 cfs for the baseflow period. Releases were gradually reduced from 1,200 cfs on average each day to 825 cfs on average each day. Under the new release regime, a very small peak fluctuation was made each day for power generation while releases were maintained at 800 cfs during most of the day. On September 4, 2007, releases were reduced to a steady release rate of 800 cfs with no fluctuations for power generation. This reduction was made to conserve water stored in Flaming Gorge Reservoir due to reduced inflow forecasts for the fall and winter months.

Baseflow conditions in Reach 2 were maintained well within 40 percent of the established baseflow target as allowed under the ROD during summer and fall months. With the Reach 2 baseflow target established at 1,000 cfs, the 40 percent flexibility (as defined in the FEIS) allowed Reach 2 flows to be between 600 cfs and 1,400 cfs. Reach 2 flows during August and September were maintained between 966 cfs and 1,277 cfs.

## Flow Objectives Achieved in Water Year 2007

The ROD directs Reclamation to operate to achieve, to the extent possible, specific flow objectives as described in the Action Alternative of the FEIS. These flow objectives and the desired minimum threshold frequencies are described in Table 2. This year (water year 2007) is the second year of operations under the ROD and thus is the second year for establishing the long-term frequencies of these spring flow objectives.

**Table 2 – Reach 1 and 2 ROD Flow Objectives Achieved in 2007**

Spring Peak Flow Objective	Reach	Desired Long-Term Frequency %	Achieved in 2007	Long-Term Frequency %*
Peak $\geq$ 26,400 cfs for at least 1 day	2	10 %	No	0 %
Peak $\geq$ 22,700 cfs for at least 2 weeks	2	10 %	No	0 %
Peak $\geq$ 18,600 cfs for at least 4 weeks	2	10 %	No	0 %
Peak $\geq$ 20,300 cfs for at least 1 day	2	30 %	No	0 %
Peak $\geq$ 18,600 cfs for at least 2 weeks	2	40 %	No	0 %
Peak $\geq$ 18,600 cfs for at least 1 day	2	50 %	No	50 %
Peak $\geq$ 8,300 cfs for at least 1 day	2	100 %	Yes	100 %
Peak $\geq$ 8,300 cfs for at least 1 week	2	90 %	Yes	100 %
Peak $\geq$ 8,300 cfs for at least 2 days except in extreme dry years	2	98 %	Yes	100 %
Peak $\geq$ 8,600 cfs for at least 1 day	1	10 %	No	0 %
Peak $\geq$ powerplant capacity for at least 1 day	1	100 %	Yes	100 %

\*The long-term frequency percentage is based on two years of operation under the ROD (2006 and 2007).

## Temperature Objectives Achieved in Water Year 2007

To achieve ROD temperature objectives (see Table 3), Reclamation followed operational guidelines and set the gates of the Flaming Gorge Dam selective withdrawal structure at 41 feet from the reservoir surface on June 12, 2007. Temperatures of dam releases during the compliance period averaged 12.8° C and did not reach target levels (15° C, 59° F; recorded at the Greendale Gage) until late July. However, average daily temperatures at the Gates of Lodore equaled or exceeded Reach 1 objectives (18° C, 64° F) beginning on June 16 and were maintained for 11 weeks throughout the summer months. This is likely due to enhanced longitudinal warming resulting from low flows. Evaluation of Reach 2 temperature objectives are pending data retrieval from the confluence of the Green and Yampa Rivers and should be available early in water year 2008.

**Table 3 – Reach 1 and 2 ROD Temperature Objectives Achieved in 2007**

<b>Spring Peak Flow Objective</b>	<b>Reach</b>	<b>Desired Frequency %</b>	<b>Achieved in 2007</b>	<b>Compliance frequency to date (%)</b>
Temperatures $\geq$ 64° F (18° C) for 3-5 weeks from June (average-dry years) or August (moderately wet-wet years) to March 1	1	100 %	Yes (11 weeks)	100 %
Green River should be no more than 9° F (5° C) colder than the Yampa River during the baseflow period	2	100 %	To be determined	To be determined

## Appendix A

### Flaming Gorge Decision Process Intended Implementation Under the 2006 Flaming Gorge Record of Decision

**Overview** - To better clarify the adaptive management process by which operational decisions at Flaming Gorge Dam will be made under the 2006 Record of Decision on the Operation of Flaming Gorge Dam Final Environmental Impact Statement (2006 Flaming Gorge Record of Decision), as well as the role of the Flaming Gorge Technical Working Group (FGTWG), the following document describes the four-step process Reclamation will be implementing. This process incorporates the Upper Colorado River Endangered Fish Recovery Program (Recovery Program), the FGTWG, and the Flaming Gorge Working Group.

Reclamation believes that the Recovery Program remains the appropriate forum for discussion of endangered fish response to Flaming Gorge Dam operations, endangered fish research needs, and refinements to the 2000 Flow and Temperature Recommendations. The purpose of the FGTWG would be limited to proposing specific flow and temperature targets (and contingencies) to meet the goals of the 2006 Flaming Gorge Record of Decision or as modified by the Recovery Program. The Flaming Gorge Working Group remains our public information/input forum.

**1. Recovery Program** - As stated in Environmental Commitment #2 in the 2006 Flaming Gorge Record of Decision, the science role of the Recovery Program in the adaptive management process includes design and execution of studies to monitor the implementation of the 2000 Flow and Temperature Recommendations and test outcomes of modified flows and water temperatures from Flaming Gorge Dam. This includes conducting research to answer specific questions raised by previous studies, to fill information gaps identified in the Recovery Implementation Program Recovery Action Plan and related documents, and/or to address uncertainties associated with the 2000 Flow and Temperature Recommendations (Section 5.5, Muth et al. 2000; Section 4.19 and 4.20, Flaming Gorge EIS; ROD environmental commitment #9). For example, effects of specific spring flow elevations on entrainment rates of larval endangered fish and their floodplain habitats is an uncertainty which prompted the Recovery Program to request periods of steady flows during the spring 2005 runoff season. Requests for such flows or release temperatures is not necessarily explicit in the 2000 Flow and Temperature Recommendations, but is necessary to fulfill adaptive management research functions that should be made no later than January of each calendar year.

Beginning each summer, the Recovery Program should begin a process to develop any desired flow request for the Green River for the following year. Maintenance schedules for the dam and powerplant must be part of these initial discussions to assure release capability. Because of the critical need for dam and powerplant maintenance issues to be part of any proposal, Reclamation must clearly communicate equipment and maintenance issues to the

Recovery Program during development of any Recovery Program request. This communication should include analysis of contingency plans for maintenance issues, system emergencies, equipment failures, or changes in hydrology. By the end of January each year, any desired flow request should be finalized and issued to Reclamation, the U.S. Fish and Wildlife Service, and the Western Area Power Administration.

**2. Flaming Gorge Technical Working Group (FGTWG)** - The primary purpose of the FGTWG is to formulate a proposal of what flows and temperatures should be achieved each year. The proposal should consider current and foreseeable hydrologic conditions in the Green River Basin (including the Yampa River Basin), the 2006 Flaming Gorge Record of Decision, and any Recovery Program flow request for the current year.

The FGTWG should meet in early March of each year to develop a proposed flow and temperature regime for the upcoming year. This proposed flow and temperature regime should achieve the 2000 Flow and Temperature Recommendations as studied in the Action Alternative of the Flaming Gorge Environmental Impact Statement as directed in the 2006 Flaming Gorge Record of Decision and/or the Recovery Program flow request for the current year. The proposal should provide clear guidance for how to adjust flow and temperature objectives under alternate hydrologic scenarios in the event that conditions become wetter or dryer. The FGTWG proposal should be finalized by early April in time to present to the Flaming Gorge Working Group.

Because the FGTWG has representation from the U.S. Fish and Wildlife Service, Western Area Power Administration, and Reclamation, FGTWG meetings also serve the purpose of informal consultation for Endangered Species Act compliance.

**3. Flaming Gorge Working Group** - The FGTWG proposal is presented to the Flaming Gorge Working Group by Reclamation. Meetings of the Flaming Gorge Working Group are conducted as a public process with regularly scheduled meetings usually held in Vernal, Utah, in mid-April and mid-August of each year. This forum is where Recovery Program requests and FGTWG proposals are presented for public comment and constitutes the public involvement and public outreach element of the adaptive management component, as discussed in Sections 4.20 and 4.21 of the Operation of Flaming Gorge Dam Final Environmental Impact Statement.

**4. Operational Plan** - Reclamation makes the final decision on how to operate Flaming Gorge Dam based on hydrologic conditions, the FGTWG flow proposal, and input from the public received via the Flaming Gorge Working Group.

## **Appendix B**

### **Flaming Gorge Decision Process for 2007 Chronology of Events**

#### **Week of February 19<sup>th</sup>**

A letter was received by Reclamation from the Upper Colorado River Endangered Fish Recovery Program indicating that no research flows were being requested in 2007.

#### **Week of February 26<sup>th</sup>**

#### **Week of March 5<sup>th</sup>**

The March final forecast for Flaming Gorge Reservoir and the Yampa River near Deerlodge, Colorado, was issued. Forecasts statistically put the Green River Basin into the moderately dry hydrologic classification.

The Flaming Gorge Technical Working Group met to begin development of a flow proposal for the spring of 2007.

#### **Week of March 12<sup>th</sup>**

The March mid-month forecast for Flaming Gorge Reservoir and the Yampa River was issued by the River Forecast Center.

#### **Week of March 19<sup>th</sup>**

The Flaming Gorge Technical Working Group held a conference call to discuss the working draft of the flow proposal.

#### **Week of March 26<sup>th</sup>**

The flow proposal was completed by the Flaming Gorge Technical Working Group. The flow proposal was provided to Reclamation for consideration.

#### **Week of April 2<sup>nd</sup>**

#### **Week of April 9<sup>th</sup>**

#### **Week of April 16<sup>th</sup>**

A Flaming Gorge Working Group meeting was held in Vernal, Utah.

### **Week of April 23<sup>rd</sup>**

Comments from the Flaming Gorge Working Group accepted until April 26, 2007.

### **Week of April 30<sup>th</sup>**

The Bureau of Reclamation made the decision to adopt the Flaming Gorge Technical Working Group Proposal for guidance of operation of Flaming Gorge Dam during the spring of 2007.

The Yampa River shows signs of early peak exceeding 7,000 cfs on April 2, 3, and 4, 2007. No actions were taken at Flaming Gorge Dam.

### **Week of May 7<sup>th</sup>**

Warm temperatures in the region indicate that the Yampa River may peak during the week of May 14, 2007.

Flaming Gorge Dam directed to increase releases beginning on May 13<sup>th</sup> to achieve powerplant capacity on May 15<sup>th</sup>.

### **Week of May 14<sup>th</sup>**

Flaming Gorge achieves approximately 4,400 cfs on May 15<sup>th</sup>. The Yampa River flows increase to 7,500 cfs on May 15<sup>th</sup>. The Yampa River peaks on May 17, 2007, at 8,300 cfs.

Flaming Gorge Dam directed to begin ramp down on May 21<sup>st</sup> as Yampa River flows decrease below 7,500 cfs. Reach 2 flows achieve 8,300 cfs on May 14<sup>th</sup>. Reach 2 flows achieve 7 days above 8,300 cfs on May 20<sup>th</sup>. Reach 2 flows peak for the year on May 17<sup>th</sup> at 12,650 cfs with 4 consecutive days above 12,000 cfs ending on May 19<sup>th</sup>.

### **Week of May 21<sup>st</sup>**

Ramp down rate set to 350 cfs/day to begin on May 21<sup>st</sup>. Fluctuations for power generation begin on May 23<sup>rd</sup>.

### **Week of May 28<sup>th</sup>**

Ramp down to 1,200 cfs on average per day completed on May 31, 2007. Releases maintained at 1,200 cfs on average per day with fluctuations to 2,000 cfs during afternoons.

### **Week of June 4<sup>th</sup>**

### **Week of June 11<sup>th</sup>**

### **Week of June 18<sup>th</sup>**

### **Week of June 25<sup>th</sup>**

The Flaming Gorge Technical Working Group held a meeting at the U.S. Fish and Wildlife Service's office in Salt Lake City, Utah. The FGTWG proposes a Reach 2 baseflow target of 1,000 cfs.

Reclamation directs Flaming Gorge Dam to reduce releases from 1,200 cfs on average per day to 825 cfs on average per day in 50 cfs increments beginning on July 4<sup>th</sup>.

### **Week of July 2<sup>nd</sup>**

Releases reduced gradually to 825 cfs on average per day with some fluctuation for power generation.

### **Week of July 9<sup>th</sup>**

### **Week of July 16<sup>th</sup>**

Releases at Flaming Gorge Dam achieve 825 cfs on average per day with very small fluctuation in the late afternoon of July 16, 2007. The Yampa River flows reach approximately 250 cfs.

### **Week of July 23<sup>rd</sup>**

### **Week of July 30<sup>th</sup>**

## Appendix C

# Letter from the Director of the Upper Colorado River Endangered Fish Recovery Program for 2007

J. Mark King, Chairman  
Implementation Committee



## Upper Colorado River Endangered Fish Recovery Program

Robert Muth, Director  
Recovery Program

U.S. Fish and Wildlife Service • P.O. Box 284811 • Denver Federal Center • Denver, CO 80225 • (303) 969-7322 • Fax (303) 969-7327

### Memorandum

February 23, 2007

To: Rick Gold, Bureau of Reclamation, Director, Upper Colorado Region  
Richard Clayton, Bureau of Reclamation, Chair, Flaming Gorge Technical Working Group

From: Robert Muth, U.S. Fish and Wildlife Service, Director, Upper Colorado River Endangered Fish Recovery Program *Robert T. Muth*

Subject: Recovery Program recommendations for 2007 spring-runoff research flows

This is to notify the Bureau of Reclamation and the Flaming Gorge Technical Working Group that the Upper Colorado River Endangered Fish Recovery Program is not recommending specific spring runoff research flows for the Green River in 2007.

During the 1 March 7-8 meeting, the Recovery Program's Biology Committee will discuss ideas for research/monitoring projects in spring-summer 2007 recently submitted by Western Area Power Administration. As proposed, these projects would be conducted with river flows expected to occur this spring.

The Recovery Program appreciates the efforts of the Bureau of Reclamation, Western Area Power Administration, and the Flaming Gorge Technical Working Group to achieve the flow and temperature recommendations and assist in the recovery of the endangered fishes.

Please contact me if there are questions.

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Colorado River Energy Distributors Association • Colorado Water Congress • National Park Service • State of Colorado  
State of Utah • State of Wyoming • The Nature Conservancy • U.S. Bureau of Reclamation • U.S. Fish and Wildlife Service  
Utah Water Users Association • Western Area Power Administration • Western Resource Advocates • Wyoming Water Association

## Appendix D

### Flaming Gorge Technical Working Group Proposed Flow and Temperature Objectives for 2007

#### Current Hydrologic Condition

For the purposes of implementing the Flaming Gorge Record of Decision (ROD) in 2007, an evaluation has been made of the current hydrologic condition of the Upper Green River (i.e., above Flaming Gorge Dam) as it relates to the historical statistics of Flaming Gorge Dam during the period from 1963 through 2006. The hydrology of the Green River and the Yampa River basins in 2007 are both tracking towards a moderately dry hydrologic designation. It is therefore proposed that the hydrologic designation in 2007 follow the Flaming Gorge unregulated inflow forecast for April through July. Based on these statistics and the current forecast of 610,000 acre-feet, the most likely hydrologic designation will be moderately dry (70 to 90 percent exceedance).

#### Record of Decision Spring Flow Objective Interpretation

If conditions remain unchanged, and the Flaming Gorge unregulated inflow forecast for April through July remains in the range from 445,000 acre-feet to 808,000 acre-feet, the hydrologic designation should be moderately dry (70 to 90 percent exceedance) and the ROD minimum spring flow objectives should be:

#### Moderately Dry Flow Objectives

Reach	Spring Peak Magnitude (cfs)	Spring Peak Duration
Reach 1	4,600 cfs	That necessary to achieve duration target in Reach 2
Reach 2	8,300 cfs	1 week (i.e., 7 days)

It is possible that hydrologic conditions could change between now and the point of implementation in either the wet or dry direction. In the event that hydrologic conditions change as specified below, the ROD minimum spring flow objectives would be as follows:

In the event conditions become drier and the Flaming Gorge unregulated inflow forecast for April through July falls below 445,000 acre-feet, the hydrologic designation should be changed to dry (>90 percent exceedance) and the ROD minimum spring flow objectives would be:

### Dry Spring Flow Objectives

Reach	Spring Peak Magnitude (cfs)	Spring Peak Duration
Reach 1	4,600 cfs	That necessary to achieve duration target in Reach 2
Reach 2	8,300 cfs	2 days except in extremely dry years ( $\geq 98\%$ exceedance conditions)

If conditions become wetter and the Flaming Gorge unregulated inflow forecast for April through July increases above 808,000 acre-feet, the hydrologic designation should be changed to average (30 to 70 percent exceedance) and the ROD minimum spring flow objectives would be:

### Average Flow Objectives

Reach	Spring Peak Magnitude (cfs)	Spring Peak Duration
Reach 1	4,600 cfs	That necessary to achieve duration target in Reach 2
Reach 2	18,600 cfs in 50% of average years	2 weeks (i.e., 14 days) in 25% of all average years
	8,300 cfs in 50% of average years	1 day in 25% of average years 1 week (i.e., 7 days) in 50% of average years

If conditions become even wetter and the Flaming Gorge unregulated inflow forecast for April through July increases above 1,360,000 acre-feet, the hydrologic designation should be changed to moderately wet (10 to 30 percent exceedance) and the ROD minimum spring flow objectives would be:

### Moderately Wet Flow Objectives

Reach	Spring Peak Magnitude (cfs)	Spring Peak Duration
Reach 1	4,600 cfs	That necessary to achieve duration target in Reach 2
Reach 2	20,300cfs	1 day in moderately wet years
	18,600 cfs	2 weeks (i.e., 14 days) in moderately wet years

Given current conditions, it is not reasonably possible for forecast conditions to change enough to change the hydrologic designation to wet ( $<10$  percent exceedance) and therefore no description of the ROD minimum spring flow objectives are provided for the wet hydrologic designation in this proposal.

## **Recovery Program Research Request**

The Flaming Gorge Technical Working Group received a letter (dated February 23, 2007) from Robert Muth (Director, Upper Colorado River Endangered Fish Recovery Program) indicating that no specific flow requests were being made through the Recovery Program for research during spring 2007.

## **Proposed Flow and Temperature Objectives for Spring 2007**

For the spring of 2007, flows in the Green River should be managed to at least achieve the minimum spring flow objectives of the ROD for the hydrologic designation established in May. It is proposed that Reach 1 flows should be managed to achieve a peak of 4,600 cfs timed coincident with the spring peak flows of the Yampa River. The duration of peak flows in Reach 1 should be managed to at least achieve the minimum flow objective duration for Reach 2 for the hydrologic designation. The peak flow magnitude in Reach 1 should not be managed in excess of 4,600 cfs in order to achieve the peak flow objective magnitude in Reach 2 unless a reasonable opportunity to achieve wet average (30-40 percent exceedance) or moderately wet (10-30 percent exceedance) flow objectives in Reach 2 occurs.

Inundated floodplain depressions provide important nursery habitat for larval razorback suckers. The Recovery Program has determined that the majority of floodplain depression habitats located in Reach 2 are connected to the river at flows in excess of 14,000 cfs. Therefore, if flows in Reach 2 achieve and/or exceed 14,000 cfs as a result of the implementation described above, Reach 2 flows should additionally be managed to sustain this level as long as reasonably possible during the spring of 2007. This level should be sustained only if larval fish are present at the time of the high flows. The U.S. Fish and Wildlife Service will monitor for the presence of larval fish and communicate this information to Reclamation on a real time basis. This level is not considered a target but rather a level to be sustained for as long as reasonably possible if achieved as a result of timing the Reach 1 peak flows with the peak flows of the Yampa River.

The ROD recognizes that real time information is appropriate for use in managing the flows of the Green River. There is a level of uncertainty for floodplain connectivity at flows between 12,000 and 14,000 cfs and the physical nature of specific floodplain connections is dynamic. The Recovery Program will develop a study protocol by May 1, 2007, which will be used to monitor the condition of floodplain connections at the following sites: Thunder Ranch, Old Charley Main, Above Brennan, and the Stirrup. The Recovery Program will communicate real time information to Reclamation describing the nature of the floodplain connections. If the peak flows achieved in Reach 2 are in the range from 12,000 to 14,000 cfs and the floodplain connections being monitored are determined by the Recovery Program to provide sufficient connectivity and if the U.S. Fish and Wildlife Service communicates to Reclamation that larval fish are present in the system, it is proposed that Reach 2 flows be sustained at this lower level, in the range from 12,000 to 14,000 cfs, for as long as reasonably possible. As described above, this lower level is not considered a target but rather a level to be sustained for as long as reasonably possible as a result of timing the Reach 1 peak flows with the peak flows of the Yampa River.

### **Proposed Flow and Temperature Targets for Summer 2007**

After the spring flow objectives in Reach 1 and Reach 2 have been achieved, flows should be gradually reduced to achieve baseflow levels by no later than July 1, 2007. Baseflows in Reaches 1 and 2 should be managed to fall within the prescribed baseflow ranges described in the Flow and Temperature Recommendations (Muth et al. 2000) depending on the hydrologic designation for 2007.

Additionally, the temperature of flows should be managed to be at least 18° C for 2 to 5 weeks in Upper Lodore Canyon during the beginning of the baseflow period. Water temperatures in the Green River should also be managed to be no more than 5° C colder than those of the Yampa River at the confluence of the Green and Yampa Rivers for the summer period of 2007 (June through August).