Flaming Gorge Technical Working Group
Proposed Flow and Temperature Objectives for 2012

Current Hydrologic Classification

For the purposes of implementing the 2006 Flaming Gorge Record of Decision (ROD) in 2012, an evaluation has been made of the current hydrologic conditions in the Upper Green River (*i.e*. above Flaming Gorge Dam). The evaluation centered on the historical unregulated inflow statistics for Flaming Gorge Dam during the period from 1964 through 2011. Based on these statistics and the May 1, 2012, forecast of 630,000 acre-feet for Flaming Gorge, the hydrologic classification will be moderately dry (70% to 90% exceedance) for spring 2012. The combined April through July forecast of the Yampa River at Maybell and Little Snake at Lily is 541,000 acre-feet. This forecast would fall into the dry hydrologic classification of the ROD.

Utilizing the flexibility in the ROD to designate a hydrologic classification two classifications higher or one lower based on conditions in the Yampa River, the official hydrologic classification will be dry (>90% exceedance). Appendix A illustrates the May 1, 2012, final forecast for Flaming Gorge Reservoir and the Yampa River Basin in relation to the hydrologic categories described in the Flow and Temperature Recommendations for Endangered Fishes in the Green River Downstream of Flaming Gorge Dam (Muth, et al, 2000) (Flow Recommendations).

Green River Basin Hydrology

The May 1, 2012, forecast of April through July unregulated inflow (current forecast) for Flaming Gorge Reservoir is 630,000 acre-feet (64% of 30-year average). This forecast falls at approximately 82% exceedance based on the historic unregulated inflow record (1963-2011). Figure 1 shows the current forecast in relation to the historic unregulated inflow volumes.

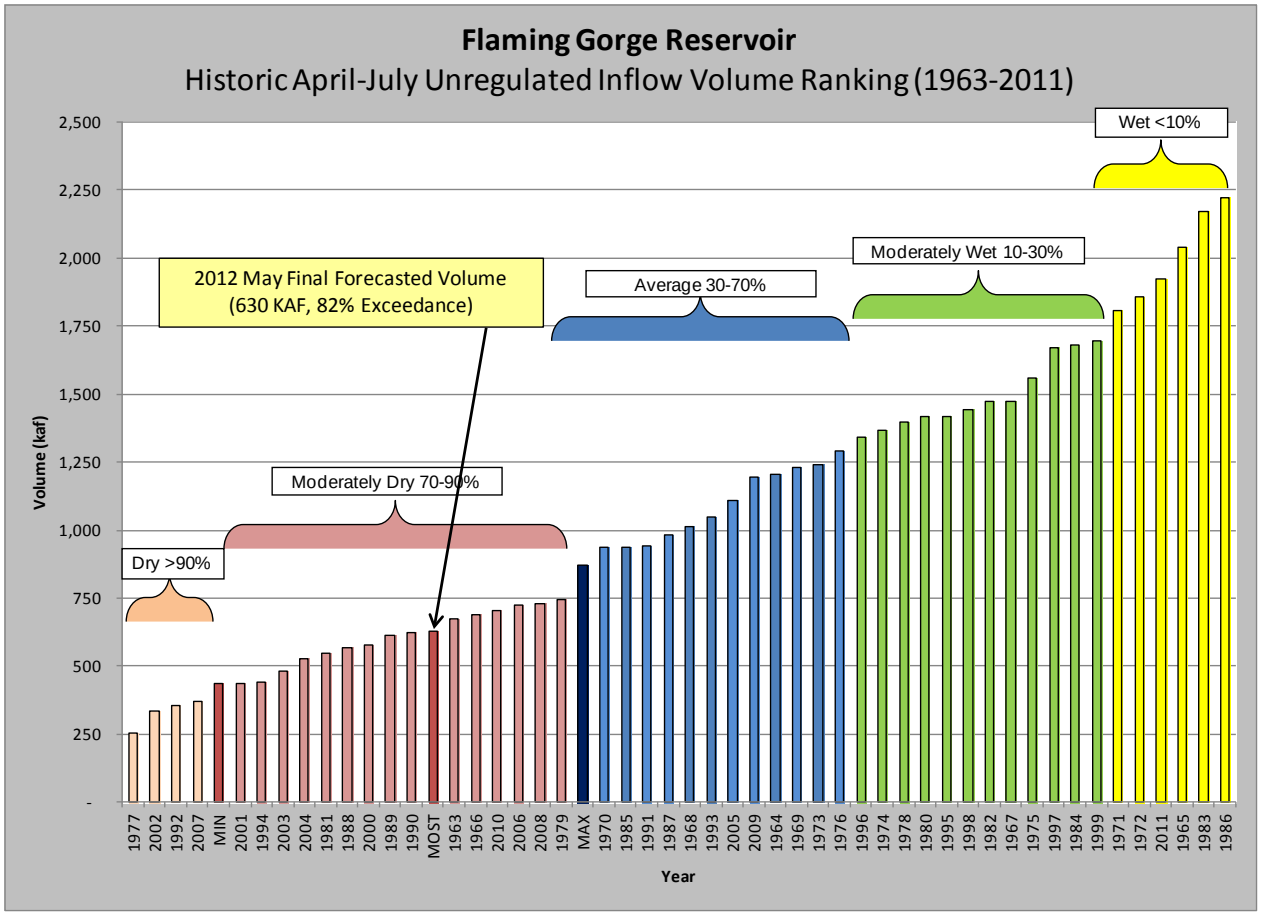


FIGURE 1—Flaming Gorge Reservoir March final forecast and ranked historic unregulated April through July inflow volume for years 1963-2011.

Flaming Gorge Reservoir currently has a water surface elevation of approximately 6026.23 feet above sea level. There is approximately 3.21 million acre-feet of live storage (85% storage capacity) in Flaming Gorge and approximately 0.539 million acre-feet of space.

Yampa River Basin Hydrology

The current forecast for the Little Snake River and Yampa River combined (Little Snake at Lily plus Yampa at Maybell) is 541,000 acre-feet (43% of 30-year average). This forecast falls at approximately 86% exceedance based on a ranking of the historic record (1922-2011). Figure 2 below shows the current forecast in relation to historic flow volumes.

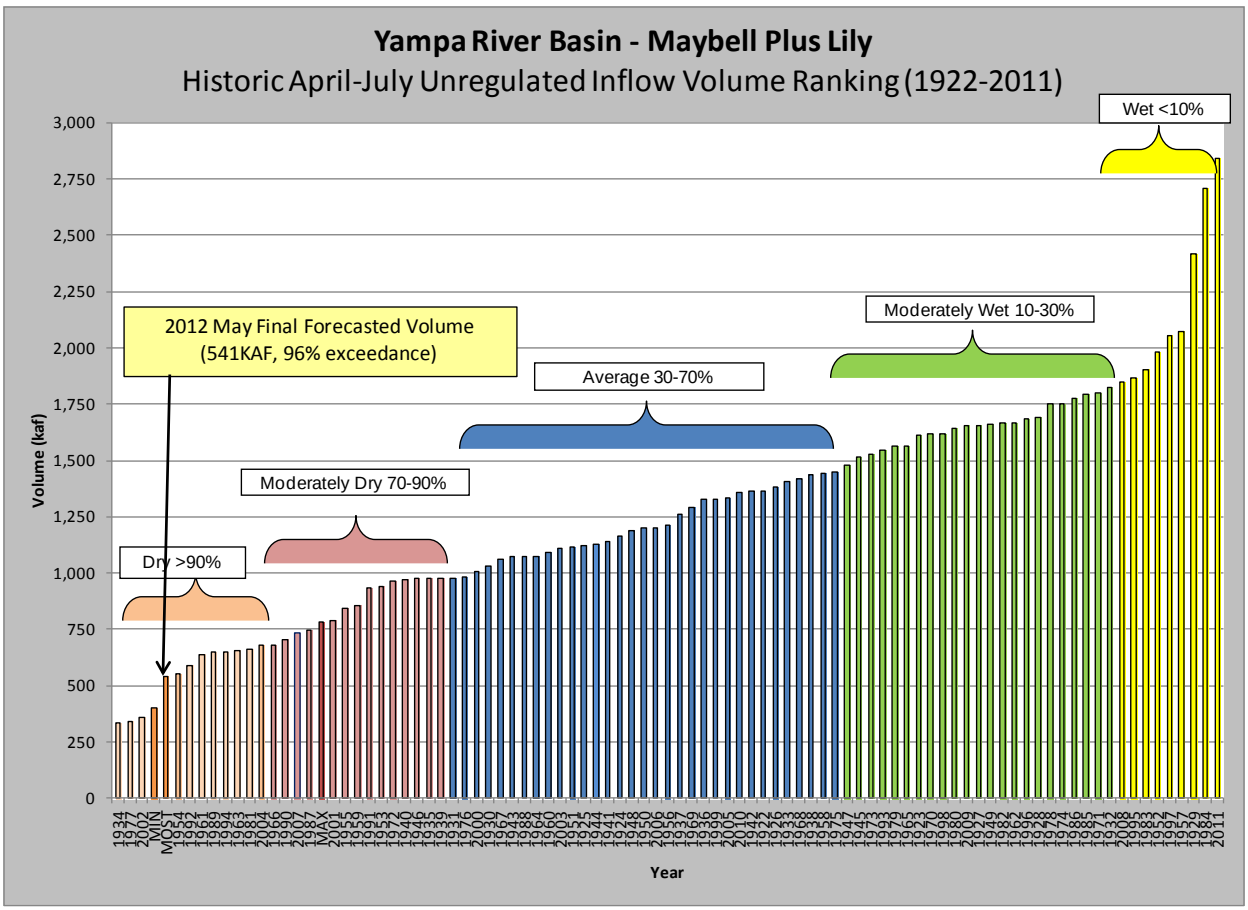


FIGURE 2—Yampa River Basin (Maybell plus Lily) current forecast and ranked historic unregulated April through July inflow volume for years 1922-2011.

Hydrologic conditions in the Yampa River Basin are dry and spring runoff conditions will likely have a significant effect on the efficiency of the 2012 spring peak.

Probabilities of Flow Events for Spring 2012

The Flaming Gorge unregulated inflow and Yampa River forecasts are average and trending solidly toward moderately dry. Conditions this year are significantly lower than the record-setting hydrology in 2011. An analysis was completed to assist in the determination of appropriate flow objectives for spring and summer 2012. 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 current analysis indicates that it is unlikely Yampa River flows above 10,000 cfs will be achieved this year.

Table 1
Yampa River (Maybell plus Lily) – April through July Unregulated Volume
Ten Similar Years to the May 1, 2012 Final Forecast
Thousand Acre-Feet (KAF)

Year	April-July Unreg Inflow Volume (KAF)
MIN	408
MOST	541
1954	555
1992	587
1961	635
1989	650
1994	651
1963	658
1981	659
2004	678
1966	679
1990	703
MAX	780

Table 2
Spring 2012 – Days above Specific Flow Thresholds in the Yampa River (Maybell plus Lily)
Based on the May 1, 2012, Final Forecast
Percent Exceedance (%)

April Final Forecast	% Exceed	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	Days above 15,000 cfs	Days above 16,000 cfs
YAMPA	25%	0	0	0	0	0	0	0
	50%	0	0	0	0	0	0	0
	75%	0	0	0	0	0	0	0
	90%	0	0	0	0	0	0	0

Record of Decision Spring Flow Objectives

If the April through July unregulated inflow into Flaming Gorge Reservoir remains in the range from 795 KAF to 1,349 KAF the hydrological classification would be average. The ROD spring flow objectives for average years are:

Average 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	≥ 18,600 cfs in 50% of average years	Two weeks (i.e. 14 days) in 25% of all average years
	≥ 8,300 cfs in 50% of average years	One week (i.e. 7 days) in 50% of average years

Flow Recommendations and FEIS

It is likely that hydrologic conditions into Flaming Gorge Reservoir will change before implementation of the proposed 2012 flow objectives. In the event conditions become drier and the Flaming Gorge Reservoir unregulated inflow forecast for April through July falls below 795 KAF, the hydrological classification would be moderately dry. ROD spring flow objectives for moderately dry years are:

Moderately 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	1 week (i.e. 7 days)

Flow Recommendations and FEIS

If conditions become drier than the current forecast at Flaming Gorge Reservoir and the April through July forecast decreases below 431 KAF, the hydrological classification would be dry. ROD spring flow objectives for dry years are:

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 or more except in extremely dry years (>98% exceedance)

Flow Recommendations and FEIS

Recovery Program Research Request

Reclamation and the Flaming Gorge Technical Working Group received a memorandum dated March 26, 2012 from Tom Chart, Director of the Upper Colorado River Endangered Fish Recovery Program (Recovery Program). In 2012, the Recovery Program intends to continue the assessment of emigration rates of razorback sucker stocked in the Stirrup floodplain to the main stem of the Green River. Studies have identified a 30 cm water depth in passages between floodplains and the main river channel (e.g., levee breaches and outlet structures) is required for juvenile and adult Colorado pikeminnow and razorback sucker fish passage. The request from the Recovery Program for a spring peak flow is 15,000 cfs, or greater, for a minimum of five consecutive days in Reach 2 of the Green River under current hydrologic conditions.

The Recovery Program request includes the recommendations by the Larval Trigger Study Plan ad hoc committee (LTSP). The LTSP uses a recent synthesis of the Flow Recommendations by Bestgen, et al, (2011) that suggests that it may not be accomplishing its intended biological purpose, i.e., to provide for successful recruitment of razorback suckers. Razorback sucker recruitment has not been observed since implementation of the ROD despite successfully meeting or exceeding target peak flow magnitudes and durations. Bestgen et al. (2011) evaluated the effectiveness of Reclamation peak-flow release strategy, and found that, since 1993, releases were made too early relative to larval razorback sucker drift.

Bestgen et al. (2011) recommends timing the releases from Flaming Gorge Dam such that the magnitude and duration coincide with the occurrence of razorback sucker larvae in the middle Green River. The Recovery Program proposes using the occurrence of razorback sucker larvae in channel margin habitats (an indication that larval drift is occurring in the river) as the "trigger" to determine when peak releases should occur from Flaming Gorge Dam. This "larval trigger" would initially be implemented on an experimental basis, but is consistent with the Flow Recommendations in which initial appearance of larval suckers was identified as one of several examples of real-time information to be considered when determining the onset of spring peak flows (see Table 5.3 of Muth et al. 2000). Determining the effectiveness of this larval trigger in recruiting razorback suckers is the primary focus of this study plan, but other potential effects are also evaluated. Based on information in Bestgen et al. (2011), using the larval trigger would most often shift the timing of Flaming Gorge peak releases to later in the runoff period. For the 1993 to 2008 period examined in Bestgen et al. (2011), the shift in timing of releases relative to peak Yampa River flows could be earlier, about the same, or as much as 17 days later if the first detection of larvae was used as the trigger.

The Recovery Program will continue studies to assess the effects of the flow and temperature recommendations on the fish community in the Green River. Through those efforts the Recovery Program is gathering a better understanding how nonnative smallmouth bass reproduction (time of spawn and first year growth) is affected by base flow magnitude and main channel temperatures in the Yampa and Green rivers. In the future, in conjunction with a specific Scope of Work, the Recovery Program will likely request specific base flow targets or release patterns for Flaming Gorge Dam releases to: a) hinder smallmouth bass reproduction, and b) benefit Colorado pikeminnow reproduction. The Recovery Program will continue to coordinate with the U.S. Fish and Wildlife Service's Utah Field Station on all future research flow requests, and specifically as the Service develops their 2012 base flow request to assist in the recovery of the endangered fish.

Proposed Flow Objectives for Spring 2012

The 2005 Operations of Flaming Gorge Dam Final Environmental Impact Statement (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."

The potential classifications for 2012 are as follows:

Dry Classification

The current forecast of 630 KAF into Flaming Gorge reservoir is moderately dry and the 541 KAF for the Yampa River Basin would fall into the dry category of the Flow Recommendations. The following proposed flow objectives apply to a dry hydrologic classification as determined by the May 1, 2012 final forecasted unregulated inflows for the April through July period into Flaming Gorge Reservoir. In accordance with the operational flexibility outlined in the ROD to achieve objectives one classification lower than the actual classification established, it is proposed that flows would be managed under the ROD spring flows objectives for dry hydrologic conditions.

Proposed Reach 1 flows should be managed to accommodate the Recovery Program spring peak research request, timed coincident with larval presence in Reach 2 of the Green River. Based on the dry conditions in the Yampa River, it is unlikely the Recovery Program spring peak research request to achieve at least 15,000 cfs in Reach 2 for a minimum duration of five days will be achieved. Once the spring peak flows have been achieved in Reach 2, Reach 1 flows should be gradually reduced at a rate of 350 cfs/day to base flow levels.

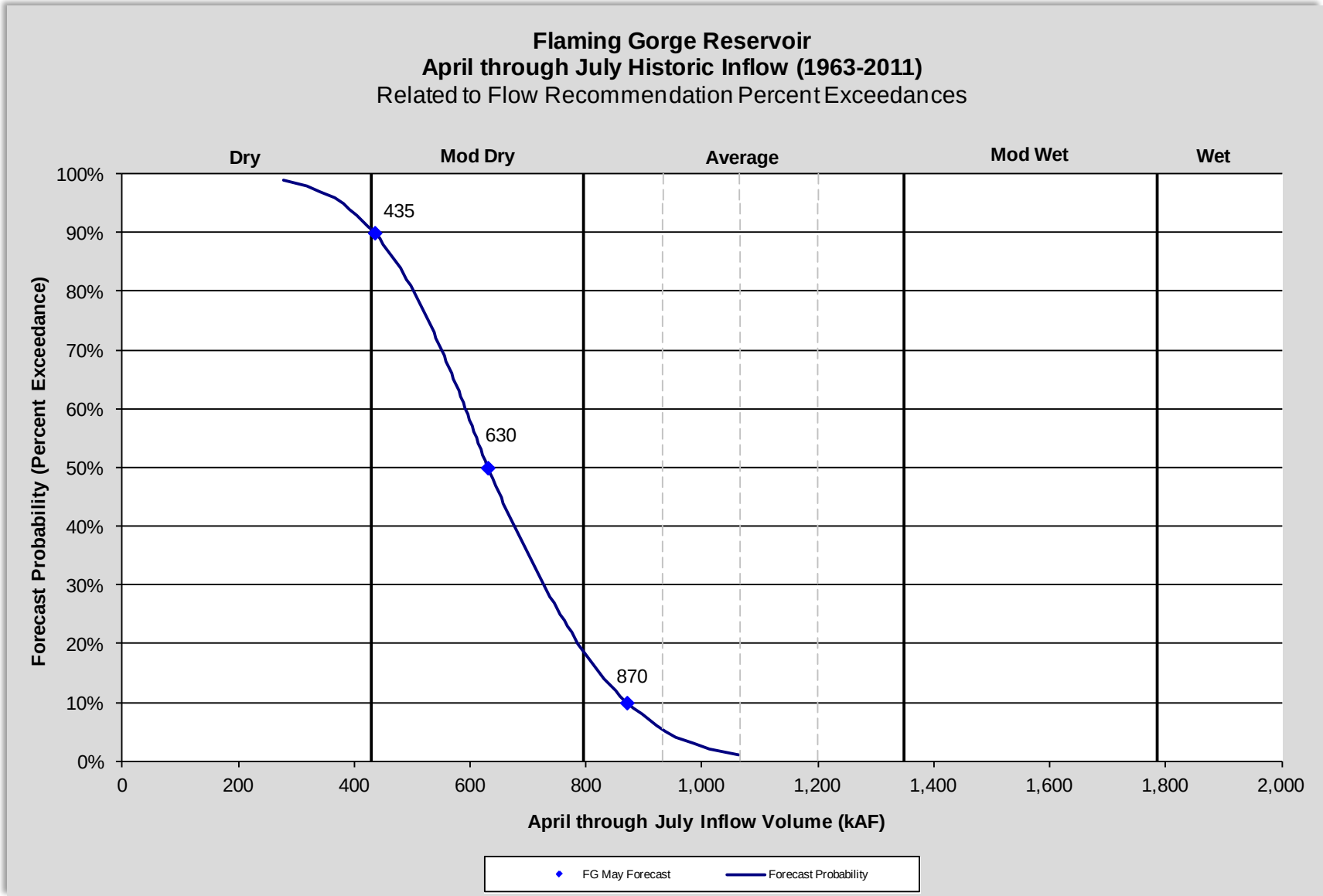
Proposed Base Flow and Temperature Objectives for Base Flows 2012

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 June 15, 2012. 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. Pursuant to the Flow Recommendations, during the August through November base-flow period, the daily flows should be within ±40% of mean base flow. During the December through February base-flow period, the daily flows should be within ±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.

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 of 2012 (June through August).

APPENDIX A

May 1, 2012 Final Forecasted April through July Inflow Volumes for Flaming Gorge Reservoir, Yampa River (Maybell plus Lily) and Jensen, Utah (sum of Flaming Gorge and Yampa)



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