

RECLAMATION

Managing Water in the West

Flaming Gorge Technical Working Group

Proposed Flow and Temperature Objectives for 2014



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Proposed Flow and Temperature Objectives

Water Year 2014

Introduction

This proposal details the Flaming Gorge Dam 2014 operational plan and is produced pursuant to the February 2006 Record of Decision for the Operation of Flaming Gorge Dam (ROD; Reclamation 2006), the Operation of Flaming Gorge Dam Final Environmental Impact Statement (FEIS; Reclamation 2006), and 2005 Final Biological Opinion on the Operation of Flaming Gorge Dam (2005 BO; Service 2005).

The Flaming Gorge Technical Working Group (FGTWG) was established pursuant to the FEIS and ROD. The ROD clarified the purpose of the FGTWG as limited to proposing specific flow and temperature targets for each year's operations based on current year hydrologic conditions and the status of endangered fish. The FGTWG was also charged with integrating, to the extent possible, any flow requests from The Upper Colorado Endangered Fish Recovery Program (Recovery Program) into the flow proposal so that Recovery Program research could also be facilitated. Members of the FGTWG include biologists and hydrologists from the Bureau of Reclamation (Reclamation), the U.S. Fish and Wildlife Service (Service), and Western Area Power Administration (Western). This group also serves as the informal consultation body for Endangered Species Act compliance as has occurred historically and as directed by the ROD.

In 2000, the Recovery Program issued Flow and Temperature Recommendations for Endangered Fishes in the Green River Downstream of Flaming Gorge Dam, (Muth et al., 2000; Flow Recommendations). The Flow Recommendations provide the basis for the proposed action outlined described and analyzed in the FEIS. The ROD implements the proposed action by modifying the operations of Flaming Gorge Dam, to the extent possible, to assist in the recovery of endangered fishes, and their critical habitat, downstream from the dam and, at the same time, maintains and continues all authorized purposes of the Colorado River Storage Project (Reclamation 2006).

Proposed Flow and Temperature Objectives for 2014

Proposed 2014 Spring Flow Objectives

For the purposes of implementing the ROD in 2014, an evaluation has been made of the current hydrologic conditions in the Upper Green River (*i.e.* above Flaming Gorge Dam) and Yampa River Basins. The evaluation centered on the historical unregulated inflow statistics for Flaming Gorge Dam during the period from 1963 through 2013. Based on these statistics and the May 1, 2014 final forecast of 1,320,000 acre-feet for Flaming Gorge, the hydrologic classification will be average (above median) (30% to 50% exceedance) for spring 2014. The combined April through July forecast of the Yampa

River at Maybell and Little Snake at Lily is 1,550,000 acre-feet. This forecast would fall into the moderately wet hydrologic classification of the ROD.¹

Reclamation received and provided to the FGTWG a memorandum dated March 21, 2014, from the Director of the Recovery Program providing the Research Request for 2014 Green River Spring Flows (2014 Spring Flow Request). The 2014 Spring Flow Request is that the FGTWG implement the *Study Plan to Examine the Effects of Using Larval Sucker Occurrence in the Green River as a Trigger for Flaming Gorge Dam* (Larval Trigger Study Plan *ad hoc* Committee 2012; LTSP) and is described in further detail in the Recovery Program Research Request section of this document.

The May final forecast for the Upper Green is in the average (above median) classification and the Yampa River Basin is in the moderately wet hydrologic classification. April received periods of above average temperatures and significant amounts of low and mid elevation snow melted bringing river flows on the Yampa River to a seasonal peak of 9,330 cfs, which occurred on April 24, 2014. Reclamation recommends operating within the official average (above median) hydrologic classification. The LTSP outlines peak flows under the average (above median) classification measured at Jensen, Utah between 18,600 cfs and 20,300 cfs for a period between 1 to 14 days during larval drift. According to the LTSP, these flows should provide connection at all study wetlands identified in the LTSP.

Flaming Gorge Dam and Reservoir is in the average (above median) classification. Reclamation understands the importance of timing releases with the emergence of larval drift in the Green River downstream of the confluence between the Green and Yampa Rivers. Based on current estimates, it is likely that larval drift will occur on the descending limb of the Yampa River hydrograph, limiting the ability of Yampa River flows to assist in meeting Jensen, Utah flows of $18,600 \text{ cfs} \geq x < 20,300$ for between 1 to 14 days. Reclamation recommends operating, to the extent possible, to implement the LTSP after maintaining efforts for safety and alleviation of flooding.

Proposed Base Flow and Temperature Objectives for Base Flows 2014

After the spring flow objectives in Reach 1 and Reach 2 have been achieved, flows should be gradually reduced to achieve base flow levels by no later than July 15, 2014. Base flows in Reaches 1 and 2 should be managed to fall within the prescribed base flow ranges described in the Flow Recommendations based on the observed April through July unregulated inflow into Flaming Gorge Reservoir (Figures 1 and 2). Pursuant to the Flow Recommendations, during the August through November base-flow period, the daily flows should be within $\pm 40\%$ of mean base flow. During the December through February base-flow period, the daily flows should be within $\pm 25\%$ of the mean base flow. Additionally, the mean daily flows should not exceed 3% variation between consecutive days and daily fluctuations at Flaming Gorge Dam should produce no more than a 0.1 meter daily stage change at Jensen, Utah.

¹ Appendix A illustrates the May 1, 2013, final forecast for Flaming Gorge Reservoir and the Yampa River Basin in relation to the hydrologic categories described in the Flow Recommendations.

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 base flow 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 (June through August).

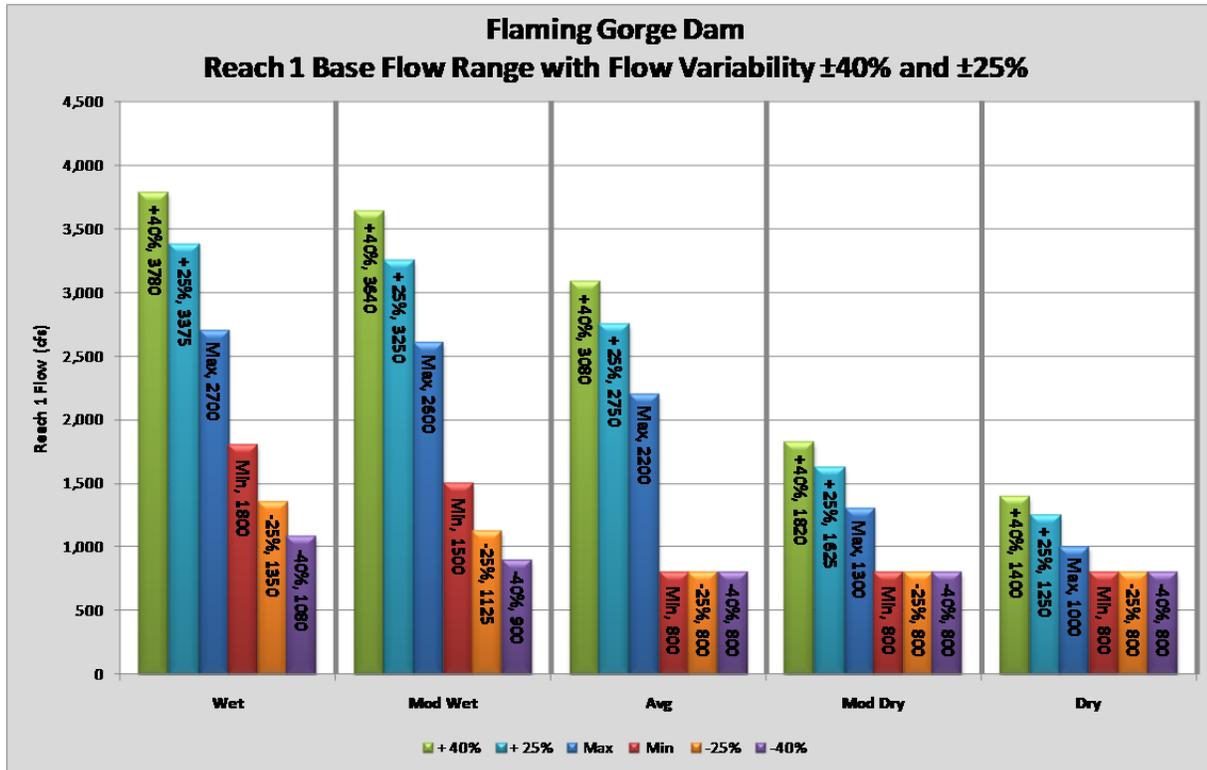


Figure 1 – Reach 1 Base Flow Ranges for each Hydrologic Classification as Outlined in the ROD.

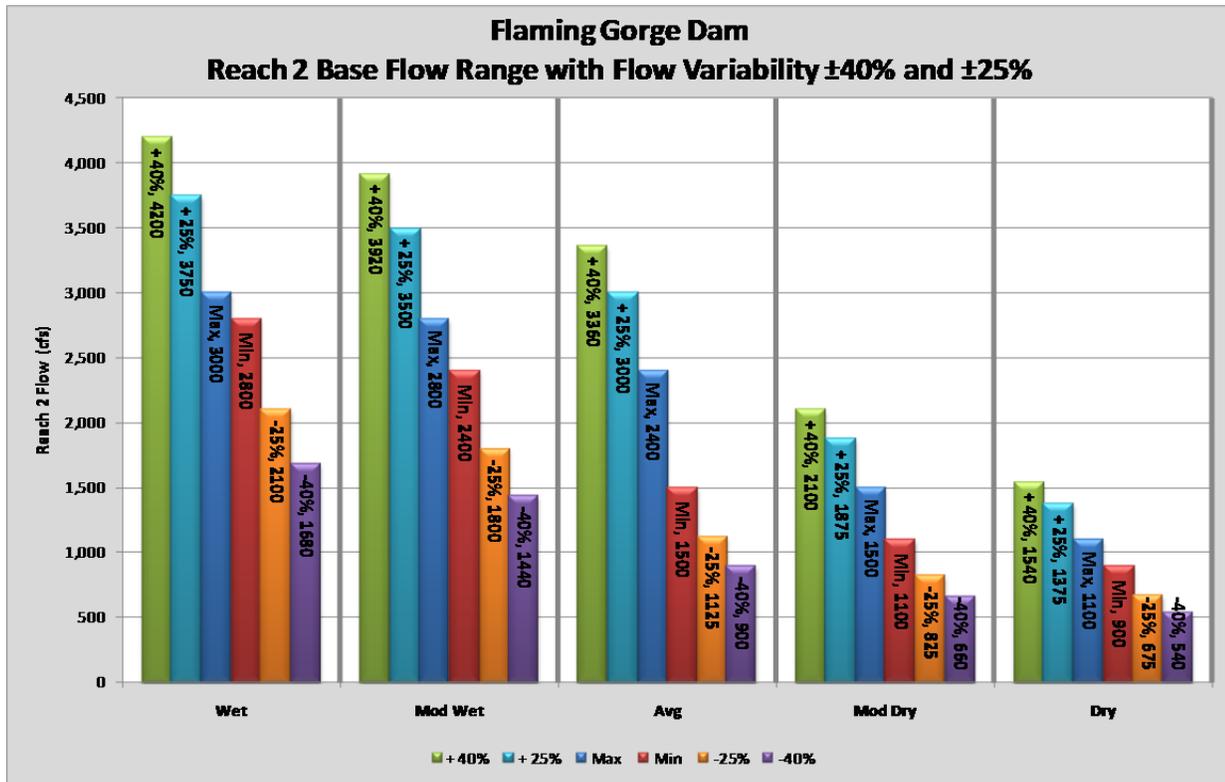


Figure 2 – Reach 2 Base Flow Ranges for each Hydrologic Classification as Outlined in the ROD.

Basin Hydrology

Green River Basin Hydrology

The May 1, 2014, final forecast of April through July unregulated inflow (current forecast) for Flaming Gorge Reservoir is 1,320,000 acre-feet (AF) (135% of 30-year average). This forecast falls at approximately 31% exceedance based on the historic unregulated inflow record (1963-2013). Figure 3 shows the current forecast in relation to the historic unregulated inflow volumes.

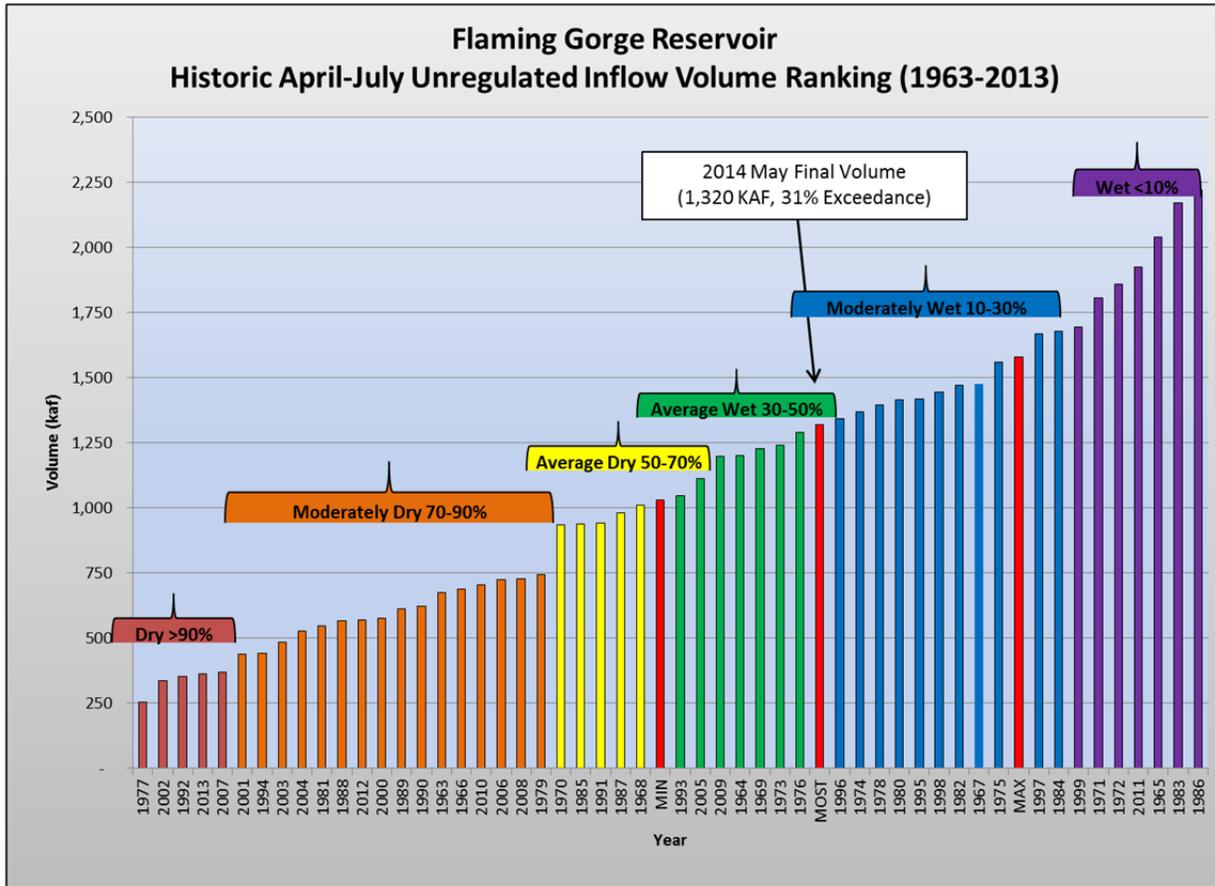


Figure 3 – Flaming Gorge Reservoir May final forecast and ranked historic unregulated April through July inflow volume for years 1963-2013.

As of May 1, 2013, Flaming Gorge Reservoir had a water surface elevation of approximately 6019.8 feet above sea level. There is approximately 2.973 million acre-feet of live storage (79% storage capacity) in Flaming Gorge and approximately 0.77 million acre-feet of space.

Yampa River Basin Hydrology

The combined current forecast for Yampa River at Deerlodge is 1,550,000 AF (125% of 30-year average). This forecast falls at approximately 29% exceedance based on a ranking of the historic record (1922-2013). Figure 4 below shows the current forecast in relation to historic flow volumes.

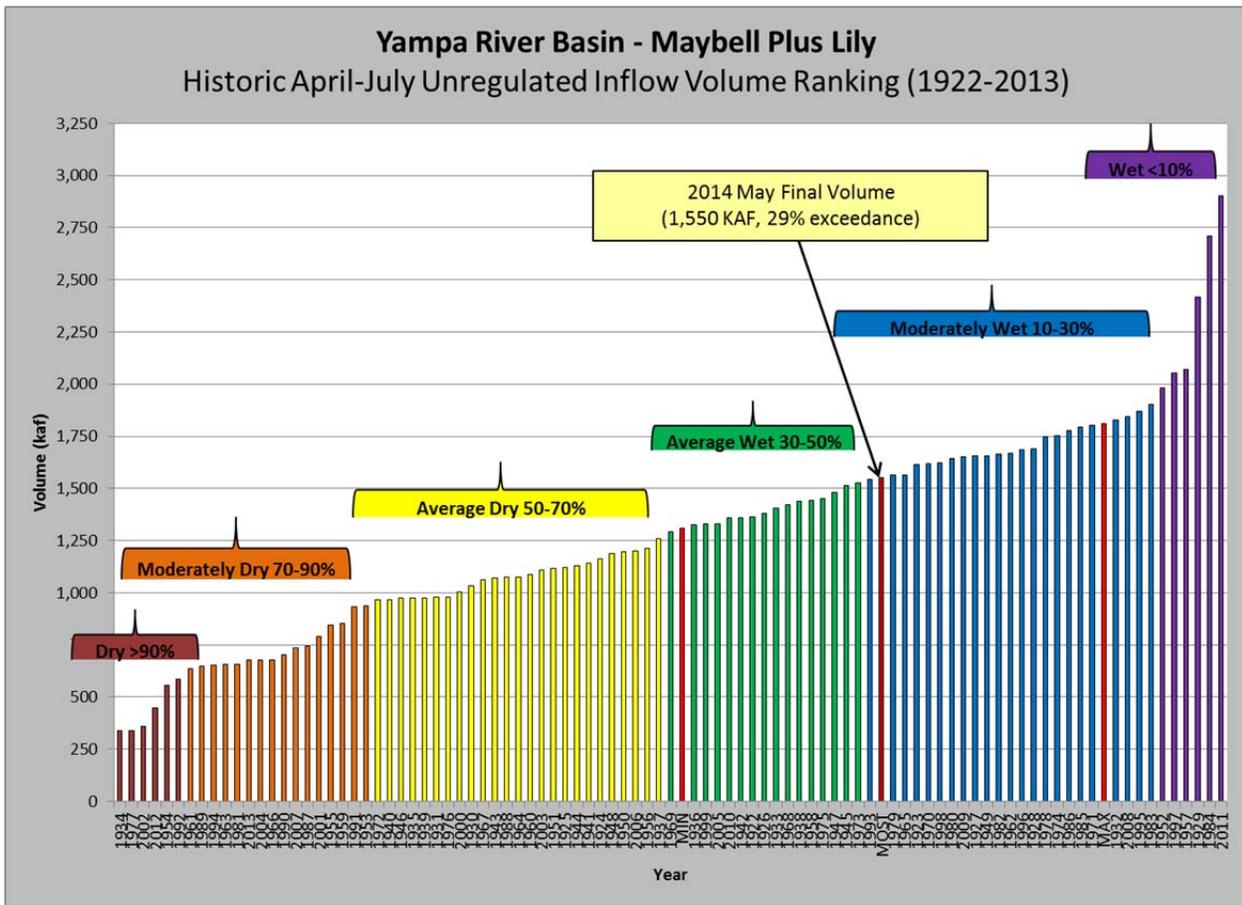


Figure 4 – Yampa River Basin (Maybell plus Lily) current forecast and ranked historic unregulated April through July inflow volume for years 1922-2013.

Hydrologic conditions in the Yampa River Basin are moderately wet, although significant amounts of low and mid elevation snowpack has already melted and spring runoff conditions will likely have a significant effect on the efficiency of the 2014 spring peak.

Probabilities of Flow Events for Spring 2014

The Flaming Gorge unregulated inflow and Yampa River forecasts are average (above median). An analysis was completed to assist in the determination of appropriate flow objectives for spring and summer 2014. The ten most similar historic years for the Yampa River Basin (Maybell plus Lily) compared to the current forecast (Table 1) were analyzed assuming a normal distribution.

Table 2 presents the percent exceedance of cumulative days greater than or equal to various flow levels at Yampa River (Maybell plus Lily). The Yampa River has achieved flows above 10,000 cfs this year. It is likely that the Yampa River peak will occur prior to the current estimate of larval drift.

Table 1
Yampa River (Maybell plus Lily) – April through July Unregulated Volume
Ten Similar Years to the May 1, 2014 Final Forecast
Thousand Acre-Feet (KAF)

Year	April-July Unreg Inflow Volume (KAF)
MIN	1,140
1968	1,420
1938	1,439
1958	1,443
1975	1,450
1947	1,479
MOST	1,500
1945	1,514
1973	1,527
1993	1,543
1979	1,562
1965	1,564
MAX	1,950

Table 2
Spring 2013 – Days above Specific Flow Thresholds in the Yampa River (Maybell plus Lily)
Based on the May 1, 2014, Final Forecast
Percent Exceedance (%)

May Final Forecast	% Exceed	Days above 8,000 cfs	Days above 9,000 cfs	Days above 10,000 cfs	Days above 11,000 cfs	Days above 12,000 cfs	Days above 13,000 cfs	Days above 14,000 cfs
YAMPA	25%	47	39	32	25	19	13	10
	50%	41	32	26	19	14	10	7
	75%	36	31	22	17	13	9	5
	90%	34	27	21	15	11	5	4

Recovery Program Research Request

Reclamation received and provided to the FGTWG a memorandum dated March 21, 2014, from the Recovery Program outlining the program’s research request for 2014 Green River spring flows (2014 Spring Flow Request).

The Recovery Program requests that the FGTWG implement the LTSP by matching Recovery Program research needs identified in the LTSP with the best available spring flow forecast information to develop a specific Reach 2 floodplain connection scenario. The LTSP describes a range of floodplain scenarios

that they would like to study and how they would evaluate the results. Additionally, the 2014 Spring Flow Request's primary objective is to build on past research to benefit the razorback sucker population throughout the Green River by timing the river-floodplain connection with the presence of wild-produced razorback sucker larvae. The 2014 Spring Flow Request supports operations consistent with the 2005 BO and ROD; however, it differs from the ROD in matching the timing and duration of Flaming Gorge releases with the spring peak flows from the Yampa River. Therefore, the ability to meet the Reach 2 flow targets at Jensen, Utah, is comprised.

Table 3 is a copy of the matrix found in Table 2 of the LTSP. It describes the flow conditions and corresponding wetlands. Under average (above median) conditions, at least eight wetlands should be available for sampling including larval fish collection and/or fall young-of-year fish collection (Table 3). Recovery Program investigators anticipate that a large fraction of these habitats will be sampled to some extent during 2014, which will enable evaluation of larval entrainment under average (above median) hydrologic conditions. Results of larval fish collection in the spring from individual wetlands will help determine the extent of fall young-of-year sampling in those areas.

The LTSP experimental timetable is to achieve three years of flows at Jensen, Utah, below 18,600 cfs, and three years above 18,600 cfs, with connecting flows in each of these years of at least seven days duration. However, spring peak flow magnitudes will be driven by hydrologic conditions in the Upper Green River Basin; it may not be possible to complete the experiment in six consecutive years.

Table 3 – LTSP TABLE 2. Matrix to Be Used in Studying the Effectiveness of a Larval Trigger

Peak Flow (x) as Measured at Jensen, Utah	Potential Study Wetlands ^(a,b)	Number of Days (x) Flow Exceeded and Corresponding Hydrologic Conditions ^(c)		
		$1 \leq x < 7$	$7 \leq x < 14$	$x \geq 14$
$8,300 \leq x < 14,000$ cfs	Stewart Lake (f), Above Brennan (f), Old Charley Wash (s)	Dry	Moderately dry	Moderately dry and average (below median)
$14,000 \leq x < 18,600$ cfs	Same as previous plus Escalante Ranch (f), Bonanza Bridge (f), Johnson Bottom (s), Stirrup (s), Leota 7 (s)	Average (below median)	Average (below median)	Average (below median)
$18,600 \leq x < 20,300$ cfs	Same as previous	Average (above median)	Average (above median)	Average (above median)
$20,300 \leq x < 26,400$ cfs	Same as previous plus Baeser Bend (s), Wyasket (s), additional Leota units (7a and 4), Sheppard Bottom (s)	Moderately wet	Moderately wet	Moderately wet
$x \geq 26,400$ cfs	Same as previous	Wet	Wet	Wet
f = flow-through wetland, s = single-breach wetland				

Record of Decision Spring Flow Objectives

The FEIS specifically addresses the content of this operating plan in Section 2.5.3.1. The operating plan is to describe the current hydrologic classification of the Green River and Yampa River Basins, including the most probable runoff patterns for the two basins. This information has been provided above. The operating plan is also to identify the most likely Reach 2 flow magnitudes and durations that are to be targeted for the upcoming spring release. It further specifies that “[b]ecause hydrologic conditions often change during the April through July runoff period; the operations plan would contain a range of operating strategies that could be implemented under varying hydrologic conditions. Flow and duration targets for these alternate operating strategies would be limited to those described for one classification lower or two classifications higher than the classification for the current year.”

Flaming Gorge Reservoir unregulated inflow forecast for April through July falls between 764,000 AF and 1,328,000 AF, the hydrological classification is average.

The peak flow as measured at Jensen, Utah, would correspond with the average hydrologic condition with targeted flows of $\geq 8,300$ cfs in Reach 2 for a duration of at least one week.

ROD spring flow objectives for average years are:

Table 5 – Average Spring Flow Objectives

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

Source: Flow Recommendations and FEIS

Literature Cited

Bureau of Reclamation. 2005. Operation of Flaming Gorge Dam Final Environmental Impact Statement. U.S. Department of the Interior, Bureau of Reclamation, Salt Lake City, Utah.

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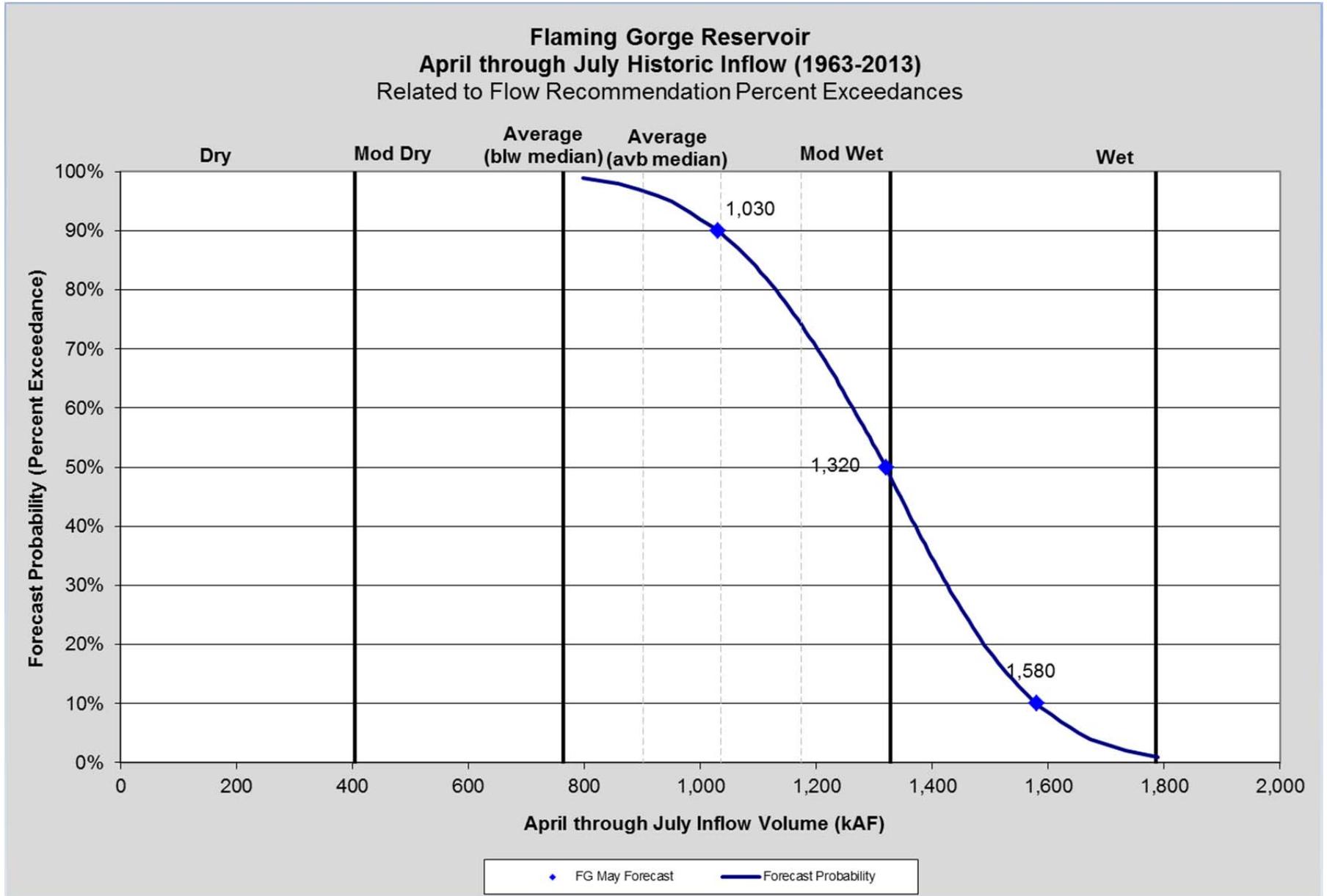
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Muth, R.T., L.W. Crist, K.E. LaGory, J.W. Hayse, K.R. Bestgen, T.P. Ryan, J.K. Lyons, and R.A. Valdez. 2000. Flow and temperature recommendations for endangered fishes in the Green River downstream of Flaming Gorge Dam. Final Report to Upper Colorado River Endangered Fish Recovery Program, Denver, Colorado.

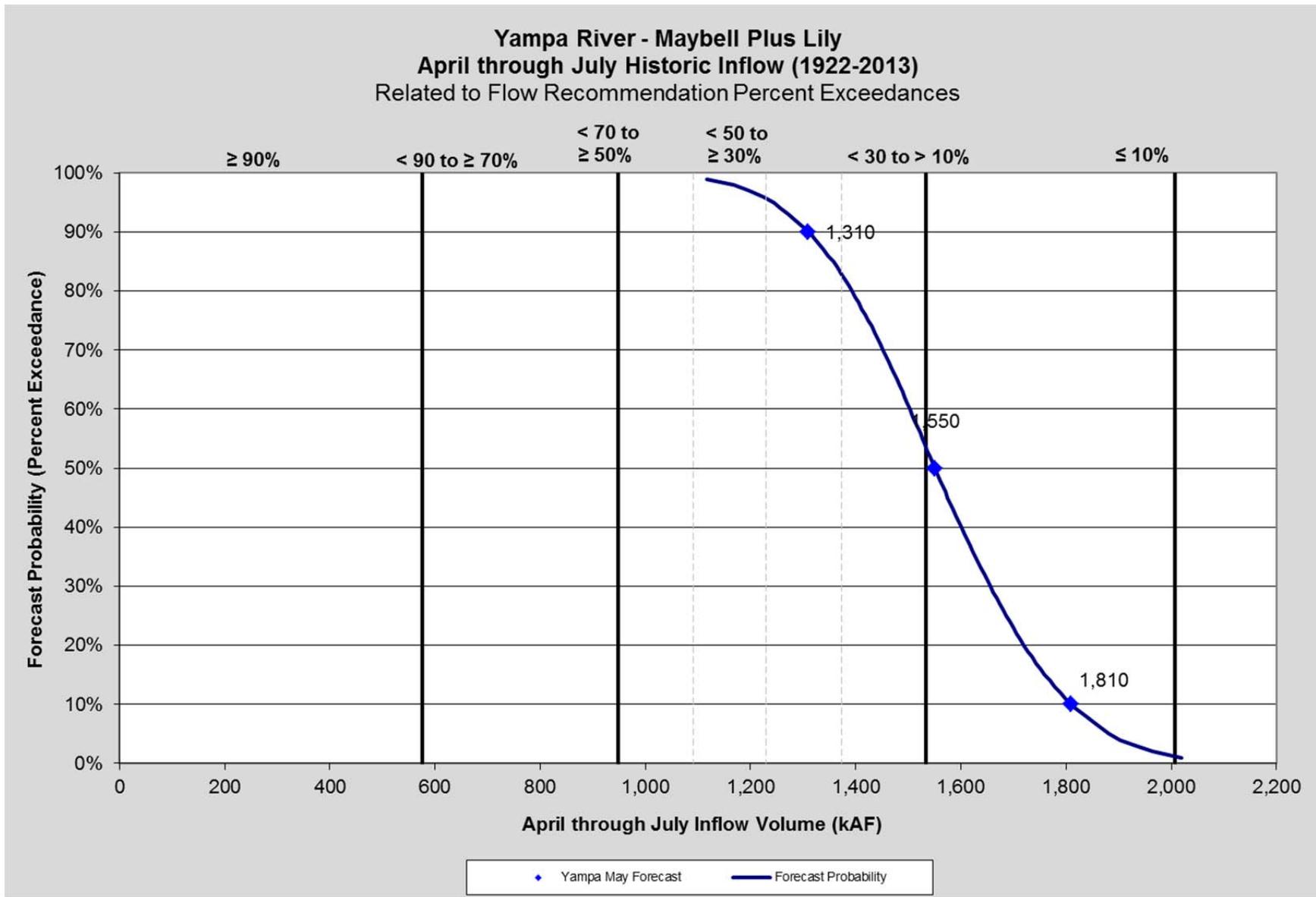
Upper Colorado River Endangered Fish Recovery Program. March 21, 2014. Memorandum to Larry Walkoviak and Heather Patno. Recovery Program Research Request for 2014 Green River Spring Flows. U.S. Fish and Wildlife Service, Upper Colorado River Endangered Fish Recovery Program, Denver, Colorado.

APPENDIX A

May 1, 2014 Final Forecasted April through July Inflow Volumes
for Flaming Gorge Reservoir and Yampa River at Deerlodge



APPENDIX A
May 1, 2014 Final Forecasted April through July Inflow Volumes
for Flaming Gorge Reservoir and Yampa River at Deerlodge



APPENDIX B

Recovery Program's Research Request for 2014 Green River Spring Flows



Upper Colorado River Endangered Fish Recovery Program

Noreen Walsh, Chairman
Implementation Committee

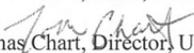
Thomas E. Chart
Program Director

U.S. Fish and Wildlife Service - P.O. Box 25486 - Denver Federal Center - Denver, CO 80225 - (303) 969-7322 - Fax (303) 969-7327

FWS/CRRP
K3a1
Mail Stop 65115
Memorandum

March 21, 2014

To: Larry Walkoviak, Regional Director, Upper Colorado Region, Bureau of Reclamation
Heather Patno, Chair, Flaming Gorge Technical Working Group, Bureau of Reclamation

From:  Thomas Chart, Director, Upper Colorado River Endangered Fish Recovery Program

Subject: Recovery Program's Research Request for 2014 Green River Spring Flows

The Upper Colorado River Endangered Fish Recovery Program (Recovery Program) supports the Bureau of Reclamation's (Reclamation) operations at Flaming Gorge Dam in 2014 consistent with the 2005 biological opinion (U.S. Fish and Wildlife Service 2005) and 2006 record of decision (ROD; U.S. Department of Interior 2006). As in the past three years, the objective of our request this year is to build on past research (Bestgen et al. 2011) to benefit the razorback sucker population throughout the Green River by timing the river-floodplain connection with the presence of wild-produced razorback sucker larvae.

The Recovery Program's 2014 spring flow request is based on objectives outlined in our *Study Plan to Examine the Effects of Using Larval Sucker Occurrence in the Green River as a Trigger for Flaming Gorge Dam* (LTSP; Larval Trigger Study Plan Ad Hoc Committee 2012). In the LTSP we describe a desired range of experimental floodplain connection scenarios and studies we would implement to evaluate those scenarios. More specifically, our study design matrix (Table 2 in the LTSP) details the range of experimental conditions we would like to assess with recognition that more than one cell of that matrix could be accomplished in a single year. Minimally, to complete the experiment, the Recovery Program requests three years with flows < 18,600 cfs and three years with flows \geq 18,600 cfs and with connecting flows in each of these years of at least seven days duration. However, spring peak flow magnitude requests will be driven by hydrologic conditions in the upper Green River Basin and to some extent the Yampa River basin; therefore, it may not be possible to complete the experiment in six consecutive years. The LTSP experiment began

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

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Recovery Program's Research Request for 2014 Green River Spring Flows

officially in 2012, however, the Recovery Program was able to gather some LTSP related information during 2011. Results from 2012 and 2013 are summarized below.

LTSP-Related Operations and Findings: 2011

In 2011, the Recovery Program identified two spring flow objectives: a) to provide floodplain connection after larval razorback sucker were detected in the Green River and secondarily, b) to connect the Stirrup floodplain as outlined in Recovery Program Project No. C6 RZ-RECR. Therefore the Recovery Program requested: a) that Reclamation's spring 2011 operations be timed to coincide with the presence of larval razorback sucker in Reach 2 habitats, and b) that if the hydrology remains wet-average, moderately wet, or wet that Reclamation release flows that maintained 18,600 cfs or greater for two weeks or more in Reach 2 (post-larval detection). The Recovery Program's request also considered scenarios in the event that the hydrology trended drier; it did not.

The May final forecast of April-July unregulated inflow volume to Flaming Gorge Reservoir was classified moderately wet. The Yampa River forecast was wet. All of the wet hydrologic classification peak flow targets for Reach 2 under the ROD were met in 2011 (Reclamation 2013). Razorback sucker larvae were detected on June 24, 2011. The following spring flows conditions were recorded post-larval detection: ten days \geq 22,700 cfs; 19 days \geq 18,600 cfs; and 21 days \geq 15,000 cfs.

USFWS field crews sampled 14 wetland habitats during September, October, and November 2011. Juvenile razorback sucker were collected in Wyasket Lake (n=15; size range 106-161mm total length) and in Leota Unit 4 (n=3; size range 85-110mm total length). This was the first evidence of over-summer survival of wild produced razorback sucker larvae since 1996 (Webber and Jones 2011). Breen (2011) reported 1,216 unique endangered fish detections at stationary PIT tag antennas set in the Stirrup floodplain levee breach during the extended period of riverine connection.

LTSP Operations and Findings: 2012

In 2012, hydrologic classifications for the Yampa River and Upper Green River basins were categorized as 'dry'. The Recovery Program and the Flaming Gorge Technical Work Group (FGTWG) ultimately agreed to focus the 2012 spring flow request on the driest category of experimental conditions outlined in the LTSP, i.e. a peak flow between 8,300 and 14,000 cfs for 1 to 7 days. The Recovery Program detected wild produced razorback sucker larvae on May 16, 2012 (Bestgen et al. 2012). Reclamation ramped up Flaming Gorge releases to a peak of 7,420 cfs, which resulted in a peak flow at Jensen, Utah of 10,200 cfs on May 24, 2012 (Reclamation 2013). Flows at Jensen, Utah were sustained above 8,300 cfs for 5 days after larvae were detected. Floodplain connection occurred at Stewart Lake and Old Charley Wash. Utah Division of Wildlife Resources (UDWR) crews documented larval entrainment into Stewart Lake and described physical conditions at that floodplain site (Breen and Skorupski 2012). Similarly, USFWS field crews documented larval entrainment into the Old Charley site. Unfortunately, all fish entrained at both locations likely perished, because water quality deteriorated quickly after flows declined. During the spring

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Recovery Program's Research Request for 2014 Green River Spring Flows

and summer months of 2012, USFWS crews (Webber and Jones 2012) sampled fish and monitored water quality at a variety of other floodplains that still held water from the extensive period of connection in 2011, but did not connect in 2012.

Personnel from Western Area Power Administration (Western), Argonne National Laboratory (funded by Western), and the Recovery Program surveyed Reach 2 levee breach elevations in Autumn 2012 to better assess connection flows for future LTSP experiments. Those data, in preliminary form, were available for FGTWG discussions in Spring 2013.

LTSP Operations and Findings: 2013

In 2013, the spring hydrologic classification started off 'dry' but turned 'moderately dry'. Reclamation reviewed the FGTWG recommendation and decided to implement the LTSP recommendations for moderately dry hydrologic conditions and to increase releases when larvae were detected (Reclamation 2014; Draft Report). The Recovery Program and the Flaming Gorge Technical Work Group (FGTWG) ultimately agreed to focus the 2013 spring flow request on the moderately dry category of experimental conditions outlined in the LTSP, i.e. a peak flow between 8,300 and 14,000 cfs for 7 to 14 days. The Recovery Program detected wild produced razorback sucker larvae on May 26, 2013 (Bestgen et al. 2013). Flaming Gorge Dam releases were increased to full power plant capacity (~4,500 cfs) on May 29, 2013. Yampa River flows dropped below 4,000 cfs and Flaming Gorge Dam releases were increased 1,000 cfs on June 4th above power plant capacity for a total release of ~5,500 cfs to maintain flows in Reach 2 above 8,300 cfs. Releases returned to power plant capacity on June 5, 2013. The Green River measured at Jensen, Utah reached its peak of 10,700 cfs on June 6, 2013. Flows at Jensen, Utah were above 8,300 cfs for 25 days total and above 8,300 cfs during larval presence for 18 consecutive days. Prior to, during, and after floodplain connection, Stewart Lake proper and the Stewart Lake drain were sampled using an assortment of techniques to monitor the fish community. UDWR biologists documented that razorback sucker larvae were entrained into Stewart Lake and grew quickly (~1mm/day) during the ~2 month inundation period. On July 31, 2013, UDWR began draining Stewart Lake because of declining water quality. A total of 613 Age-0 razorback sucker were collected, of which 592 were released alive to the Green River (Skorupski et al. 2013). This is the largest number of juvenile razorback suckers ever documented in the Colorado River Basin, demonstrating the importance of appropriately timed connections between the river and floodplain wetlands. The Recovery Program hopes that Stewart Lake water levels can be maintained in 2014 at least as long as they were in 2013, recognizing that prolonged favorable conditions for razorback sucker growth in late summer months results in larger fish with a higher probability of surviving their first winter. Razorback sucker larvae were not detected in the Escalante Ranch wetland; the only other wetland identified in the LTSP that connected to the Green River in 2013 (Webber and Jones 2013).

THE RECOVERY PROGRAM'S SPRING 2014 GREEN RIVER FLOW REQUEST:

Implement the LTSP. The Recovery Program requests that the FGTWG match Recovery Program research needs identified in the LTSP with the best available spring flow forecast information to develop a specific middle Green River floodplain connection scenario. The Recovery Program

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Recovery Program's Research Request for 2014 Green River Spring Flows

Director's office will distribute the pertinent FGTWG recommendation to the Biology and Management Committees and Principal Investigators as quickly as possible.

The Recovery Program will provide a real-time assessment of razorback sucker larval presence (i.e., the 'larval trigger') through ongoing Recovery Program Project No. 22f. Based on information provided in Bestgen et al. (2011), waiting for this larval trigger will likely cause Reclamation to make spring releases from Flaming Gorge Dam after the Yampa River has peaked, which may necessitate releases in excess of power plant capacity to meet the flow magnitude thresholds needed for river-floodplain connections. As addressed in the LTSP, the Recovery Program is prepared to direct sampling efforts each year to the appropriate floodplain habitats based on hydrologic forecasting and the FGTWG request. The Recovery Program is poised and properly funded to follow through on specific LTSP field investigations again in 2014 (e.g., Project Nos. 22F, 164 and 165; Scopes of Work available at: <http://www.coloradoriverrecovery.org/documents-publications/work-plan-documents/project-scopes-of-work.html>) ; sampling protocols and rationale are discussed further in Bestgen et al. (2012).

The Recovery Program remains concerned about possible release of nonnative burbot from Flaming Gorge Reservoir, particularly during the spring when release volumes increase. Accordingly, the Recovery Program, the National Park Service, UDWR, and Western committed to initiating a risk assessment of burbot entrainment associated with Flaming Gorge spring operations (Trammell et al. 2014; also referenced in the LTSP). The Recovery Program considers the risk of entraining burbot to be reasonably low at this time.

That conclusion is based on the following:

- The incidence of adult burbot in the portion of Flaming Gorge Reservoir nearest the dam is currently very low.
- The risk of entraining adults and juveniles through the spillway will always be fairly low based on the species' behavior.
- The risk of entraining larvae is of moderate concern. According to the literature and known water temperatures in the reservoir in late May-June, Age-0 burbot would likely range in size from 10 to 40 mm (total length). Young burbot of 30-40 mm should be entering a "settlement period", i.e. transitioning from using the full water column in near shore habitats to a primarily benthic behavior, remaining near the shoreline but on the substrate, and largely unavailable for entrainment. In June 2013, burbot larvae with lengths of 10-20mm were captured in the Sheep Creek inflow area, about 20 miles upstream of the dam (Carl Saunders, pers. comm.); thus, a portion of a larval cohort could still be found in open water during the spring runoff period. Therefore if Reclamation is considering using the spillway¹ the Recovery Program will sample for burbot larvae in the reservoir near the entrance to the spillway. This type of sampling could be accomplished quickly and on short notice.
 - If larvae are captured, the Recovery Program would determine if additional monitoring / management would be needed below the dam.

¹ As noted in Section 2.5.3.2 of the Flaming Gorge EIS, there were concerns regarding damage to the spillway and it was stated that excessive spillway damage would limit its use to cases of hydrologic necessity. Inspections since issuance of the ROD in 2006 have verified continued deterioration of the air slot in the spillway. As a result, Reclamation cannot support use of the spillway unless absolutely necessary for flood control or dam safety reasons.

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Recovery Program's Research Request for 2014 Green River Spring Flows

The Recovery Program assumes that a specific 2014 LTSP spring flow request will be developed in concert with the FGTWG using the best available flow forecast information.

Base Flow Requests

The Recovery Program will pursue experimentation outlined in the LTSP for the foreseeable future. We understand that spring operations could affect water availability for base flow operations. We reserve the right to discuss 2014 base flow operations at a later time.

In closing, the Recovery Program appreciates Reclamation's efforts in the past to achieve the flow and temperature recommendations and assist in recovery of the endangered fishes. We recognize that greater reliance on the biological trigger (presence of larval razorback sucker) may require greater volumes of water during the spring in some years, but we believe this experiment is consistent with the biological intent of Muth et al (2000) and is research essential to the recovery of the endangered fish. The Recovery Program's sampling results from the past two years, and particularly the large number of juvenile razorback suckers collected at Stewart Lake in 2013, clearly demonstrate the effectiveness of the LTSP operations. Thank you for considering this Recovery Program request for spring flows.

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