

Flaming Gorge Technical Working Group Proposed Flow and Temperature Targets for 2006

The April through July unregulated inflow forecast into Flaming Gorge Reservoir for water year 2006 as of April 1, 2006 is 1,210 thousand acre-feet (102% of normal). This forecast falls at approximately the 42% exceedance level within the wet to dry continuum based on the historic record for Flaming Gorge Dam (1963 to 2005). From this forecast, the Green River Basin for 2006 is currently classified as "Average" as defined by the 2006 Flaming Gorge Record of Decision. For this classification, we interpret the 2006 Flaming Gorge Record of Decision to call for the following flow and temperature targets during the spring and summer period:

In Reach 1 for average years the spring peak flow should be at least 4,600 cfs. The duration of this spring peak should be based on that needed to achieve the recommended duration for Reach 2. After spring operations have been completed, flows in Reach 1 should be managed to target a base flow level in the range from 800 cfs to 2,200 cfs until March of the following year. The descending ramping rate from peak to base flow should be limited to 500 cfs/day.

In Reach 2 for average years the spring peak flow should be equal to or greater than 18,600 cfs in 1 of every 2 years and equal to or greater than 8,300 cfs in all other average years. For average years with peak flows equal to or greater than 18,600 cfs, 1 of every 2 years should have durations of 2 weeks or greater. After spring operations have been completed, flows in Reach 2 should be managed to target a base flow level in the range from 1,500 cfs to 2,400 cfs until March of the following year.

In Reach 3, the magnitude and duration of spring peak flows are assumed to be achieved when the targets for Reach 2 are achieved. Base flows targets in Reach 3 are assumed to be achieved when Reach 2 base flow targets are achieved.

Recovery Program Biology Committee Request

A Recovery Program Biology Committee flow request has been submitted to us. It is requesting that our proposal implement the 2006 Flaming Gorge Record of Decision for 2006. No deviation from the 2006 Flaming Gorge Record of Decision has been requested for 2006. More specifically, the Biology Committee has requested that if conditions in the Green River basin become wetter to the point where the basin would be classified as moderately wet (10-30% exceedance), flow and temperature targets for the moderately wet classification should be followed. If hydrologic conditions remain in the 30-70% exceedance range near 30% exceedance, the Biology Committee requests a flow target of 18,600 cfs for 2 weeks in Reach 2 be considered.

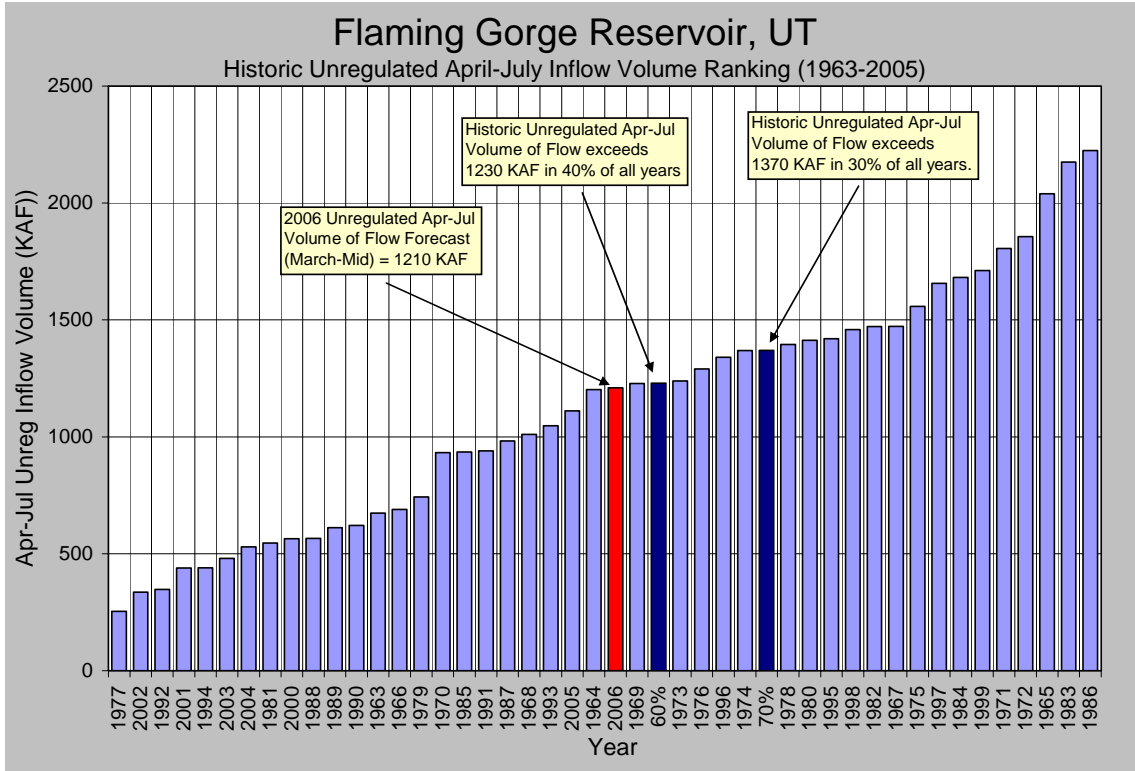
Factors Considered in Our Proposal

Table 5.3 of the Flow and Temperature Recommendations (Muth et al. 2000) summarizes examples of real-time and other year-specific information that should be considered in determining annual patterns of releases from Flaming Gorge Dam. Certainly, forecasted hydrologic conditions in the Green and Yampa Rivers drainages, water surface elevation of the Flaming Gorge Reservoir, and river temperatures (modeled and real-time) are critical pieces of information in that decision making process. However, status of the endangered fish populations and existing habitat conditions will be important factors to consider as well. The Recovery Program has conducted standardized larval sampling to assess annual reproduction of Colorado pikeminnow and razorback sucker in Reach 2 of the Green River since 1990 and 1993, respectively. These and other long term data sets will be used to predict important biological events and physical parameters (eg. presence of early life stages of endangered fish and condition of habitat) to assist Reclamation as they prepare to meet annual targets, and communication of real-time data to Reclamation should inform them during actual operations.

Overall, surveys suggest recent upward trends in larval drift density of both razorback sucker and Colorado pikeminnow. Increases in razorback sucker larvae may be due to apparent increased reproductive activity by stocked razorback sucker. Thus, real-time biological information such as presence of larval razorback sucker or Colorado pikeminnow and congregations of razorback sucker on spawning bars have been and will continue to be used to refine operations during the spring and summer period.

Green River Basin Hydrology

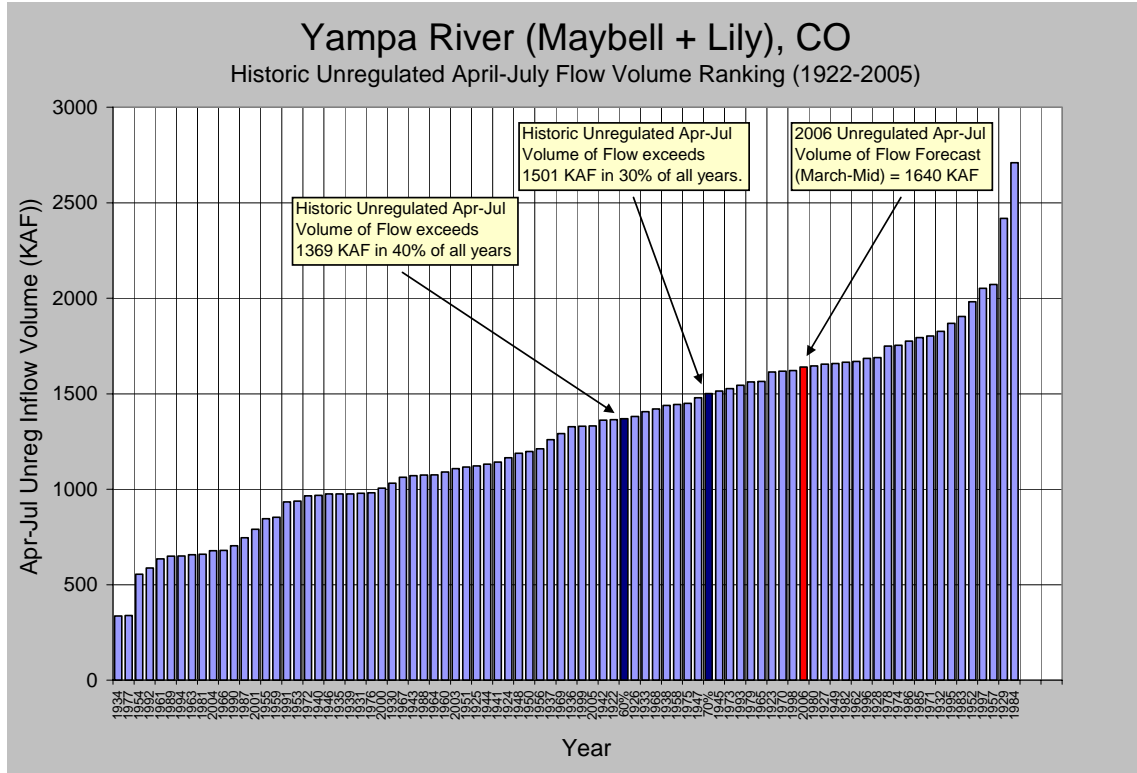
The current (April final) unregulated inflow forecast for Flaming Gorge Reservoir is 1,210 KAF (102% of normal). This forecast falls at approximately 42% exceedance based on the historic unregulated inflow record (1963-2005). The graph below shows the current forecast in relation to the historic unregulated inflow volumes. For reference, the 40% and 30% exceedance volumes are shown in dark blue.



Flaming Gorge Reservoir currently has a water surface elevation of approximately 6021 feet above sea level. There is approximately 3.02 million acre-feet of live storage in Flaming Gorge and approximately 0.76 million acre-feet of space.

Yampa River Basin Hydrology

The current (April final) forecasted April through July flow for the Little Snake River and Yampa River combined (Lily plus Maybell) is 1640 KAF (121% of normal). This forecast falls at approximately 23% exceedance based on a ranking of the historic record (1922-2005). The graph below shows the current forecast in relation to the historic volumes of flow. For reference, the 40% and 30% exceedance volumes are shown in dark blue.



Hydrologic conditions in the Yampa River basin look promising for high flows this year. Based on the current forecast, the following table describes the probabilities for specific flow events on the Yampa River this year.

Probabilities of Flow Events on the Yampa River for Spring 2006 (Number of Days)

Event	90%	75%	50%	25%
Flow above 16,000 cfs	--	--	3	4
Flow above 15,000 cfs	--	2	5	8
Flow above 14,000 cfs	--	3	7	10
Flow above 13,000 cfs	2	6	10	13
Flow above 12,000 cfs	9	11	15	18
Flow above 11,000 cfs	16	19	22	25
Flow above 10,000 cfs	25	28	32	36

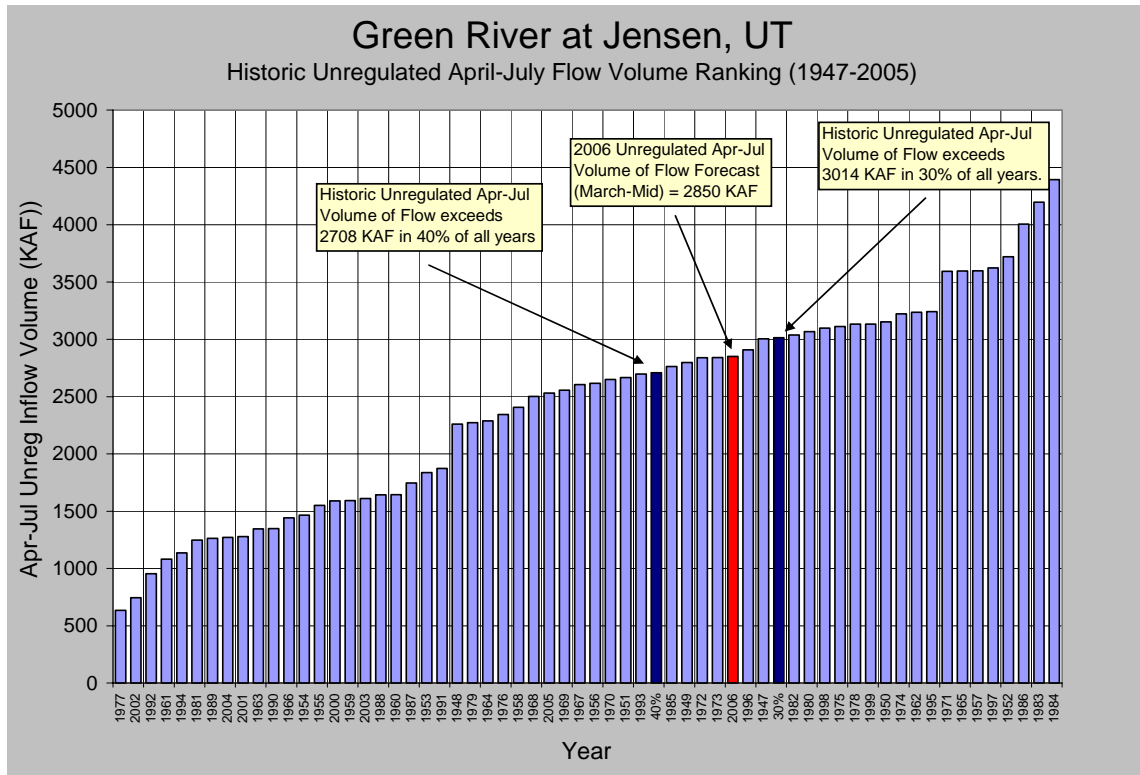
These statistics are based on comparison of the current forecast for the Yampa River Basin (Lily plus Maybell) to the 10 most similar historic years. These years are 1923, 1927, 1949, 1962, 1965, 1970, 1979, 1980, 1982 and 1998. The minimum Apr-Jul

volume for these years was 1,562 KAF and the maximum Apr-Jul volume was 1,669 KAF. The average for these years was 1,627 KAF. The probabilities were computed assuming a normal distribution for the events.

Green and Yampa River Basin Hydrology (combined)

The combined Apr-Jul forecasts for Flaming Gorge, Little Snake near Lily, CO and Yampa River near Maybell, CO is currently (April final) 2,850 KAF. The combined Apr-Jul forecast for these points is the best indicator of what volume of unregulated flow will likely occur on the Green River at Jensen, Utah during 2006. This volume falls at approximately 34% exceedance when compared to the historic record (1947-2005).

The 2006 Flaming Gorge Record of Decision calls for a flow target of 18,600 cfs in 40% of all years. 30% of all years fall into either the ‘wet’ or ‘moderately wet’ hydrologic classification. The remaining 10% of all years are those that are classified as ‘average’ yet have above normal forecast levels. Our analysis indicates 2006 will likely be one of these average years. The graph shown below indicates where within the wet to dry continuum the current Apr-Jul forecast falls in comparison to history. For reference, the 40% and 30% exceedance volumes are identified in dark blue.



Proposed Flow and Temperature Targets for the Spring-2006

The Flaming Gorge technical working group proposes that during the spring of 2006, if the combined forecast of the Green and Yampa Rivers remains in the range from 2,710 KAF to 3,015 KAF, flows located on the Green River near Jensen, Utah should be managed to the extent possible in order to achieve at least 18,600 cfs for at least 14 days. A flow and duration of this magnitude has not occurred in this reach of the Green River since 1999. We believe that the current hydrologic conditions as well as conditions of the endangered fish support this target for 2006. We propose that flows in Reach 2 of at least 18,600 cfs be targeted during the peak and post peak flows of the Yampa River.

If the combined forecast of the Green and Yampa Rivers decreases below 2,710 KAF prior to or during spring operations for 2006, we propose that the flows in the Green River near Jensen, Utah be managed to achieve at least 18,600 cfs for at least 1 day.

If the Green and Yampa River combined forecast increases above 3,015 KAF prior to or during spring operations for 2006, we propose that the flows located on the Green River near Jensen, Utah be managed to achieve at least 20,300 cfs for at least 1 day and at least 18,600 cfs for at least 14 days.

During this operational period, if forecasted Yampa River flows do not provide a reasonable opportunity to achieve the level specified in our proposal for Reach 2, we propose that flows in Reach 1 be managed to the extent possible in order to achieve at least 4,600 cfs for as long as necessary to safely manage Flaming Gorge Reservoir in order to obtain our proposed base flow target by no later than July 15, 2006. However, if this situation arises, decisions will incorporate historical and real-time data on the occurrence of razorback sucker larvae in the system and perhaps other parameters identified in table 5.3 of Muth et al. (2000). Maintaining connectivity with floodplain nursery habitats at flows of 14,000 or greater in reach two is desired for as long as possible in order to entrain drifting razorback sucker larvae. We propose no specific temperature targets during spring operations.

Proposed Flow and Temperature Targets for Summer-2006

The technical working group proposes that after the spring operation is completed, if the hydrology remains in the average category, a base flow target should be selected in the range from 1500 to 2400 cfs in Reach 2. If the hydrology moves to the moderately wet classification, we propose a base flow target be selected in the range from 2400 to 2800 cfs in Reach 2. This base flow target should be achieved on or before July 15, 2006.

The 2006 Flaming Gorge Record of Decision does allow for daily fluctuations to occur for power production. The technical working group proposes that fluctuations for power generation be allowed during the base flow period but should be limited to produce no more than a 0.1 meter stage change each day measured at the Green River near Jensen, Utah stream gauge.

The 2006 Flaming Gorge Record of Decision does allow for base flows in Reach 2 to vary about the mean base flow target.

Variation in flow around the established mean base flow should be consistent with the variability that occurred in pre-dam flows. Mean daily flows should be kept within +/-40% of the annual mean base flow in the summer-autumn (August through November) and within +/-25% of the annual mean base flow in winter (December through February); however, dam operations should not be adjusted to compensate for short-term increases in tributary inflows resulting from weather events that would exceed these thresholds. Differences due to reservoir operations in mean daily flows between consecutive days should not exceed 3%.

The technical working group proposes that variations about the mean base flow target be limited such that the following temperature targets can also be achieved.

1. Water temperatures of 18 degrees Celsius or greater for 2 to 5 weeks in the beginning of the base flow period should be targeted in upper Ladore Canyon.
2. Green River should be no more than about 5 degrees Celsius colder than the Yampa River at their confluence in Echo Park during the summer base flow period.

The Flaming Gorge technical working group will reconvene on July 7, 2006 to discuss the results of spring operations and to update the base flow proposal.