From: **RRFW Riverwire** riverwire@rrfw.org
Subject: Glen Canyon Dam Update
Date: February 7, 2010 at 11:40 AM
To: john@livingrivers.org

RR

RRFW Riverwire -

Glen Canyon Dam Update

February 7, 2010

Glen Canyon Dam and Lake Powell

The unregulated inflow volume into Lake Powell in January 2010 was just below what was forecasted at the beginning of January. The unregulated inflow to Lake Powell for the month of January was 304,000 acre-feet (75% of average). This was about 26,000 acre-feet below the unregulated inflow volume that was projected in the January 2010 24-Month Study. For this reason, the elevation of Lake Powell at the end of January was about 2 inches below what was projected in the January 2010 24-Month Study. The end of January Lake Powell elevation was 3622.12 feet above sea level which was over 4 feet lower than the elevation on January 1, 2010.

The release volume for January 2010 was 900,480 acre-feet. Daily peak releases for power generation in January were 17,500 cfs during the morning and afternoon with lows of approximately 9,500 cfs in the very early morning hours. In February 2010 the scheduled release volume for the month is 640,000 acre-feet. Peak releases each day for power generation in February will be approximately 14,000 cfs with lows of about 8,000 cfs.

In addition to the daily fluctuation pattern, instantaneous releases from Glen Canyon Dam also fluctuate to provide approximately 40 megawatts of system regulation to maintain stable conditions within the electrical generation and transmission system. These momentary fluctuations for regulation are very short lived and typically balance out over the hour. Glen Canyon Dam also provides a level of reserve generation that can be called upon when unanticipated outages occur within the generation system. When an outage event occurs, reserve generation at Glen Canyon Dam can be called upon and this additional reserve generation is typically maintained for 2 hours or less.

The official Water Supply Forecast (April-July Unregulated Inflow Volume) for Lake Powell issued by the Colorado Basin River Forecast Center will be updated during the first week of February. The January official forecast for Lake Powell unregulated inflow was 6.2 million acre-feet (maf) which is 78% of average for the period from 1971 to 2000. The preliminary Water Supply Forecast updated for February has been released and is 6.0 maf (76% of average). The official Water Supply Forecast is expected to be released later this week.

Based on the January forecast, the January 2010 24-Month Study projected that the water year release volume from Lake Powell was likely to be 8.23 maf pursuant to the Interim Guidelines. However, the operating tier for Glen Canyon Dam in water year 2010 is Upper Elevation Balancing and under this tier there is a possibility for an April adjustment. It is possible, if hydrologic conditions become wetter than current levels, that an April adjustment to Equalization could occur and under Equalization the projected water year release from Glen Canyon Dam could be greater than 10.5 maf.

As of early January, given the hydrologic conditions within the Colorado River Basin and the range of possible inflow scenarios that could occur in 2010, Reclamation estimates that there is was about a 21% probability that an April adjustment to the Equalization Tier will occur. This estimate is based on many factors that are changing through time. Reclamation will update this estimated probability each month to provide stakeholders some probablistic estimate of the possibility that Equalization will occur in water year 2010.

The January 2010 24-Month Study has been published and is available here:
http://www.usbr.gov/uc/water/crsp/studies/24Month_01.pdf

Updated elevation projections for Lake Powell through water year 2010 based on the most recently published 24-Month Study are maintained at:
http://www.usbr.gov/uc/water/crsp/studies/lppwse.html

Upper Colorado River Basin Hydrology

In the Upper Colorado River Basin during water year 2009, the overall precipitation accumulated through September 30, 2009 was approximately 95% of average based on the 30 year average for the period from 1971 through 2000. For water year 2010 the dry conditions have continued. Precipitation for October 2009 was 85% of average and for November, precipitation was estimated to be only 40% of average. In December 2009, the estimated precipitation above Lake Powell was 115% of average.

The Climate Prediction Center outlook (dated January 21, 2010) for temperature over the next 3 months indicates that temperatures in the northern reaches of the Upper Colorado River Basin have an increased probability of being above average. Accumulated precipitation over the next 3 months are projected to be near average in the Upper Colorado River Basin (above Lake Powell) while are projected to be above average in the Lower Colorado River Basin (below Lake Powell).

Upper Colorado River Basin Drought

The Upper Colorado River Basin continues to experience a protracted multi-year drought. Since 1999, inflow to Lake Powell has been below average in every year except water years 2005 and 2008. In the summer of 1999, Lake Powell was close to full with reservoir storage at 23.5 million acre-feet, or 97 percent of capacity. During the next 5 years (2000 through 2004) unregulated inflow to Lake Powell was well below average. This resulted in Lake Powell storage decreasing during this period to 8.0 million acre-feet (33 percent of capacity) which occurred on April 8, 2005. During 2005, 2008 and 2009, drought conditions eased somewhat with net gains in storage to Lake Powell. As of January 31, 2010 the storage in Lake Powell was 13.99 million acre-feet (57.52 percent of capacity) which is still below desired levels while the overall reservoir storage in the Colorado River Basin as of January 31, 2010 is 33.01 million acre-feet (55.64 percent of capacity).

RRFW thanks Rick Clayton of the USBOR for his assistance in providing information for this notification.

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From: **RRFW Riverwire** riverwire@rrfw.org
Subject: RRFW Riverwire - Glen Canyon Dam Update March 2010
Date: February 27, 2010 at 8:45 PM
To: john@livingrivers.org

RR

RRFW Riverwire

Glen Canyon Dam Update

February 27, 2010

Glen Canyon Dam / Lake Powell

The unregulated inflow volume into Lake Powell so far in February has been somewhat below the forecasted level. As of February 21, 2010 the unregulated inflow rate to Lake Powell is on pace to reach approximately 295,000 acre-feet for the month which would be about 30,000 acre-feet less than what was forecasted at the beginning of February. The February 2010 24-Month Study projected that the end of month elevation of Lake Powell would be 3619.97 feet above sea level. As of February 21, 2010 the projected end of month elevation of Lake Powell is now 3620.19 feet above sea level (about 2 inches above what was projected) which is about 2 feet lower than the reservoir elevation on February 1, 2010.

Releases from Glen Canyon Dam during the month of February 2010 have fluctuated each day for power generation between a peak hourly average release of about 14,000 cubic feet per second (cfs), during the morning and afternoon and a daily low hourly average release of 8,000 cfs during the late evening and early morning hours.

For March, the release volume is projected to be 600,000 acre-feet. Daily fluctuations in March are projected to have a peak hourly average release each day of approximately 12,000 cfs and a daily low hourly average release of approximately 6,000 cfs.

In addition to the daily fluctuation pattern, instantaneous releases from Glen Canyon Dam also fluctuate to provide approximately 40 megawatts of system regulation to maintain stable conditions within the electrical generation and transmission system. This translates into momentary release fluctuations of about +/- 1100 cfs above or below the hourly average release rate. These momentary fluctuations for regulation are very short lived and typically balance out over the hour. When an unanticipated outage event occurs in the generation system, reserve generation at Glen Canyon Dam can also be called upon up to a limit of 88 megawatts (approximately 2400 cfs of release) for a duration of 2 hours or less. Under normal circumstances, calls for reserve generation occur fairly infrequently and are for much less than the limit of 88 megawatts.

The mid-month Water Supply Forecast for February (April-July Unregulated Inflow Volume) was reduced by 200,000 acre-feet from the official Water Supply Forecast for February to 5.6 million acre-feet (maf) which is 71% of average. This forecast will be updated during the first week of March 2010.

The February 2010 24-Month Study projected that the water year release volume from Lake Powell will likely be 8.23 maf pursuant to the Interim Guidelines. However, the operating tier for Glen Canyon Dam in water year

Guidelines. However, the operating tier for Glen Canyon Dam in water year 2010 is Upper Elevation Balancing and under this tier there is a possibility for an April adjustment to the operational plan which could incorporate either Equalization releases or Balancing releases. Given the current conditions of Lake Powell and Lake Mead, it is possible, if hydrologic conditions become wetter than what is currently projected, that an April adjustment to Equalization could occur. If this adjustment were to occur in April, the projected water year release from Glen Canyon Dam could be greater than 10.5 maf.

As of early February, given the hydrologic conditions within the Colorado River Basin and the range of possible inflow scenarios that could occur in 2010, Reclamation estimates that there is about a 25% probability that an April adjustment to Equalization will occur. This estimate is based on many factors that are changing through time. Reclamation will update this estimated probability each month to provide stakeholders some indication of the probability that Equalization will occur in water year 2010.

The February 2010 24-Month Study has been published and will be available here:
http://www.usbr.gov/uc/water/crsp/studies/24Month_02.pdf

Updated elevation projections for Lake Powell through water year 2010 based on the most recently published 24-Month Study are maintained at:
http://www.usbr.gov/uc/water/crsp/studies/lppwse.html

Upper Colorado River Basin Hydrology

In the Upper Colorado River Basin during water year 2009, the overall precipitation accumulated through September 30, 2009 was approximately 95% of average based on the 30 year average for the period from 1971 through 2000. For water year 2010 the dry conditions have persisted. Estimated percentages of average precipitation for the months thus far in water year 2010 are as follows: October 85%, November 40%, December 130%, January 100%.

The Climate Prediction Center outlook (dated January 21, 2010) for temperature over the next 3 months indicates that temperatures in the northern reaches of the Upper Colorado River Basin have an increased probability of being above average. Accumulated precipitation over the next 3 months are projected to be near average in the Upper Colorado River Basin (above Lake Powell) while are projected to be above average in the Lower Colorado River Basin (below Lake Powell).

Upper Colorado River Basin Drought

The Upper Colorado River Basin continues to experience a protracted multi-year drought. Since 1999, inflow to Lake Powell has been below average in every year except water years 2005 and 2008. In the summer of 1999, Lake Powell was close to full with reservoir storage at 23.5 million acre-feet, or 97 percent of capacity. During the next 5 years (2000 through 2004) unregulated inflow to Lake Powell was well below average. This resulted in Lake Powell storage decreasing during this period to 8.0 million acre-feet (33 percent of capacity) which occurred on April 8, 2005. During 2005, 2008 and 2009, drought conditions eased somewhat with net gains in storage to Lake Powell. As of February 9, 2010 the storage in Lake Powell was 13.93 million acre-feet (57.29 percent of capacity) which is still below desired levels while the overall reservoir storage in the

is still below desired levels while the overall reservoir storage in the Colorado River Basin as of February 9, 2010 is 33.14 million acre-feet (55.72 percent of capacity).

RRFW thanks Rick Clayton of the USBOR for his assistance in providing information for this notification.

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Forward email

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From: **RRFW Riverwire** riverwire@rrfw.org
Subject: RRFW Riverwire - Glen Canyon Dam Update April 2010
Date: April 12, 2010 at 7:25 PM
To: john@livingrivers.org

RR

RRFW Riverwire

Glen Canyon Dam Update

April 12, 2010

Glen Canyon Dam / Lake Powell

The unregulated inflow volume into Lake Powell in March was 475,000 acre-feet (72% of average). This was 25,000 acre-feet above the level forecasted in the March (Most Probable) 24-Month Study. The current elevation of Lake Powell as of April 8, 2010 is 3618.94 feet above sea level and stable. Inflows to Lake Powell are projected to increase during late April and into May and the reservoir elevation will likely begin to rise during this time. The April (Most Probable) 24-Month Study is projecting that the reservoir elevation will peak later this summer at approximately 3631 feet above sea level which is 69 feet from the full pool elevation of 3700 feet.

Releases from Glen Canyon Dam during the month of April will fluctuate each day for power generation between a peak hourly average release of about 12,500 cfs, during the morning and afternoon and a daily low hourly average release of 6,500 cfs during the late evening and early morning hours. The release volume scheduled for April is 600,000 acre-feet. The release volume projected for May is also 600,000 acre-feet and daily fluctuations in May will likely be very similar to April.

In addition to the daily fluctuation pattern, instantaneous releases from Glen Canyon Dam also fluctuate to provide approximately 40 megawatts of system regulation to maintain stable conditions within the electrical generation and transmission system. This translates into momentary release fluctuations of about +/- 1100 cfs above or below the hourly average release rate. These momentary fluctuations for regulation are very short lived and typically balance out over the hour. When an unanticipated outage event occurs in the generation system, reserve generation at Glen Canyon Dam can also be called upon up to a limit of 88 megawatts (approximately 2400 cfs of release) for a duration of 2 hours or less. Under normal circumstances, calls for reserve generation occur fairly infrequently and are for much less than the limit of 88 megawatts.

The snowpack conditions in the Upper Colorado River Basin are approximately 88% of average as of April 9, 2010. Typically the snowpack for the Upper Colorado River Basin peaks during the second week of April and begins to decline as temperatures increase and snowmelt begins. The Colorado Basin River Forecast Center (CBRFC) has issued the April Official Water Supply Forecast (April-July Unregulated Inflow Volume) for Lake Powell and it is projecting that the volume of unregulated inflow to Lake Powell for the period from April 1, 2010 through July 31, 2010 will be 5.0 million acre-feet (maf) which is 63% of average for the historic period from 1971-2000.

Based on the April Official Forecast, and a projected Lake Powell release volume of 8.23 maf pursuant to the Colorado River Interim Guidelines for Lower Basin Shortages and Coordinated Operations for Lakes Powell and Mead (Interim Guidelines), the April (Most Probable) 24-Month Study projects that the water year ending elevation of Lake Powell will be 3629.20. This elevation is 12.8 feet below the Equalization Level for water year 2010 as established in the Interim Guidelines. This condition does not meet the criteria for an April adjustment to the Equalization Tier from the remainder of water year 2010 (see Section 6.B.3 of the Record of Decision). Therefore, the release volume for water year 2010 will be 8.23 maf and monthly release volume for the remainder of the water year will be scheduled to meet this annual release volume.

The April 2010 24-Month Study will be published on April 10, 2010 and will be available here. Updated elevation projections for Lake Powell through water year 2010 based on the most recently published 24-Month Study are maintained at: Lake Powell Projected Elevations.

Upper Colorado River Basin Hydrology

In the Upper Colorado River Basin during water year 2009, the overall precipitation accumulated through September 30, 2009 was approximately 95% of average based on the 30 year average for the period from 1971 through 2000. For water year 2010 the dry conditions have persisted. Estimated percentages of average precipitation for the months thus far in water year 2010 are as follows: October 85%, November 40%, December 130%, January 100% and February 100%, March 85%.

The Climate Prediction Center outlook (dated March 18, 2010) for temperature over the next 3 months indicates that temperatures in the Upper Colorado River Basin are expected to be above average and precipitation over the next 3 months in the Upper Colorado River Basin is projected to also be above average.

Upper Colorado River Basin Drought

The Upper Colorado River Basin continues to experience a protracted multi-year drought. Since 1999, inflow to Lake Powell has been below average in every year except water years 2005 and 2008. In the summer of 1999, Lake Powell was close to full with reservoir storage at 23.5 million acre-feet, or 97 percent of capacity. During the next 5 years (2000 through 2004) unregulated inflow to Lake Powell was well below average. This resulted in Lake Powell storage decreasing during this period to 8.0 million acre-feet (33 percent of capacity) which occurred on April 8, 2005. During 2005, 2008 and 2009, drought conditions eased somewhat with net gains in storage to Lake Powell. As of April 8, 2010 the storage in Lake Powell was 13.65 million acre-feet (56.1 percent of capacity) which is still below desired levels while the overall reservoir storage in the Colorado River Basin as of March 23, 2010 is 32.60 million acre-feet (54.8 percent of capacity).

This information courtesy Rick Clayton, US Bureau of Reclamation

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Forward email

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From: **RRFW Riverwire** riverwire@rrfw.org
Subject: RRFW Riverwire - Glen Canyon Dam Update April 2010
Date: May 2, 2010 at 9:40 PM
To: john@livingrivers.org

RR

RRFW Riverwire

Glen Canyon Dam Update

May 2, 2010

Glen Canyon Dam / Lake Powell

The unregulated inflow volume into Lake Powell in April 2010 will be well above the volume forecasted at the beginning of the month. The official forecasted unregulated inflow volume for April 2010 for Lake Powell was 650,000 acre feet (66% of average). As of April, 29, 2010 the unregulated inflow volume is tracking towards a monthly volume of 915,000 acre-feet (93% of average). This isn't necessarily an indication the runoff volume this year will be larger than expected, but is more an indication that the runoff is occurring earlier than expected. During the first week of May 2010, the Colorado River Basin River Forecast Center will update the forecasted runoff volume for the year and Reclamation will update the operatonal projections at that time. The current runoff forecast (April through July unregulated inflow volume) for Lake Powell (April mid month) is 5.2 million acre-feet (66% of average).

Because the inflow volume to Lake Powell during April 2010 has been larger than expected, the elevation of Lake Powell is about 2 feet higher than expected. Based on the forecasted inflow at the beginning of April 2010, the elevation was projected to be at 3618.5 feet above sea level (81.5 feet from full pool) on May 1, 2010. The actual elevation on May 1, 2010 will likely be about 3620.5 feet above sea level (79.5 feet from full pool). Given the current forecast, the projected peak elevation for water year 2010 will occur in July and is likely to be approximately 3632 feet above sea level (68 feet below full pool).

Releases from Glen Canyon Dam during the month of May will fluctuate each day for power generation between a peak hourly average release of about 12,500 cfs, during the morning and afternoon and a daily low hourly average release of 6,500 cfs during the late evening and early morning hours. The release volume scheduled for May is 600,000 acre-feet. The release volume projected for June is also 600,000 acre-feet and this will be confirmed in late May.

In addition to the daily fluctuation pattern, instantaneous releases from Glen Canyon Dam also fluctuate to provide approximately 40 megawatts of system regulation to maintain stable conditions within the electrical generation and transmission system. This translates into momentary release fluctuations of about +/- 1100 cfs above or below the hourly average release rate. These momentary fluctuations for regulation are very short lived and typically balance out over the hour. When an unanticipated outage event occurs in the generation system, reserve generation at Glen Canyon Dam can also be called upon up to a limit of 88 megawatts (approximately 2400 cfs of release) for a duration of 2 hours or less. Under normal circumstances, calls for reserve generation occur fairly infrequently and are

Under normal circumstances, calls for reserve generation occur fairly infrequently and are for much less than the limit of 88 megawatts.

Based on the April Official Forecast, and a projected Lake Powell release volume of 8.23 maf pursuant to the Colorado River Interim Guidelines for Lower Basin Shortages and Coordinated Operations for Lakes Powell and Mead (Interim Guidelines), the April (Most Probable) 24-Month Study projects that the water year ending elevation of Lake Powell will be 3629.20. This elevation is 12.8 feet below the Equalization Level for water year 2010 as established in the Interim Guidelines. This condition does not meet the criteria for an April adjustment to the Equalization Tier from the remainder of water year 2010 (see Section 6.B.3 of the Record of Decision). Therefore, the release volume for water year 2010 will be 8.23 maf and monthly release volume for the remainder of the water year will be scheduled to meet this annual release volume.

The May 2010 24-Month Study will be published on May 10, 2010 and will be available here. Updated elevation projections for Lake Powell through water year 2010 based on the most recently published 24-Month Study are maintained at: Lake Powell Projected Elevations.

Upper Colorado River Basin Hydrology

In the Upper Colorado River Basin during water year 2009, the overall precipitation accumulated through September 30, 2009 was approximately 95% of average based on the 30 year average for the period from 1971 through 2000. For water year 2010 the dry conditions have persisted. Estimated percentages of average precipitation for the months thus far in water year 2010 are as follows: October 85%, November 40%, December 130%, January 100% and February 100%, March 85%.

The Climate Prediction Center outlook (dated April 15, 2010) for temperature over the next 3 months indicates that temperatures in the Upper Colorado River Basin are expected to be above average and precipitation over the next 3 months in the Upper Colorado River Basin is projected to also be above average.

Upper Colorado River Basin Drought

The Upper Colorado River Basin continues to experience a protracted multi-year drought. Since 1999, inflow to Lake Powell has been below average in every year except water years 2005 and 2008. In the summer of 1999, Lake Powell was close to full with reservoir storage at 23.5 million acre-feet, or 97 percent of capacity. During the next 5 years (2000 through 2004) unregulated inflow to Lake Powell was well below average. This resulted in Lake Powell storage decreasing during this period to 8.0 million acre-feet (33 percent of capacity) which occurred on April 8, 2005. During 2005, 2008 and 2009, drought conditions eased somewhat with net gains in storage to Lake Powell. As of April 29, 2010 the storage in Lake Powell was 13.80 million acre-feet (56.8 percent of capacity) which is still below desired levels while the overall reservoir storage in the Colorado River Basin as of Apirl 29, 2010 is 32.85 million acre-feet (55.2 percent of capacity).

This information courtesy Rick Clayton, US Bureau of Reclamation

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From: **RRFW Riverwire** riverwire@rrfw.org
Subject: RRFW Riverwire - Glen Canyon Dam Update July 2010
Date: June 25, 2010 at 4:40 PM
To: john@livingrivers.org

RR

RRFW Riverwire

Glen Canyon Dam Update

June 25, 2010

Glen Canyon Dam / Lake Powell

The unregulated inflow volume into Lake Powell so far for June (as of June 23rd) is 2.42 million acre feet (maf). Observed inflows peaked on June 12, 2010 at 57,600 cubic feet per second (cfs) and have declined since that time to 26,300 cfs on June 23, 2010. At the current rate of decline is it estimated that the unregulated inflow to Lake Powell for the month of June will be approximately 2.7 maf (88% of average). This will be well above the projected unregulated inflow from the June 24-month study which was 2.05 maf (66% of average). The Colorado Basin River Forecast Center did increase the June forecast to 2.45 maf (79% of average) on June 15th and this volume will now likely be exceeded on June 24th.

As a result of the additional volume of inflow that is being observed this month, the elevation of Lake Powell is much higher than what was projected in the June 24-Month Study. It is now likely that the peak elevation this summer will be in the range from 3638 to 3640 feet above sea level rather than the previously projected peak of 3634 to 3635 feet above sea level. The April through July forecasted unregulated inflow to Lake Powell is currently 5.45 maf (69% of average) based on the June mid month forecast. This forecast will be updated during the first week of July.

Releases from Glen Canyon Dam during the month of June will fluctuate each day for power generation between a peak hourly average release of about 12,500 cfs, during the morning and afternoon and a daily low hourly average release of 6,500 cfs during the late evening and early morning hours. The release volume scheduled for June is 600,000 acre-feet. The release volume scheduled for July is 800,000 acre-feet and daily fluctuations will range between 16,500 cfs during the afternoon and evening hours and 8.500 cfs during the late night and early morning hours. The release volume for August is projected to be 800,000 acre-feet and this will be confirmed in late July.

In addition to the daily fluctuation pattern, instantaneous releases from Glen Canyon Dam also fluctuate to provide approximately 40 megawatts (approximately 1,100 cfs) of system regulation to maintain stable conditions within the electrical generation and transmission system. This translates into momentary release fluctuations of about +/- 1100 cfs above or below the hourly average release rate. These momentary fluctuations for regulation are very short lived and typically balance out over the hour. When an unanticipated outage event occurs in the generation system, reserve generation at Glen Canyon Dam can also be called upon up to a limit of 83 megawatts (approximately 2,250 cfs of release) for a

duration of 2 hours or less. Under normal circumstances, calls for reserve generation occur fairly infrequently and are for much less than the limit of 83 megawatts.

On September 1, 2010 and continuing through October 31, 2010, the releases from Glen Canyon Dam will be steady with no fluctuations for power production (excluding system regulation and spinning reserves) for a steady flow experiment pursuant to the February 2008 Finding of No Significant Impact Experimental Releases from Glen Canyon Dam, Arizona 2008 through 2012. This year will be the third year of steady flows of the 5 year experiment. The projected release rate being targeted is 8,000 cfs which is equivalent to a monthly release volume of approximately 476,000 acre-feet in September 2010 and 491,000 acre-feet in October 2010. At the end of August, for a period of approximately 3 days, the daily fluctuation schedule will change each day in order to gradually transition to the steady release rate of 8,000 cfs to begin on September 1, 2010.

Pursuant to the Colorado River Interim Guidelines for Lower Basin Shortages and Coordinated Operations for Lakes Powell and Mead (Interim Guidelines) the operational tier for water year 2010 is Upper Elevation Balancing and the projected water year release volume is 8.23 maf. Under this operational tier there was a possibility that Equalization could occur in 2010 if the April 2010 24-Month Study ,with 8.23 maf release during water year 2010, projected that the elevation of Lake Powell on September 30 , 2010 was to be greater than 2010 equalization level (3642 feet above sea level). This condition, however, was not projected in the April 2010 24-Month Study. Therefore, the release volume for water year 2010 will be 8.23 maf. Projected monthly release volumes for the remainder of the water year will be scheduled to meet this annual release volume.

The June 2010 24-Month Study projects that operation tier for Glen Canyon Dam in water year 2011 will be Upper Elevation Balancing. The June 2010 24-Month Study also projects a shift to Equalization in April 2011 with a projected annual release volume of 11.15 maf. It should be cautioned however that at this time of year, the inflow scenario assumed in the 24-Month Study for the following water year is based on the statistical average and does not reflect a current projection from the Colorado Basin River Forecast Center (CBRFC). There is a high level of uncertainty about what the inflow conditions will be like in water year 2011. In August 2010 the CBRFC will issue an inflow projection for water year 2011 and the August 2010 24-Month Study will be based on this inflow projection rather than statistical average. It is currently forecasted that there is approximately a 62% probability that Equalization will occur in water year 2011. This forecast will be updated each month as conditions change.

The July 2010 24-Month Study will be published by July 12, 2010 and will be available here:
http://www.usbr.gov/uc/water/crsp/studies/24Month_07.pdf
Updated elevation projections for Lake Powell through water year 2010 based on the most recently published 24-Month Study are maintained at: Lake Powell Projected Elevations:
http://www.usbr.gov/uc/water/crsp/studies/lppwse.html

Upper Colorado River Basin Hydrology

In the Upper Colorado River Basin during water year 2009, the overall precipitation accumulated through September 30, 2009 was approximately 95% of average based on the 30 year average for the period from 1971 through 2000. For water year 2010 dry conditions have persisted. Estimated percentages of average precipitation for the months thus far in water year 2010 are as follows: October 85%, November 40%, December 130%, January 100% and February 100%, March 90%, April 120%, May 80%. The overall estimated precipitation percentage of average thus far in water year 2010 for the Upper Colorado River Basin is 87% of average.

The Climate Prediction Center outlook (dated May 20, 2010) for temperature over the next 3 months indicates that temperatures in the Upper Colorado River Basin are expected to be above average while precipitation over the next 3 months is projected to be near average.

Upper Colorado River Basin Drought

The Upper Colorado River Basin continues to experience a protracted multi-year drought. Since 1999, inflow to Lake Powell has been below average in every year except water years 2005 and 2008. In the summer of 1999, Lake Powell was close to full with reservoir storage at 23.5 million acre-feet, or 97 percent of capacity. During the next 5 years (2000 through 2004) unregulated inflow to Lake Powell was well below average. This resulted in Lake Powell storage decreasing during this period to 8.0 million acre-feet (33 percent of capacity) which occurred on April 8, 2005. During 2005, 2008 and 2009, drought conditions eased somewhat with net gains in storage to Lake Powell. As of June 23, 2010 the storage in Lake Powell was 15.8 million acre-feet (64.8 % of capacity) which is still below desired levels while the overall reservoir storage in the Colorado River Basin as of June 23, 2010 is 34.65 million acre-feet (58.3 % of capacity).

RRFW thanks Rick Clayton of the USBOR for his assistance in providing information for this notification.

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River Runners for Wilderness | PO Box 17301 | Boulder | CO | 80308

From: **RRFW Riverwire** riverwire@rrfw.org
Subject: Glen Canyon Dam Update August 2010
Date: July 23, 2010 at 4:25 PM
To: john@livingrivers.org

RR

RRFW Riverwire

Glen Canyon Dam Update August 2010

July 23, 2010

Glen Canyon Dam / Lake Powell

The unregulated inflow volume into Lake Powell for July 2010 through July 21st is 550 thousand acre feet (kaf) and at the current inflow rate, the inflow volume for July 2010 will likely be approximately 674 kaf (43% of average). Observed inflows peaked for water year 2010 on June 12, 2010 at 57,600 cubic feet per second (cfs). Since that time inflows have steadily declined and as of July 21, 2010 inflows had decreased to 6,250 cfs. The low water surface elevation for water year 2010 occurred on April 15, 2010 when the elevation dipped to 3618.64 feet above sea level. Since that date the elevation has been on the rise and reached a peak of 3638.82 on June 30, 2010. This will likely be the peak elevation for water year 2010 as inflows are projected to fall below release rates during the next week. The overall elevation increase for water year 2010 was just over 20 feet. By the end of water year 2010 the elevation is projected to be roughly 3634.7 feet above sea level. The April through July forecasted unregulated inflow to Lake Powell is currently 5.77 maf (73% of average) based on the July midmonth forecast.

Releases from Glen Canyon Dam during the month of July will fluctuate each day for power generation between a peak hourly average release of about 16,500 cfs, during the morning and afternoon and a daily low hourly average release of 8,500 cfs during the late evening and early morning hours. The release volume scheduled for July is 800,000 acre-feet. The release volume for August will be approximately 800,000 acre-feet.

Bureau of Reclamation officials are projecting August flows to be the same as July flows at this time, between a peak hourly average release of about 16,500 cfs, during the morning and afternoon and a daily low hourly average release of 8,500 cfs during the late evening and early morning hours.

In addition to the daily fluctuation pattern, instantaneous releases from Glen Canyon Dam also fluctuate to provide approximately 40 megawatts (approximately 1,100 cfs) of system regulation to maintain stable conditions within the electrical generation and transmission system. This translates into momentary release fluctuations of about +/- 1100 cfs above or below the hourly average release rate. These momentary fluctuations for regulation are very short lived and typically balance out over the hour. When an unanticipated outage event occurs in the generation system, reserve generation at Glen Canyon Dam can also be called upon up to a limit of 83 megawatts (approximately 2,250 cfs of release) for a duration of 2 hours or less. Under normal circumstances, calls for reserve generation occur fairly infrequently and are for much less than the limit of 83 megawatts.

On September 1, 2010 and continuing through October 31, 2010, the releases from Glen Canyon Dam will be steady with no fluctuations for power production (excluding system regulation and spinning reserves) for a steady flow experiment pursuant to the February 2008 Finding of No Significant Impact 'Experimental Releases from Glen Canyon Dam, Arizona 2008 through 2012'. This year will be the third year of steady flows of the 5 year experiment. The projected release rate being targeted is 8,000 cfs which is equivalent to a monthly release volume of approximately 476,000 acre-feet in September 2010 and 492,000 acre-feet in October 2010. At the end of August, for a period of approximately 3 days, the daily fluctuation schedule will change each day in order to gradually transition to the steady release rate of 8,000 cfs to begin on September 1, 2010.

Pursuant to the Colorado River Interim Guidelines for Lower Basin Shortages and Coordinated Operations for Lakes Powell and Mead (Interim Guidelines) the operational tier for water year 2010 is Upper Elevation Balancing and the projected water year release volume is 8.23 million acre feet (maf). Under this operational tier there was a possibility that Equalization could occur in 2010 if the April 2010 24-Month Study,with 8.23 maf projected for release during water year 2010, indicated a Lake Powell projected elevation on September 30 , 2010 greater than 3642 feet above sea level (the Equalization level for water year 2010). This condition was not projected in the April 24-Month Study and for this reason, the release volume for water year 2010 will be 8.23 maf. Monthly release volumes for the remainder of the water year will be scheduled to achieve this water year release volume.

The July 2010 24-Month Study projects that operation tier for Glen Canyon Dam in water year 2011 will be Upper Elevation Balancing but also projects a shift to Equalization in April 2011. The projected water year 2011 release volume is 11.5 maf. It should be cautioned however that at this time of year, the inflow assumptions used in the 24-Month Study for the following water year are based on statistical averages and do not reflect current hydrologic conditions. There is a high level of uncertainty about what the inflow conditions will be in water year 2011. In August 2010 the Colorado Basin River Forecast Center will issue an inflow projection for water year 2011 and this will be the basis of the inflow assumptions used in the August 2010 24-Month Study. It is currently forecasted that there is approximately a 59% probability that Equalization will occur in water year 2011. This forecast will be updated each month as conditions change.

The July 2010 24-Month Study has been published and will be available here:

http://www.usbr.gov/uc/water/crsp/studies/24Month_07.pdf

Updated elevation projections for Lake Powell through water year 2010 based on the most recently published 24-Month Study are maintained at:

http://www.usbr.gov/uc/water/crsp/studies/lppwse.html

Upper Colorado River Basin Hydrology

In the Upper Colorado River Basin during water year 2009, the overall precipitation accumulated through September 30, 2009 was approximately 95% of average based on the 30 year average for the period from 1971 through 2000. For water year 2010 dry conditions

have persisted. Estimated percentages of average precipitation for the months thus far in water year 2010 are as follows: October 85%, November 40%, December 130%, January 100% and February 100%, March 90%, April 120%, May 75%, June 100%, . The overall estimated precipitation percentage of average thus far in water year 2010 for the Upper Colorado River Basin is 87% of average.

The Climate Prediction Center outlook (dated July 15, 2010) for temperature over the next 3 months indicates that temperatures in the Upper Colorado River Basin are expected to be above average while precipitation over the next 3 months is projected to be below average.

Upper Colorado River Basin Drought

The Upper Colorado River Basin continues to experience a protracted multi-year drought. Since 1999, inflow to Lake Powell has been below average in every year except water years 2005 and 2008. In the summer of 1999, Lake Powell was close to full with reservoir storage at 23.5 million acre-feet, or 97 percent of capacity. During the next 5 years (2000 through 2004) unregulated inflow to Lake Powell was well below average. This resulted in Lake Powell storage decreasing during this period to 8.0 million acre-feet (33 percent of capacity) which occurred on April 8, 2005. During 2005, 2008 and 2009, drought conditions eased somewhat with net gains in storage to Lake Powell. As of July 21, 2010 the storage in Lake Powell was 15.73 million acre-feet (64.7 % of capacity) which is still below desired levels while the overall reservoir storage in the Colorado River Basin as of June 30, 2010 is 34.37 million acre-feet (57.8 % of capacity).

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From: **RRFW Riverwire** riverwire@rrfw.org
Subject: RRFW Riverwire Glen Canyon Dam Update
Date: September 28, 2010 at 11:35 AM
To: john@livingrivers.org

RR

RRFW Riverwire

Glen Canyon Dam Update

September 28, 2010

Glen Canyon Dam Lake Powell

During September 2010 through September 26, 2010 the unregulated inflow volume to Lake Powell is trending towards 266 thousand acre feet (kaf) (56% of average). This will be approximately 144 kaf below what was projected in the September 24-Month Study and as a result the elevation of Lake Powell at the end of September will be about 1 foot lower than what was projected in the September 24-Month Study. The September 30th elevation of Lake Powell will likely be approximately 3633.7 feet above sea level. This projected ending elevation corresponds to a live storage of 15.27 million acre feet (maf) which is 62.8% of the full capacity of 24.32 maf.

During August the release volume from Glen Canyon Dam was 801.7 kaf and the hourly releases during most days fluctuated between a peak of 16,500 cubic feet per second (cfs) during the day and a low of 8,500 cfs during the evening and early morning for power generation. On September 1, 2010 and continuing through October 31, 2010, the releases from Glen Canyon Dam will be steady with no fluctuations for power production (excluding system regulation and spinning reserves) for the steady flow experiment pursuant to the February 2008 Finding of No Significant Impact Experimental Releases from Glen Canyon Dam, Arizona 2008 through 2012. This will be the third year of steady flows of the 5 year experiment. The steady release rate is 8,000 cfs which is equivalent to a monthly release volume of approximately 476,000 acre-feet in September 2010 and 492,000 acre-feet in October 2010.

During the steady flow experiment the instantaneous releases from Glen Canyon Dam may fluctuate somewhat to provide approximately 40 megawatts (approximately 1,100 cfs) of system regulation to maintain stable conditions within the electrical generation and transmission system. This translates into momentary release fluctuations of about +/- 1100 cfs above or below the targeted steady release target (8000 cfs). These momentary fluctuations for regulation are very short lived and will typically balance out over the hour. Spinning and non-spinning reserve generation will also be carried at Glen Canyon Dam during the steady flow experiment. When an unanticipated outage event occurs in the generation system, reserve generation at Glen Canyon Dam can also be called upon up to a limit of 83 megawatts (approximately 2,250 cfs of release) for a duration of 2 hours or less. Under normal circumstances, calls for reserve generation occur fairly infrequently and are for much less than the limit of 83 megawatts.

The August 2010 24-Month Study (most probable inflow scenario) projected the January 1, 2011 elevation of Lake Powell to be 3628.73 feet. Pursuant to the Interim Guidelines, the determination is that the Operational Tier for water year 2011 will be the Upper Elevation Balancing Tier. Under this Operational Tier, there is a possibility that the annual release volume from Lake Powell could be 8.23 maf. There is also a possibility that Equalization or Balancing could occur in 2011 which would result in an annual release volume greater than 8.23 maf. The possibility of Equalization or Balancing in 2011 will depend on the reservoir conditions projected for the end of water year 2011 in the April 2011 24-Month Study with the most probable inflow scenario and 8.23 maf projected for release from Lake Powell. The September 2010 24-Month Study indicates that Equalization is likely to be triggered in April 2011 and the annual release volume for water year 2011 is projected to be 11.28 maf.

There is a high level of uncertainty regarding the hydrologic conditions that will be experienced in water year 2011. Each month, the 24-Month Study will be updated to reflect current reservoir conditions and the most probable inflow forecast. The projected annual release volume for water year 2011 in the 24-Month Study will reflect the implementation of the Upper Elevation Balancing Tier with updated hydrologic conditions and is therefore likely to change each month. It is possible that a relatively small change in the forecast could have a large impact on the projected annual release volume. Based on the current inflow forecast (dated September 1, 2010), there is approximately a 58% probability that Equalization will occur in water year 2011.

The current inflow forecast for Lake Powell projects the most probable unregulated inflow volumes for the next 3 months as follows: Sepember-400 kaf (84% of average); October-475 kaf (87% of average; November-460 kaf (84% of average). The outlook for water year 2011 (dated August 3, 2010) projected the most probable unregulated inflow volume to Lake Powell during water year 2011 to be 10.75 maf (89% of average). It is likely the unregulated volume of inflow to Lake Powell in water year 2011 will be greater than or less than the most probable projection. The range of possible unregulated inflow volumes to Lake Powell is currently projected to be as dry as 5.0 maf (40% of average) to as wet as 17.1 maf (142% of average). In October, this hydrologic outlook for water year 2011 will be updated.

The September 2010 24-Month Study has been published and is available here:
http://www.usbr.gov/uc/water/crsp/studies/24Month_09.pdf

Updated elevation projections for Lake Powell through water year 2010 based on the most recently published 24-Month Study are maintained at:
http://www.usbr.gov/uc/water/crsp/studies/lppwse.html

Upper Colorado River Basin Hydrology

In the Upper Colorado River Basin during water year 2009, the overall precipitation accumulated through September 30, 2009 was approximately 95% of average based on the 30 year average for the period from 1971 through 2000. For water year 2010 dry conditions have persisted. Estimated percentages of average precipitation for the months thus far in water year 2010 are as follows: October 85%, November 40%, December 130%, January 100% and February 100%, March 90%, April 120%, May 75%, June 100%, July 95%. The overall estimated precipitation percentage of average thus far in water year 2010 for the Upper Colorado River Basin is 96% of average.

The Climate Prediction Center outlook (dated August 19, 2010) for temperature over the next 3 months indicates that temperatures in the Upper Colorado River Basin are expected to be above average while precipitation over the next 3 months is projected to be below average.

Upper Colorado River Basin Drought

The Upper Colorado River Basin continues to experience a protracted multi-year drought. Since 1999, inflow to Lake Powell has been below average in every year except water years 2005 and 2008. In the summer of 1999, Lake Powell was close to full with reservoir storage at 23.5 maf, or 97 percent of capacity. During the next 5 years (2000 through 2004) unregulated inflow to Lake Powell was well

below average. This resulted in Lake Powell storage decreasing during this period to 8.0 maf (33 percent of capacity) which occurred on April 8, 2005. During 2005, 2008 and 2009, drought conditions eased somewhat with net gains in storage to Lake Powell. As of September 1, 2010 the storage in Lake Powell was 15.36 maf (63.1 % of capacity) which is still below desired levels while the overall reservoir storage in the Colorado River Basin as of September 1, 2010 is 33.73 maf (56.7 % of capacity).

RRFW thanks Rick Clayton of the USBOR for his assistance in providing information for this notification.

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From: **RRFW Riverwire** riverwire@rrfw.org
Subject: RRFW Riverwire Glen Canyon Dam Update
Date: October 27, 2010 at 11:40 AM
To: john@livingrivers.org

RR

RRFW Riverwire
Glen Canyon Dam Update

October 27, 2010

Glen Canyon Dam Lake Powell

During October 2010 the unregulated inflow volume to Lake Powell through October 26, 2010 is tracking towards a monthly volume of was 330 thousand acre feet (kaf) (60% of average). This volume will be below the volume forecasted for October which was 375 kaf (69% of average). However, due to significant local precipitation in the region around Lake Powell, the elevation of Lake Powell will likely be about 0.7 feet above the level projected in the October 24-Month Study for the end of October. The elevation of Lake Powell on October 31, 2010 will likely be approximately 3633.75 feet above sea level which corresponds to a live storage of approximately 15.30 maf and 62.9% of the full capacity of 24.32 million acre feet (maf).

On November 1, 2010, the releases from Glen Canyon Dam will resume normal fluctuations for power generations each day. During September and October 2010, the releases were steady with no fluctuations for power generation as part of a 5 year study of steady flows pursuant to the February 2008 Finding of No Significant Impact 'Experimental Releases from Glen Canyon Dam, Arizona 2008 through 2012'. This was the third year of steady flows of the 5 year study. The steady release rate for this year was 8,000 cubic feet per second (cfs). The volume released during September was 480 kaf and the volume released in October will be approximately 495 kaf.

The release volume scheduled for November is 810 kaf which is equivalent to an average daily release rate of approximately 13,600 cfs. Daily fluctuations will likely peak near 16,000 cfs during the morning and afternoon and evening hours. Daily low releases will occur during the early morning hours (i.e. midnight to about 6:00 am) and will be about 8,000 cfs. The projected release volume for December is currently 865 kaf which is equivalent to an average daily release rate of approximately 14,050 cfs. According to Bureau of Reclamation officials, the daily peak and low release rate in December and January will likely also range from 16,000 cfs to 8,000 cfs respectively.

In addition to the daily fluctuation pattern for power generation, the instantaneous releases from Glen Canyon Dam may also fluctuate somewhat to provide approximately 40 megawatts of system regulation. These instantaneous releases adjustments maintain stable conditions within the electrical generation and transmission system and result in momentary release fluctuations within a range that is about 1100 cfs above or below the targeted release rate for a given hour of the day. These momentary fluctuations for regulation are very short lived and typically balance out over the hour. Spinning and non-spinning reserve generation is also maintained at Glen Canyon Dam. When an unanticipated electrical outage event occur within the electrical transmission system, this reserve generation at

Glen Canyon Dam can be called upon up to a limit of 83 megawatts (approximately 2,250 cfs of release) for a duration of up to 2 hours. Under normal circumstances, calls for reserve generation occur fairly infrequently and are for much less than the limit of 83 megawatts.

In August of 2010, the August 2010 24-Month Study Model was used to project the January 1, 2010 elevation of Lake Powell and Lake Mead under the most probable inflow scenario. Pursuant to the Interim Guidelines and based on this August projection, the operational tier for water year 2011 was selected to be the Upper Elevation Balancing Tier. Under the Upper Elevation Balancing Tier, there is a possibility that the annual release volume from Lake Powell could be 8.23 maf. There is also a possibility under this tier that Equalization or Balancing could occur in 2011 which would result in an annual release volume greater than 8.23 maf.

The possibility of Equalization or Balancing in 2011 is dependent on the end of water year 2011 reservoir conditions projected in the April 2011 24-Month Study under the most probable inflow scenario and with 8.23 maf projected for release from Lake Powell during water year 2011. For this reason it will not be known for certain whether Equalization or Balancing will occur in water year 2011 until April 2011. 24-Month Studies prior to April 2011 can project that Equalization or Balancing are likely to occur, but these projections are subject to change with changes in the forecasted hydrology of the Colorado River Basin. It is possible that a relatively small change in forecasted hydrology can have a large impact on the projected annual release volume.

The October 2010 24-Month Study with the most probable inflow and an 8.23 maf release does project that Balancing is likely to occur in 2011. For this reason, the projected most probable annual release volume for water year 2011 in the October 24-Month Study is 9.00 maf. Given the current range of uncertainty of the forecasted hydrology for water year 2011, it is possible that Equalization could occur in water year 2011 which would result if the annual release being greater than 10.7 maf. Analysis of the probable range of inflows that could occur during water year 2011 indicate that the probability of Equalization occurring in 2011 is currently about 50%.

The current inflow forecast for Lake Powell projects the most probable unregulated inflow volumes for the next 3 months as follows: October-375 kaf (69% of average; November-400 kaf (73% of average); December-375 kaf (86% of average). The outlook for water year 2011 (dated October 3, 2010) projected the most probable unregulated inflow volume to Lake Powell during water year 2011 to be 9.60 maf (80% of average). It is possible that the unregulated volume of inflow to Lake Powell in water year 2011 will be greater than or less than the most probable projection. The probable range of unregulated inflow volumes to Lake Powell during water year 2011 is currently projected to be as dry as 4.5 maf (37% of average) to as wet as 15.8 maf (131% of average).

The October 2010 24-Month Study has been published and is available here:

http://www.usbr.gov/uc/water/crsp/studies/24Month_10.pdf

The November 2010 24-Month Study will be published by November 10, 2010. Updated elevation projections for Lake Powell through water year 2011 and 2012 based on the most recently published 24-Month Study are maintained at:

http://www.usbr.gov/uc/water/crsp/studies/lppwse.html

Upper Colorado River Basin Hydrology

In the Upper Colorado River Basin during water year 2010, the overall precipitation accumulated through September 30, 2009 was approximately 90% of average based on the 30 year average for the period from 1971 through 2000. For October 2010, the first month of water year 2011, precipitation in the Upper Colorado River Basin has been above normal and as of October 26th is 170% of average.

The Climate Prediction Center outlook (dated October 21, 2010) for temperature over the next 3 months indicates that temperatures in the Upper Colorado River Basin are expected to be above average while precipitation over the next 3 months is projected to be near average.

Upper Colorado River Basin Drought

The Upper Colorado River Basin continues to experience a protracted multi-year drought. Since 1999, inflow to Lake Powell has been below average in every year except water years 2005 and 2008. In the summer of 1999, Lake Powell was close to full with reservoir storage at 23.5 million acre-feet, or 97 percent of capacity. During the next 5 years (2000 through 2004) unregulated inflow to Lake Powell was well below average. This resulted in Lake Powell storage decreasing during this period to 8.0 million acre-feet (33 percent of capacity) which occurred on April 8, 2005. During 2005, 2008 and 2009, drought conditions eased somewhat with net gains in storage to Lake Powell. As of October 26, 2010 the storage in Lake Powell was 15.32 million acre-feet (63.0 % of capacity) which is still below desired levels while the overall reservoir storage in the Colorado River Basin as of October 26, 2010 is 32.84 million acre-feet (55.2 % of capacity).

RRFW thanks Rick Clayton of the USBOR for his assistance in providing information for this notification..

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From: **RRFW Riverwire** riverwire@rrfw.org
Subject: RRFW Riverwire - Glen Canyon Dam Update
Date: November 30, 2010 at 7:20 PM
To: john@livingrivers.org

RR

RRFW Riverwire

Glen Canyon Dam Update

November 30, 2010

Glen Canyon Dam / Lake Powell

During November 2010 through the first 25 days of the month, the unregulated inflow to Lake Powell has been tracking towards a monthly volume of 452 kaf (83% of average). This volume is slightly greater thant the volume forecasted for November at the beginning of the month which was 425 kaf (78% of average). Although the inflow to Lake Powell during November will likely be above forecasted levels, the water surface elevation elevation of Lake Powell at the end of November will likely be lower than forecasted. The November 24-Month Study projected that Lake Powell would end November at an elevation of 3630.85 feet above sea level. Based on current conditions and projected conditions to the end of November, the water surface elevation is likely to be about 3630.2 feet above sea level which is 68.8 feet below full pool and translates to a storage level of 14.88 maf which is 61.2% of the full capacity of 24.32 maf.

The release volume scheduled for December is 845 kaf which is equivelent to an average daily release rate of approximately 13,750 cfs. Daily fluctuations will likely peak near 16,000 cfs during the morning and afternoon and evening hours. Daily low releases will occur during the early morning hours (i.e. midnight to about 6:00 am) and will be about 8,500 cfs. The projected release volume for January is currently 865 kaf which is equivelent to an average daily release rate of approximately 14,050 cfs. The daily peak and low release rate in January will likely also range from 16,000 cfs to 8,500 cfs respectively.

In addition to the daily fluctuation pattern for power generation, the instantaneous releases from Glen Canyon Dam may also fluctuate somewhat to provide approximately 40 megawatts of system regulation. These instantaneous releases adjustments maintain stable conditions within the electrical generation and transmission system and result in momentary release fluctuations within a range that is about 1100 cfs above or below the targeted release rate for a given hour of the day.

These momentary fluctuations for regulation are very short lived and typically balance out over the hour. Spinning and non-spinning reserve generation is also maintained at Glen Canyon Dam. When an unanticipated electrical outage event occur within the electrical transmission system, this reserve generation at Glen Canyon Dam can be called upon up to a limit of 98 megawatts (approximately 2,600 cfs of release) for a duration of up to 2 hours. Under normal circumstances, calls for reserve generation occur fairly infrequently and are for much less than the limit of 98 megawatts.

In August of 2010, the August 2010 24-Month Study Model was used to project the

January 1, 2010 elevation of Lake Powell and Lake Mead under the most probable inflow scenario. Pursuant to the Interim Guidelines and based on this August projection, the operational tier for water year 2011 was selected to be the Upper Elevation Balancing Tier. Under the Upper Elevation Balancing Tier, there is a possibility that the annual release volume from Lake Powell could be 8.23 maf. There is also a possibility under this tier that Equalization or Balancing could occur in 2011 which would result in an annual release volume greater than 8.23 maf.

The possibility of Equalization or Balancing in 2011 is dependent on the end of water year 2011 reservoir conditions projected in the April 2011 24-Month Study under the most probable inflow scenario and with 8.23 maf projected for release from Lake Powell during water year 2011. For this reason it will not be known for certain whether Equalization or Balancing will occur in water year 2011 until April 2011. 24-Month Studies prior to April 2011 can project that Equalization or Balancing are likely to occur, but these projections are subject to change with changes in the forecasted hydrology of the Colorado River Basin. It is possible that a relatively small change in forecasted hydrology can have a large impact on the projected annual release volume.

The November 2010 24-Month Study with the most probable inflow and an 8.23 maf release does project that Balancing is likely to occur in 2011. For this reason, the projected most probable annual release volume for water year 2011 in the November 24-Month Study is 9.00 maf. Given the current range of uncertainty of the forecasted hydrology for water year 2011, it is possible that Equalization could occur in water year 2011 which would result if the annual release being greater than about 10.7 maf. Analysis of the probable range of inflows that could occur during water year 2011 indicate that the probability of Equalization occurring in 2011 is currently about 48%.

The current unregulated inflow forecast for Lake Powell projects the most probable unregulated inflow volumes for the next 3 months as follows: November-425 kaf (78% of average; December-400 kaf (86% of average); January-350 kaf (86% of average). The outlook for water year 2011, incorporating this new forecast, projectes the most probable unregulated inflow volume to Lake Powell during water year 2011 to be 9.64 maf (80% of average). It is possible that the unregulated volume of inflow to Lake Powell in water year 2011 will be greater than or less than the most probable projection. The probable range of unregulated inflow volumes to Lake Powell during water year 2011 is currently projected to be as dry as 4.5 maf (37% of average) to as wet as 15.8 maf (131% of average).

The November 2010 24-Month Study has been published and is available here. Updated elevation projections for Lake Powell through water year 2011 and 2012 based on the most recently published 24-Month Study are maintained at: Lake Powell Projected Elevations.

Upper Colorado River Basin Hydrology

In the Upper Colorado River Basin during water year 2010, the overall precipitation accumulated
through September 30, 2009 was approximately 90% of average based on the 30 year average for the period from 1971 through 2000. For October 2010, the first month of water year 2011, precipitation in the Upper Colorado River Basin was approximately 135% of

average basin wide.

The Climate Prediction Center outlook (dated November 18, 2010) for temperature over the next 3 months indicates that temperatures in the Upper Colorado River Basin are expected to be above average while precipitation over the next 3 months is projected to be near average.

Upper Colorado River Basin Drought

The Upper Colorado River Basin continues to experience a protracted multi-year drought. Since 1999, inflow to Lake Powell has been below average in every year except water years 2005 and 2008. In the summer of 1999, Lake Powell was close to full with reservoir storage at 23.5 million acre-feet, or 97 percent of capacity. During the next 5 years (2000 through 2004) unregulated inflow to Lake Powell was well below average. This resulted in Lake Powell storage decreasing during this period to 8.0 million acre-feet (33 percent of capacity) which occurred on April 8, 2005. During 2005, 2008 and 2009, drought conditions eased somewhat with net gains in storage to Lake Powell. As of November 25, 2010 the storage in Lake Powell was approximately 14.97 million acre-feet (61.5 % of capacity) which is below desired levels. The overall reservoir storage in the Colorado River Basin as of November 7, 2010 is approximately 32.44 million acre-feet (54.5 % of capacity).

RRFW thanks Rick Clayton, BOR for this update.

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River Runners for Wilderness | PO Box 17301 | Boulder | CO | 80308

From: **RRFW Riverwire** riverwire@rrfw.org
Subject: RRFW Riverwire - Glen Canyon Dam Update
Date: December 21, 2010 at 5:15 AM
To: john@livingrivers.org

RR

RRFW Riverwire

Glen Canyon Dam Update

December 21, 2010

Glen Canyon Dam / Lake Powell

During December 2010, through the first 19 days of the month, the unregulated inflow to Lake Powell has been tracking towards a monthly volume of 383 kaf (88% of average). This volume is slightly above the volume forecasted for December by the Colorado Basin River Forecast Center on December 1, 2010 which was 360 kaf (83% of average). Although the inflow to Lake Powell during December is projected to be above what was forecasted at the beginning of December, the water surface elevation of Lake Powell at the end of December will likely be about 0.3 feet below what was projected in the December 24-Month Study. The December 24-Month Study projected that Lake Powell would end December at an elevation of 3626.4 feet above sea level. The elevation of Lake Powell at the end of the day on December 31, 2010 will likely be about 3626.1 feet above sea level. The end of month storage in Lake Powell for December 2010 will likely be about 14.6 million acre feet (maf) which is 60.1% of the full capacity of 24.32 maf.

The release volume scheduled for December is 845 thousand acre feet (kaf) which is equivalent to an average daily release rate of approximately 13,750 cubic feet per second (cfs). Daily fluctuations during December have been and will continue to peak near 16,000 cfs during the morning and early evening hours. Daily low releases have been and will continue to occur during the early morning hours (i.e. midnight to about 6:00 am) to about 8,500 cfs. The projected release volume for January is currently 865 kaf which is equivalent to an average daily release rate of approximately 14,050 cfs. The daily peak and low release rate in January will likely also range from 16,000 cfs to about 9,500 cfs respectively.

In addition to the daily fluctuation pattern for power generation, the instantaneous releases from Glen Canyon Dam may also fluctuate somewhat to provide approximately 40 megawatts of system regulation. These instantaneous releases adjustments maintain stable conditions within the electrical generation and transmission system and result in momentary release fluctuations within a range that is about 1100 cfs above or below the targeted release rate for a given hour of the day. These momentary fluctuations for regulation are very short lived and typically balance out over the hour. Spinning and non-spinning reserve generation is also maintained at Glen Canyon Dam. When an unanticipated electrical outage event occurs within the electrical transmission system, this reserve generation at Glen Canyon Dam can be called upon up to a limit of 98 megawatts (approximately 2,600 cfs of release) for a duration of up to 2 hours. Under normal circumstances, calls for reserve generation occur fairly infrequently and are for much less than the limit of 98 megawatts.

In August of 2010, the August 2010 24-Month Study Model was used to project the January 1, 2010 elevation of Lake Powell and Lake Mead under the most probable inflow scenario. Pursuant to the

elevation of Lake Powell and Lake Mead under the most probable inflow scenario pursuant to the Interim Guidelines and based on this August projection, the operational tier for water year 2011 was selected to be the Upper Elevation Balancing Tier. Under the Upper Elevation Balancing Tier, there is a possibility that the annual release volume from Lake Powell could be 8.23 maf. There is also a possibility under this tier that Equalization or Balancing could occur in 2011 which would result in an annual release volume greater than 8.23 maf.

The possibility of Equalization or Balancing in 2011 is dependent on the end of water year 2011 reservoir conditions projected in the April 2011 24-Month Study under the most probable inflow scenario and with 8.23 maf projected for release from Lake Powell during water year 2011. For this reason it will not be known for certain whether Equalization or Balancing will occur in water year 2011 until April 2011. 24-Month Studies prior to April 2011 can project that Equalization or Balancing are likely to occur, but these projections are subject to change with changes in the forecasted hydrology of the Colorado River Basin. It is possible that a relatively small change in forecasted hydrology can have a large impact on the projected annual release volume.

The December 2010 24-Month Study with the most probable inflow scenario for water year 2011 did project that Balancing is likely to occur in 2011. For this reason, the projected most probable annual release volume for water year 2011 in the December 24-Month Study was 9.00 maf. Given the current range of uncertainty of the forecasted hydrology for water year 2011, it is possible that Equalization could also occur in water year 2011 which would result if the annual release being greater than about 10.7 maf. Each month the 24-Month Study is updated to reflect the most probable inflow scenario which is based on the most recent forecast from the Colorado River Basin Forecast Center (CBRFC). In January, the CBRFC will issue the first water supply forecast for 2011. This new forecast could potentially change the most probable inflow scenario and projected annual release from Glen Canyon Dam.in the January 24-Month Study. Analysis of the probable range of inflows that could occur during water year 2011 indicates that the probability of Equalization occurring in 2011 is currently about 48%. This probability will be updated during the first part of January 2011.

The unregulated inflow forecast for Lake Powell over the next 3 months is as follows: December-360 kaf (83% of average); January-350 kaf (86% of average); February-350 kaf (83% of average). The outlook for water year 2011, incorporating this new forecast, projects the most probable unregulated inflow volume to Lake Powell during water year 2011 to be 9.66 maf (80% of average). It is possible that the unregulated volume of inflow to Lake Powell in water year 2011 will be greater than or less than the most probable projection. The probable range of unregulated inflow volumes to Lake Powell during water year 2011 is currently projected to be as dry as 4.5 maf (37% of average) to as wet as 15.8 maf (131% of average).

The December 2010 24-Month Study has been published and is available here.

Updated elevation projections for Lake Powell through water year 2011 and 2012 based on the most recently published 24-Month Study are maintained here.

Upper Colorado River Basin Hydrology

In the Upper Colorado River Basin during water year 2010, the overall precipitation accumulated through September 30, 2010 was approximately 90% of average based on the 30 year average for the period from 1971 through 2000. For Water Year 2011 thus far, the estimated monthly precipitation within the Upper Colorado River Basin (above Lake Powell) as a percentage of average has been: (October - 135%, November - 95%)

The Climate Prediction Center outlook (dated November 18, 2010) for temperature over the next 3 months indicates that temperatures in the Upper Colorado River Basin are expected to be above average while precipitation over the next 3 months is projected to be near average.

Upper Colorado River Basin Drought

The Upper Colorado River Basin continues to experience a protracted multi-year drought. Since 1999

The Upper Colorado River Basin continues to experience a protracted multi-year drought. Since 1999, inflow to Lake Powell has been below average in every year except water years 2005 and 2008. In the summer of 1999, Lake Powell was close to full with reservoir storage at 23.5 million acre-feet, or 97 percent of capacity. During the next 5 years (2000 through 2004) unregulated inflow to Lake Powell was well below average. This resulted in Lake Powell storage decreasing during this period to 8.0 million acre-feet (33 percent of capacity) which occurred on April 8, 2005. During 2005, 2008 and 2009, drought conditions eased somewhat with net gains in storage to Lake Powell. As of December 19, 2010 the storage in Lake Powell was approximately 14.61 million acre-feet (60.1 % of capacity) which is below desired levels. The overall reservoir storage in the Colorado River Basin as of December 19, 2010 is approximately 32.19 million acre-feet (54.1 % of capacity).

RRFW thanks Rick Clayton of the USBOR for this update.

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# #

From: **RRFW Riverwire** riverwire@rrfw.org
Subject: RRFW Riverwire - Glen Canyon Dam Update
Date: January 11, 2011 at 8:53 PM
To: john@livingrivers.org

RR

RRFW Riverwire

Glen Canyon Dam Update

January 11, 2011

Glen Canyon Dam - Lake Powell

During December 2010 the unregulated inflow to Lake Powell was 417 thousand acre feet (kaf) (96% of average). This was 57 kaf above the volume forecasted by the Colorado Basin River Forecast Center (CBRFC) on December 1, 2010 which was 360 kaf (83% of average). The elevation of Lake Powell at the end of the day on December 31, 2010 was 3626.54 feet above sea level (73.46 feet from full pool) which corresponds to a live storage content of 14.44 maf (59.5% of capacity).

During the last half of December, precipitation within the Upper Colorado River Basin was well above average and the snowpack conditions have increased significantly. On December 17, 2010 the snowpack above Lake Powell was estimated to be 102% of average. By December 31, 2010 the snowpack conditions above Lake Powell had increased to an estimated 151% of average. Precipitation above Lake Powell for the first 3 months of water year 2011 has been well above average at nearly 150% of average.

Based on these conditions and projected climate conditions over the next several months, the CBRFC has issued the Final Water Supply Forecast (April through July 2011 forecasted unregulated inflow volume) for Lake Powell that is well above average at 9.5 million acre feet (maf) which is 120% of average. This forecast translates into an increase to the expected inflow to Lake Powell for water year 2011 that is more than 3 million acre-feet more than what was projected one month ago.

Operation of Glen Canyon Dam during January 2011 has been modified based on this new forecast. On Sunday January 9, 2011, releases from Glen Canyon Dam were increased to an average daily release volume of approximately 34,000 acre-feet which translates to an average daily release of 17,100 cfs. Releases are scheduled to peak for power generation during the afternoon hours for the remainder of January to 20,500 cfs. Releases during the early morning hours are approximately 12,500 cfs.

The release volume for February is projected to be 981,000 kaf which the estimated capacity of Glen Canyon Power plant under the scheduled maintenance unit outage plan with an allowance of capacity to provide spinning reserves and regulation. It is anticipated that fluctuations
for power generation will be minimal in February and the estimated release rate will likely be approximately 17,600 cfs.

In addition to the daily fluctuation pattern for power generation, the instantaneous releases from Glen Canyon Dam may also fluctuate somewhat to provide approximately 40

megawatts of system regulation. These instantaneous releases adjustments maintain stable conditions within the electrical generation and transmission system and result in momentary release fluctuations within a range that is about 1100 cfs above or below the targeted release rate for a given hour of the day. These momentary fluctuations for regulation are very short lived and typically balance out over the hour. Spinning and non-spinning reserve generation is also maintained at Glen Canyon Dam. When an unanticipated electrical outage event occur within the electrical transmission system, this reserve generation at Glen Canyon Dam can be called upon up to a limit of 98 megawatts (approximately 2,600 cfs of release) for a duration of up to 2 hours. Under normal circumstances, calls for reserve generation occur fairly infrequently and are for much less than the limit of 98 megawatts.

In August of 2010, the August 2010 24-Month Study Model was used to project the January 1, 2010 elevation of Lake Powell and Lake Mead under the most probable inflow scenario. Pursuant to the Interim Guidelines and based on this August projection, the operational tier for water year 2011 was determined to be the Upper Elevation Balancing Tier. Under the Upper Elevation Balancing Tier, there is a possibility that the annual release volume from Lake Powell could be 8.23 maf. There is also a possibility under this tier that Equalization or Balancing could occur in 2011 which would result in an annual release volume greater than 8.23 maf.

The possibility of Equalization or Balancing in 2011 is dependent on the end of water year 2011 reservoir conditions projected in the April 2011 24-Month Study under the most probable inflow scenario and with 8.23 maf projected for release from Lake Powell during water year 2011. For this reason it will not be known for certain whether Equalization or Balancing will occur in water year 2011 until April 2011. 24-Month Studies prior to April 2011 can project that Equalization or Balancing are likely to occur, but these projections are subject to change with changes in the forecasted hydrology of the Colorado River Basin. It is possible that a relatively small change in forecasted hydrology can have a large impact on the projected annual release volume.

The January 2011 24-Month Study with the most probable inflow scenario for water year 2011 projects that Equalization is likely to occur in 2011. For this reason, the projected most probable annual release volume for water year 2011 in the January 24-Month Study is 11.367 maf. Given the current range of uncertainty of the forecasted hydrology for water year 2011, it is possible that Balancing could also occur in water year 2011 which would result if the annual release being 9.0 maf. Each month the 24-Month Study is updated to reflect the most probable inflow scenario which is based on the most recent forecast from the Colorado River Basin Forecast Center (CBRFC). Analysis of the probable range of inflows that could occur during water year 2011 indicates that the probability of realizing an inflow volume that would trigger Equalization in 2011 is currently about 76%. This probability will be updated again during the first part of February 2011.

The unregulated inflow forecast for Lake Powell over the next 3 months is as follows: January-380 kaf (94% of average); February-380 kaf (90% of average); March-670 kaf (101% of average). The outlook for water year 2011, incorporating this new forecast and the January Final Water Supply Forecast, the most probable unregulated inflow volume to Lake Powell during water year 2011 is now 13.19 maf (110% of average). It is possible that the unregulated volume of inflow to Lake Powell in water year 2011 will be greater than or

the unregulated volume of inflow to Lake Powell in water year 2011 will be greater than or less than the most probable projection. The probable range of unregulated inflow volumes to Lake Powell during water year 2011 is currently projected to be as dry as 8.9 maf (74% of average) to as wet as 18.6 maf (154% of average).

Upper Colorado River Basin Hydrology

In the Upper Colorado River Basin during water year 2010, the overall precipitation accumulated through September 30, 2010 was approximately 90% of average based on the 30 year average for the period from 1971 through 2000. For Water Year 2011 thus far, the estimated monthly precipitation within the Upper Colorado River Basin (above Lake Powell) as a percentage of average has been: (October - 135%, November - 95%, December -230%)

The Climate Prediction Center outlook (dated December 16, 2010) for temperature over the next 3 months indicates that temperatures in the Upper Colorado River Basin are expected to be near average while precipitation over the next 3 months is also projected to be near average.

Upper Colorado River Basin Drought

The Upper Colorado River Basin continues to experience a protracted multi-year drought. Since 1999, inflow to Lake Powell has been below average in every year except water years 2005 and 2008. In the summer of 1999, Lake Powell was close to full with reservoir storage at 23.5 million acre-feet, or 97 percent of capacity. During the next 5 years (2000 through 2004) unregulated inflow to Lake Powell was well below average. This resulted in Lake Powell storage decreasing during this period to 8.0 million acre-feet (33 percent of capacity) which occurred on April 8, 2005. During 2005, 2008 and 2009, drought conditions eased somewhat with net gains in storage to Lake Powell. As of January 10, 2011 the storage in Lake Powell was approximately 14.26 million acre-feet (58.6 % of capacity) which is below desired levels. The overall reservoir storage in the Colorado River Basin as of January 10, 2011 is approximately 32.29 million acre-feet (54.3 % of capacity).

RRFW thanks Rick Clayton of the USBOR for this update.

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Forward email
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From: **RRFW Riverwire** riverwire@rrfw.org
Subject: RRFW Riverwire - Glen Canyon Dam Update
Date: February 18, 2011 at 4:30 PM
To: john@livingrivers.org

RR

RRFW Riverwire

Glen Canyon Dam Update

February 18, 2011

Glen Canyon Dam / Lake Powell

As of February 15, 2011, unregulated inflow to Lake Powell is trending towards a February monthly volume of 314 kaf (75% of average). The monthly volume of unregulated inflow to Lake Powell that was forecasted at the beginning of February by the Colorado River Forecast Center (CBRFC) was 350 kaf (83% of average). Releases from Glen Canyon Dam are currently averaging about 18,000 cfs and this is well above the rate of inflow that Lake Powell is currently receiving. For this reason, the elevation of Lake Powell will likely decline by about 5 feet during February to an elevation of approximately 3615 feet above sea level. This condition is likely to change in March or April when the snowpack begins to melt and inflows increase to a rate much greater than what is being released from Glen Canyon Dam. When this occurs the elevation of Lake Powell will begin to increase. It is currently projected that by late summer the elevation of Lake Powell will rebound to a peak elevation for water year 2011 of approximately 3639 feet above sea level. The peak elevation of Lake Powell for water year 2011 will depend largely upon the inflow volume that Lake Powell receives over the next 5-7 months.

Current Dam Operations

The release volume scheduled for February is 968 kaf. During the first 21 days of February daily releases will fluctuate for power production between an afternoon peak of approximately 19,700 cfs and an early morning low of approximately 15,000 cfs. On or about February 22, 2011, only 5 of the 8 generator units at Glen Canyon Dam will be available for electrical generation which will reduce the release capacity of Glen Canyon Dam Powerplant to approximately 16,000 cfs. In order to release the scheduled volume for February (968 kaf), releases during the period from February 22, 2011 to the end of February will be steady at approximately 16,000 cfs and this release regime will remain in place intil mid March when 2 additional units are projected to be returned to service. It is anticipated that the monthly release volume for March will likely be approximately 1020 kaf. Releases will be steady at approximately 16,000 cfs until Glen Canyon Unit 7 and 8 are returned to service on or about March 18, 2011. After March 18th, releases will resume daily fluctuations for power generation with daily peak releases each day of approximately 19,400 cfs. Early morning releases will be the lowest of the day and could be as low as 11,400 cfs.

In addition to daily operations that may or may not include daily fluctuation patterns, the instantaneous releases from Glen Canyon Dam can also fluctuate somewhat to provide approximately 40 megawatts of system regulation. These instantaneous releases adjustments maintain stable conditions within the electrical generation and transmission system and result in momentary release fluctuations within a range that is about 1100 cfs

system and result in momentary release fluctuations within a range that is about 1100 cfs above or below the targeted release rate for a given hour of the day. These momentary fluctuations for regulation are very short lived and typically balance out over the hour. Spinning and non-spinning reserve generation can also occur at Glen Canyon Dam. When an unanticipated electrical outage event occur within the electrical transmission system, reserve generation at Glen Canyon Dam can be called upon up to a maximum of 98 megawatts (approximately 2,600 cfs of release) for a duration of up to 2 hours. Under normal circumstances, calls for reserve generation occur fairly infrequently and are for much less than the limit of 98 megawatts.

Annual Operations-Coordinated Operation of Lake Mead and Lake Powell under Interim Guidelines for Water Year 2011

In August of 2010, the 24-Month Study model projected the January 1, 2010 elevation of Lake Powell and Lake Mead under the most probable inflow scenario. Pursuant to the December 2007 Record of Decision on Colorado River Interim Guidelines for Lower Basin Shortages and the Coordinated Operations of Lake Powell and Lake Mead (Interim Guidelines) and based on this August projection, the operational tier for water year 2011 was selected to be the Upper Elevation Balancing Tier. Under this operational tier, there is a possibility that the annual release volume from Lake Powell could be as low as 8.23 maf and there is also a possibility under this tier that Equalization or Balancing could occur which would result in an annual release volume greater than 8.23 maf.

For water year 2011, the possibility of Equalization or Balancing will dependent on the reservoir conditions of Lake Powell and Lake Mead that are projected for the end of water year in the April 24-Month Study. For this reason it will not be known for certain whether Equalization or Balancing will occur in water year 2011 until April. 24-Month Studies prior to April may project annual release volumes that reflect Equalization or Balancing, but these projections are preliminary and subject to change until April. In April, it will be know whether Equalization or Balancing will occur in water year 2011. It is possible that relatively small changes to the inflow forecast can have a large impact on the projected annual release volume.

Current Inflow Forecasts and Model Projections

Snowpack conditions above Lake Powell have persisted to be above average since late December 2010. The overall snowpack above Lake Powell on February 14, 2011 was 118% of average. For more information regarding current snowpack conditions please click here. The current Water Supply forecast for Lake Powell (April through July Unregulated Inflow Volume) is 9.0 maf (113% of average) and this forecast was issued by the CBRFC on February 15, 2011.

The unregulated inflow forecast for Lake Powell over the next 3 months is as follows: February-350 kaf (83% of average); March-625 kaf (94% of average) and April-1150 kaf (117% of average). Incorporating these new forecasts with the current Water Supply forecast, the projected unregulated inflow volume to Lake Powell during water year 2011 is now 12.60 maf (105% of average). This is referred to as the current Most Probable water year unregulated inflow projection and there is a 50% chance that the actual unregulated inflow volume in water year 2011 will be greater than this projected volume. There is also

a 50% chance that the actual unregulated inflow volume will be less than this volume. The current Minimum Probable water year unregulated inflow projection for water year 2011 (i.e. volume likely to be exceeded 90% of the time) is 8.9 maf (74% of average). The current Maximim Probable water year unregulated inflow projection for water year 2011 (i.e. volume likely to be exceeded 10% of the time) is 18.6 maf (154% of average).

The February 2011 24-Month Study, with the Most Probable water year unregulated inflow projection, projects that Equalization is likely to occur in 2011. The annual release volume projected for water year 2011 is 11.48 maf. Given the current range of uncertainty of the forecasted hydrology for water year 2011, it is possible that Balancing could also occur in water year 2011 which would result if the annual release being 9.0 maf. Each month the 24-Month Study is updated to reflect the most probable inflow scenario which is based on the most recent forecast from the Colorado River Basin Forecast Center (CBRFC). Analysis of the probable range of inflows that could occur during water year 2011 indicates that the probability of realizing an inflow volume that would trigger Equalization in 2011 if projected in April is currently about 71%. This probability will be updated again during the first part of March 2011.
The February 2010 24-Month Study is now published and is available here. Updated elevation projections for Lake Powell through water year 2011 and 2012 based on the most recently published 24-Month Study are maintained at: Lake Powell Projected Elevations.

Upper Colorado River Basin Hydrology

In the Upper Colorado River Basin during water year 2010, the overall precipitation accumulated through September 30, 2010 was approximately 90% of average based on the 30 year average for the period from 1971 through 2000. For Water Year 2011 thus far, the estimated monthly precipitation within the Upper Colorado River Basin (above Lake Powell) as a percentage of average has been: (October - 135%, November - 95%, December - 230%, January - 50%)

The Climate Prediction Center outlook (dated January 20, 2010) for temperature over the next 3 months indicates that temperatures in the Upper Colorado River Basin are expected to be above average while precipitation over the next 3 months is also projected to be below average.

Upper Colorado River Basin Drought

The Upper Colorado River Basin continues to experience a protracted multi-year drought. Since 1999, inflow to Lake Powell has been below average in every year except water years 2005 and 2008. In the summer of 1999, Lake Powell was close to full with reservoir storage at 23.5 million acre-feet, or 97 percent of capacity. During the next 5 years (2000 through 2004) unregulated inflow to Lake Powell was well below average. This resulted in Lake Powell storage decreasing during this period to 8.0 million acre-feet (33 percent of capacity) which occurred on April 8, 2005. During 2005, 2008 and 2009, drought conditions eased somewhat with net gains in storage to Lake Powell. As of February 9, 2011 the storage in Lake Powell was approximately 13.61 million acre-feet (56.0 % of capacity) which is below desired levels. The overall reservoir storage in the Colorado River Basin as of February 9, 2011 is approximately 32.02 million acre-feet (53.8 % of capacity).

RRFW thanks Rick Clayton, US Bureau of Reclamation for this update.

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From: **RRFW Riverwire** riverwire@rrfw.org
Subject: RRFW Riverwire - Glen Canyon Dam Update
Date: March 9, 2011 at 8:10 PM
To: john@livingrivers.org

RR

RRFW Riverwire

Glen Canyon Dam Update

March 9, 2011

Glen Canyon Dam / Lake Powell

The unregulated inflow volume to Lake Powell for February 2011 was 317,000 acre-feet (kaf) which was 75% of average. The monthly volume of unregulated inflow to Lake Powell that was forecasted at the beginning of February by the Colorado River Forecast Center (CBRFC) was 350 kaf (83% of average).

Releases from Glen Canyon Dam are currently (as of March 8, 2011) averaging about 15,700 cubic feet per second (cfs) and this is well above the rate of inflow that Lake Powell is receiving. The elevation of Lake Powell is declining and is projected to decline by about 3.5 feet during March 2011 to approximately 3610.2 feet above sea level. When the snowpack begins to melt and inflows increase, which is projected to occur in late March or early April, the elevation of Lake Powell will begin to rise. It is currently projected that by late summer the elevation of Lake Powell will rebound to a peak elevation for water year 2011 of approximately 3638 feet above sea level. This elevation corresponds to a live storage in Lake Powell of approximately 15.8 million acre-feet (maf) which is 65% of capacity. The peak elevation of Lake Powell for water year 2011 will depend largely upon the inflow volume that Lake Powell receives over the next 4 months.

Current Dam Operations

The release volume scheduled for March is 1034 kaf. During the first 18 days of March, daily releases will fluctuate for power production between an afternoon peak of approximately 16,000 cfs and an early morning low release of approximately 14,500 cfs. On or about March 19, 2011, Glen Canyon Powerplant Unit 8 will return to service and 6 of the 8 generators will be available for power generation. When this occurs, daily fluctuations will increase such that afternoon peak releases will be approximately 19,600 cfs and early morning low releases will be approximately 14,000 cfs. This fluctuation pattern will likely remain in place until April 4, 2011. On April 4, 2011, Glen Canyon Powerplant Units 3 and 4 will be taken out of service for approximately 6 weeks for annual maintenance. At that time, releases from Glen Canyon Dam will likely be steady at approximately 16,000 cfs and will be maintained at that level to the end of April. The projected release volume for April, 2011 is 966 kaf.

In addition to daily operations that may or may not include daily fluctuation patterns for load following power generation, the instantaneous

releases from Glen Canyon Dam may also fluctuate somewhat to provide approximately 40 megawatts of system regulation. These instantaneous releases adjustments maintain stable conditions within the electrical generation and transmission system and result in momentary release fluctuations within a range that is about 1100 cfs above or below the targeted release rate for a given hour of the day. These momentary fluctuations for regulation are very short lived and typically balance out over the hour. Spinning and non-spinning reserve generation can also occur at Glen Canyon Dam. When an unanticipated electrical outage event occurs within the electrical transmission system, reserve generation at Glen Canyon Dam can be called upon up to a maximum of 98 megawatts (approximately 2,600 cfs of release) for a duration of up to 2 hours. Under normal circumstances, calls for reserve generation occur fairly infrequently and are for much less than the required 98 megawatts.

Annual Operations-Coordinated Operation of Lake Mead and Lake Powell under Interim Guidelines for Water Year 2011

In August of 2010, the 24-Month Study model projected the January 1, 2010 elevation of Lake Powell and Lake Mead under the most probable inflow scenario. Pursuant to the December 2007 Record of Decision on Colorado River Interim Guidelines for Lower Basin Shortages and the Coordinated Operations of Lake Powell and Lake Mead (Interim Guidelines) and based on this August projection, the operational tier for water year 2011 was selected to be the Upper Elevation Balancing Tier. Under this operational tier, there is a possibility that the annual release volume from Lake Powell could be as low as 8.23 maf and there is also a possibility under this tier that Equalization or Balancing could occur which would result in an annual release volume greater than 8.23 maf.

For water year 2011, the possibility of Equalization or Balancing will dependent on the reservoir conditions of Lake Powell and Lake Mead that are projected for the end of water year in the April 24-Month Study. For this reason it will not be known for certain whether Equalization or Balancing will occur in water year 2011 until April. 24-Month Studies prior to April may project annual release volumes that reflect Equalization or Balancing, but these projections are preliminary and subject to change until April. In April, it will be known whether Equalization or Balancing will occur in water year 2011. It is possible that relatively small changes to the inflow forecast can have a large impact on the projected annual release volume.

Current Inflow Forecasts and Model Projections

Snowpack conditions above Lake Powell have persisted to be above average since late December 2010. The overall snowpack above Lake Powell on March 8, 2011 was 121% of average. For more information regarding current snowpack conditions please click here. The current Water Supply forecast for Lake Powell (April through July Unregulated Inflow Volume) is 9.2 maf (116% of average) and this forecast was issued by the CBRFC on March 3, 2011.

The unregulated inflow forecast for Lake Powell over the next 3 months is as follows: March-500 kaf (75% of average); April-1,100 kaf (112% of average) and May-2,900 kaf (126% of average). Incorporating these new forecasts with the current Water Supply forecast, the projected unregulated inflow volume to Lake Powell during water year 2011 is now 12.68 maf (105% of average). This is referred to as the current Most Probable water year unregulated inflow projection and there is a 50% chance that the actual unregulated inflow volume in water year 2011 will be greater than this projected volume. There is also a 50% chance that the actual unregulated inflow volume will be less than this volume. The current Minimum Probable water year unregulated inflow projection for water year 2011 (i.e. volume likely to be exceeded 90% of the time) is 9.7 maf (81% of average). The current Maximim Probable water year unregulated inflow projection for water year 2011 (i.e. volume likely to be exceeded 10% of the time) is 16.0 maf (133% of average).

The March 2011 24-Month Study, with the Most Probable water year unregulated inflow projection, projects that Equalization is likely to occur in 2011. The annual release volume from Lake Powell is projected for water year 2011 to be 11.63 maf. While it is still possible that Equalization will not occur in 2011, the probability that Equalization will occur is quite high and is probably on the order of about 95%. For Equalization not to occur in 2011, the Water Supply forecast issued in April would have to be about 7.0 maf or less. Given that the current (March) Water Supply forecast is 9.2 maf, this forecast would have to drop by at least 2.2 maf in just one month. While this is possible, it is very unlikely. In the past 25 years of developing the Water Supply forecast for Lake Powell, there has only been one occurrence when the March Water Supply forecast decreased by more than 2.0 maf between March and April and this was in 2004 when the decrease was 2.5 maf.

The March 2010 24-Month Study will be published by March 10, 2011and will be available here. Updated elevation projections for Lake Powell through water year 2011 and 2012 based on the most recently published 24-Month Study are maintained at: Lake Powell Projected Elevations.

Upper Colorado River Basin Hydrology

In the Upper Colorado River Basin during water year 2010, the overall precipitation accumulated through September 30, 2010 was approximately 90% of average based on the 30 year average for the period from 1971 through 2000. For Water Year 2011 thus far, the estimated monthly precipitation within the Upper Colorado River Basin (above Lake Powell) as a percentage of average has been: (October - 135%, November - 95%, December - 230%, January - 50%, February - 105%).

The Climate Prediction Center outlook (dated February 17, 2010) for temperature over the next 3 months indicates that temperatures in the Upper Colorado River Basin are expected to be above average while precipitation over the next 3 months is also projected to be below average.

the next 3 months is also projected to be below average.

Upper Colorado River Basin Drought

The Upper Colorado River Basin continues to experience a protracted multi-year drought. Since 1999, inflow to Lake Powell has been below average in every year except water years 2005 and 2008. In the summer of 1999, Lake Powell was close to full with reservoir storage at 23.5 million acre-feet, or 97 percent of capacity. During the next 5 years (2000 through 2004) unregulated inflow to Lake Powell was well below average. This resulted in Lake Powell storage decreasing during this period to 8.0 million acre-feet (33 percent of capacity) which occurred on April 8, 2005. During 2005, 2008 and 2009, drought conditions eased somewhat with net gains in storage to Lake Powell. As of March 7, 2011 the storage in Lake Powell was approximately 13.12 million acre-feet (53.9 % of capacity) which is below desired levels. The overall reservoir storage in the Colorado River Basin as of March 7, 2011 is approximately 31.76 million acre-feet (53.4 % of capacity.

RRFW thanks Rick Clayton of US Bureau of Reclamation for this update.

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From: **RRFW Riverwire** riverwire@rrfw.org
Subject: RRFW Riverwire - Glen Canyon Dam Update
Date: April 8, 2011 at 8:50 PM
To: john@livingrivers.org

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RRFW Riverwire

Glen Canyon Dam Update

Arpil 8, 2011

Glen Canyon Dam / Lake Powell

The unregulated inflow to Lake Powell for March 2011 was 594 kaf (90% of average). Observed inflows to Lake Powell have increased over the past several weeks and are currently averaging about 10,400 cfs. With daily average release rate from Glen Canyon Dam that is about 16,000 cfs, the elevation of Lake Powell is still declining , but the rate of decline has been moderated by these increased inflow conditions. The elevation of Lake Powell at midnight on April 7, 2011 was 3609.84 feet above sea level (90.16 feet from full pool). The elevation of Lake Powell will begin to increase later in April when inflows exceed releases. It is projected that the elevation of Lake Powell could increase by more than 30 feet to a peak elevation of approximately 3643 feet above sea level by late July or early August.

Current Dam Operations

The release volume scheduled for April is 966 kaf. During the first 3 days of April, daily releases fluctuates for power production between an afternoon peak of approximately 19,600 cfs and an early morning low release of approximately 14,000 cfs. On April 4, 2011, Glen Canyon Powerplant Units 3 and 4 were taken out of service for approximately 6 weeks for annual maintenance. Releases from Glen Canyon Dam were set to 16,000 cfs with no fluctuations for power generation at that time due to limited capacity of the available generating units at Glen Canyon Power Plant. Releases of 16,000 cfs steady will likely continue until the end of April. In early May, releases will likely be steady at about 15,000 cfs for the first 13 days of the month. On May 14, 2011 it is projected that Units 3 and 4 will be returned to service. When this occurs, releases from Glen Canyon Dam will be increased such that peak releases will be about 22,000 cfs and off peak releases will be about 16,000 cfs. The projected release volume for May is approximately 1.10 maf.

In addition to daily operations that may or may not include daily fluctuation patterns for load following power generation, the instantaneous releases from Glen Canyon Dam may also fluctuate somewhat to provide approximately 40 megawatts of system regulation. These instantaneous releases adjustments maintain stable conditions within the electrical generation and transmission system and result in momentary release fluctuations within a range that is about 1100 cfs above or below the targeted release rate for a given hour of the day. These momentary fluctuations for regulation are very short lived and typically balance out over the hour. Spinning and non-spinning reserve generation can also occur at Glen Canyon Dam. When an unanticipated electrical outage event occurs within the electrical transmission system, reserve generation at Glen Canyon Dam can be called upon up to a maximum of 98 megawatts (approximately 2,600 cfs of release) for a duration of up to 2 hours. Under normal circumstances, calls for reserve generation occur fairly infrequently

and are for much less than the required 98 megawatts.

Annual Operations-Coordinated Operation of Lake Mead and Lake Powell under Interim Guidelines for Water Year 2011

In August of 2010, the 24-Month Study model projected the January 1, 2010 elevation of Lake Powell and Lake Mead under the most probable inflow scenario. Pursuant to the December 2007 Record of Decision on Colorado River Interim Guidelines for Lower Basin Shortages and the Coordinated Operations of Lake Powell and Lake Mead (Interim Guidelines) and based on this August projection, the operational tier for water year 2011 was selected to be the Upper Elevation Balancing Tier. Under this operational tier, there is a possibility that the annual release volume from Lake Powell could be as low as 8.23 maf and there is also a possibility under this tier that Equalization or Balancing could occur which would result in an annual release volume greater than 8.23 maf.

The possibility of Equalization or Balancing in water year 2011 is dependent upon the reservoir conditions of Lake Powell and Lake Mead projected at the end of the water year in the Most Probable April 24-Month Study when the projected Glen Canyon Dam annual release condition is 8.23 maf . The April 24-Month Study, with a projected water year release of 8.23 maf projects the elevation of Lake Powell on September 30, 2011 (end of water year 2011) to be 3662.63 feet above sea level which is above the Equalization Level for 2011 (3643 feet). Based on this model projection and consistent with the Interim Guidelines, the Equalization Tier will govern the operation of Lake Powell for the remainder of water year 2011.

Current Inflow Forecasts and Model Projections

Snowpack conditions above Lake Powell have persisted to be above average since late December 2010. The overall snowpack above Lake Powell on April 7, 2011 was 115% of average. The current Water Supply forecast for Lake Powell (April through July Unregulated Inflow Volume) is 9.5 maf (120% of average) and this forecast was issued by the CBRFC on April 4, 2011.

The unregulated inflow forecast for Lake Powell over the next 3 months is as follows: April-1,100 kaf (112% of average); May-3,000 kaf (130% of average); June-3,850 kaf (125% of average). Incorporating these new forecasts with the current Water Supply forecast, the projected unregulated inflow volume to Lake Powell during water year 2011 is now 13.11 maf (109% of average). These forecasts combined with projected inflows in August and September of 2011 make up the 2011 Most Probable water year inflow condition. The Most Probable inflow condition has a statistical probability of being achieved that is 50%. In other words, there is a 50% chance that the unregulated inflow volume for water year 2011 for Lake Powell will be 13.11 maf or greater.

A Minimum Probable water year inflow conditions has also been developed for water year 2011. The Minimum Probable inflow condition has a statistical probability of being achieved that is 90%. The 2011 Minimum Probable water year inflow condition is currently 10.5 maf (87% of average). A Maximum Probable water year inflow condition has also been developed for water year 2011. The 2011 Maximum Probable inflow condition is currently 16.2 maf (135% of average).

The April 2011 24-Month Study, with the 2011 Most Probable inflow condition projects

that Equalization will be required under the Interim Guidelines and the projected annual release volume is projected to be 11.56 maf. As hydrologic conditions change during the remainder of the water year, this annual release projection will be adjusted to achieve the Equalization Tier of the Interim Guidelines.

Upper Colorado River Basin Hydrology

In the Upper Colorado River Basin during water year 2010, the overall precipitation accumulated through September 30, 2010 was approximately 90% of average based on the 30 year average for the period from 1971 through 2000. For Water Year 2011 thus far, the estimated monthly precipitation within the Upper Colorado River Basin (above Lake Powell) as a percentage of average has been: (October - 135%, November - 95%, December - 225%, January - 50%, February - 100%, March- 90%)

The Climate Prediction Center outlook (dated March 17, 2010) for temperature over the next 3 months indicates that temperatures in the Upper Colorado River Basin are expected to be above average while precipitation over the next 3 months is projected to be near average in the northern reaches of the basin while below average in the southern reaches of the basin.

Upper Colorado River Basin Drought

The Upper Colorado River Basin continues to experience a protracted multi-year drought. Since 1999, inflow to Lake Powell has been below average in every year except water years 2005 and 2008. In the summer of 1999, Lake Powell was close to full with reservoir storage at 23.5 million acre-feet, or 97 percent of capacity. During the next 5 years (2000 through 2004) unregulated inflow to Lake Powell was well below average. This resulted in Lake Powell storage decreasing during this period to 8.0 million acre-feet (33 percent of capacity) which occurred on April 8, 2005. During 2005, 2008 and 2009, drought conditions eased somewhat with net gains in storage to Lake Powell. As of April 7, 2011 the storage in Lake Powell was approximately 12.71 million acre-feet (52.2 % of capacity) which is below desired levels. The overall reservoir storage in the Colorado River Basin as of April 7, 2011 is approximately 31.42 million acre-feet (52.8 % of capacity).

RRFW thanks Rick Clayton, US Bureau of Reclamation for this update.

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From: **RRFW Riverwire** riverwire@rrfw.org
Subject: RRFW Riverwire - Glen Canyon Dam Update
Date: May 9, 2011 at 10:01 AM
To: john@livingrivers.org

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RRFW Riverwire

Glen Canyon Dam Update

May 9, 2011

Glen Canyon Dam / Lake Powell

The unregulated inflow to Lake Powell for April 2011 was 983 thousand acre feet (kaf) (100% of average) which was 117 kaf below the level forecasted for April by the Colorado Basin River Forecast Center which was 1100 kaf (112% of average). On April 9, 2011, the elevation of Lake Powell reached 3609.7 feet above sea level which will likely be the lowest level that occurs during water year 2011. As of May 2, 2011 the elevation had increased to 3612.1 feet above sea level. Inflows are averaging about 25,000 cfs while releases are averaging about 14,400 cfs so the elevation is increasing at over 1 inch per day. It is projected that the elevation of Lake Powell could increase by more than 40 feet to a peak elevation of approximately 3655 feet above sea level by late July or early August which would be approximately 45 feet from the full pool elevation of 3700 feet.

Current Dam Operations

The release volume currently scheduled for May is 1103 kaf. Releases in May, from May 1 through May 13 will be near steady at 14,400 cfs. On May 14, 2011 it is projected that Units 3 and 4 will be returned to service. When this occurs, releases from Glen Canyon Dam will be increased such that daily peak releases will be about 22,000 cfs and off peak releases will be about 16,000 cfs.

The projected release volume for June is currently projected to be 1398 kaf to 1458 kaf. Flows in June will likely be steady, with releases between 23,500 cfs and 24,500 cfs during June in all hours. This will be the estimated power plant capacity during that month based on unit performance.

In addition to daily operations that may or may not include daily fluctuation patterns for load following power generation, the instantaneous releases from Glen Canyon Dam may also fluctuate somewhat to provide approximately 40 megawatts of system regulation. These instantaneous release adjustments maintain stable conditions within the electrical generation and transmission system and result in momentary release fluctuations within a range of about 1100 cfs above or below the targeted hourly release rate. The momentary fluctuations for regulation are very short lived and typically balance out over the hour.

Spinning and non-spinning reserve generation is also maintained at Glen Canyon Dam. In order for Glen Canyon Dam (and other Colorado River Storage Project dams) to participate in the electrical generation and transmissions system, Glen Canyon Dam must provide a level of reserve generation to assist the local control area to maintain electrical supply when unanticipated generation unit outages occur within the control area. Glen Canyon is

required to maintain 99 megawatts (approximately 2,650 cfs of release) of capacity in reserve for these unanticipated outages. When an electrical outage occurs, Glen Canyon Dam can be called upon to provide up to an additional 99 megawatts of generation above what was originally scheduled for Glen Canyon Dam for a duration of 2 hours or less. Under normal circumstances, calls for reserve generation occur fairly infrequently and are for much less than the required 99 megawatts.
Annual Operations-Coordinated Operation of Lake Mead and Lake Powell under Interim Guidelines for Water Year 2011

In August of 2010, the 24-Month Study was used to projected the January 1, 2010 elevations of Lake Powell and Lake Mead. Based on these projected elevations and pursuant to the December 2007 Record of Decision on Colorado River Interim Guidelines for Lower Basin Shortages and the Coordinated Operations of Lake Powell and Lake Mead (Interim Guidelines), the operating tier for water year 2011 was selected to be Upper Elevation Balancing. Operation of Glen Canyon Dam under Upper Elevation Balancing can result in an annual release as low as 7.0 million acre feet (maf) when Balancing or as high as would be required to achieve Equalization which could be as low as 8.23 maf or as high as 13 maf or greater depending on system conditions. The operational outcome of Upper Elevation Balancing is largely dependent on system conditions at the end of the water year that are projected in the April 24-Month Study. For more information on the Interim Guidelines see:

http://www.usbr.gov/lc/region/programs/strategies/RecordofDecision.pdf

Current Inflow Forecasts and Model Projections

Snowpack conditions above Lake Powell have persisted to be above average since late December 2010. The overall snowpack above Lake Powell on May 2, 2011 was 160% of the seasonal average. The snowpack conditions have continued to build basin wide throughout April when typically snowpack begins to melt in April. Temperatures in the Colorado River Basin have remained below average and this has protected the snowpack beyond what was expected just one month ago. The Water Supply forecast for Lake Powell (April through July Unregulated Inflow Volume) was 9.7 maf (123% of average) at mid-April but has been increased substantially for May which is now 11.5 maf (145% of average). The 2011 water year projected unregulated inflow volume was projected in April to be 13.11 maf (109% of average). With the increased forecast for May the updated 2011 water year projected unregulated inflow volume is now 15.34 maf (127% of average). The last water year where Lake Powell observed that level of unregulated inflow was 1996 when the unregulated inflow volume was 17.05 maf (142% of average) and in the 47 years since the closure of Glen Canyon Dam there have only been 8 years where the unregulated inflow volume was at or above the level projected for this year.

The unregulated inflow forecast for Lake Powell over the next 3 months based on the May preliminary Water Supply forecast is as follows: May-3,000 kaf (130% of average); June-5,200 kaf (169% of average); July-2,300 kaf (148% of average). Incorporating these new forecasts the most probable Lake Powell unregulated inflow volume projection for water year 2011 is 15.34 maf (127% of average). This is the median unregulated inflow volume that is forecasted to occur for water year 2011. There is a 50% chance that the unregulated inflow volume will be higher or lower than this volume. A reasonable range of possible

inflow volume will be higher or lower than this volume. A reasonable range of possible inflows is defined by a minimum probable inflow volume and a maximum probable inflow volume. These volumes represent what would be expected to be achieved or exceeded 90% of the time (minimum inflow volume) and 10% of the time (maximum inflow volume). The forecasted water year (2011) minimum probable inflow volume issued for May is 12.4 maf (103% of average). The forecasted water year (2011) maximum probable inflow volume issued for May is 18.1 maf (150% of average). Given this range, there is still a significant amount of uncertainty for how 2011 will play over the next 5 months.

The April 2011 24-Month Study, with the 2011 most probable inflow condition projects that Equalization will be required under the Interim Guidelines and the projected annual release volume from this study is projected to be 11.56 maf. The increased forecast will almost certainly increase the projected annual release volume when the May 24-month study is completed. As hydrologic conditions change during the remainder of the water year, this annual release volume projection will be adjusted to achieve the objectives of the Equalization Tier of the Interim Guidelines.

The April 2011 24-Month Study has been published and is available here:

http://www.usbr.gov/uc/water/crsp/studies/24Month_12.pdf

Updated elevation projections for Lake Powell through water year 2011 and 2012 based on the most recently published 24-Month Study are maintained at:

http://www.usbr.gov/uc/water/crsp/studies/lppwse.html

Upper Colorado River Basin Hydrology

In the Upper Colorado River Basin during water year 2010, the overall precipitation accumulated through September 30, 2010 was approximately 90% of average based on the 30 year average for the period from 1971 through 2000. For Water Year 2011 thus far, the estimated monthly precipitation within the Upper Colorado River Basin (above Lake Powell) as a percentage of average has been: (October - 135%, November - 95%, December - 225%, January - 50%, February - 100%, March - 90%)

The Climate Prediction Center outlook (dated April 21, 2010) for temperature over the next 3 months indicates that temperatures in the Upper Colorado River Basin are expected to be above average while precipitation over the next 3 months is projected to be near average in the northern reaches of the basin while below average in the southern reaches of the basin.

Upper Colorado River Basin Drought

The Upper Colorado River Basin continues to experience a protracted multi-year drought. Since 1999, inflow to Lake Powell has been below average in every year except water years 2005 and 2008. In the summer of 1999, Lake Powell was close to full with reservoir storage at 23.5 million acre-feet, or 97 percent of capacity. During the next 5 years (2000 through 2004) unregulated inflow to Lake Powell was well below average. This resulted in Lake Powell storage decreasing during this period to 8.0 million acre-feet (33 percent of capacity) which occurred on April 8, 2005. During 2005, 2008 and 2009, drought

conditions eased somewhat with near or above average inflow conditions and net gains in storage to Lake Powell. 2011 will be another above average inflow year so drought conditions are easing somewhat in the Colorado River Basin. As of May 2, 2011 the storage in Lake Powell was approximately 12.95 million acre-feet (53.2 % of capacity) which is below desired levels. The overall reservoir storage in the Colorado River Basin as of April 18, 2011 is approximately 31.58 million acre-feet (53.1 % of capacity).

RRFW thanks Rick Clayton of US Bureau of Reclamation for this update.

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From: **RRFW Riverwire** riverwire@rrfw.org
Subject: RRFW Riverwire - Glen Canyon Dam Update
Date: June 8, 2011 at 9:10 PM
To: john@livingrivers.org

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RRFW Riverwire

Glen Canyon Dam Update

June 8, 2011

Glen Canyon Dam Lake Powell

The unregulated inflow volume to Lake Powell for May 2011 was been 2.35 million acre feet (maf) (102% of average). Inflows have increased due to snowmelt runoff within the basin and observed inflows to Lake Powell are averaging nearly 75,000 cubic feet per second (cfs). Observed inflows will likely continue to increase in June and could reach levels near 140,000 cfs by late June. The spring runoff is well under way and there is still significant snow yet to melt at the higher elevations within the basin. Inflows will likely be very high over the next 2 months. The forecasted unregulated inflow for June is 6.1 maf which would be the 2nd wettest June for Lake Powell since the initial operation of Glen Canyon Dam began in 1963.

The elevation of Lake Powell will increase significantly during the months of June and July, 2011. As of June 7, 2011 the elevation of Lake Powell was 3628.4 feet which is about 19 feet above the low elevation of the year (3609.7 feet on April 9, 2011). During June and July, the elevation will likely increase rapidly and is projected to reach a peak elevation for the year in early August 2011 of approximately 3660 to 3665 feet above sea level. This would be 35 to 40 feet below the full pool elevation of 3700 feet. The last time Lake Powell was at an elevation in this range was in October of 2001 near the beginning of the most current drought.

Current Dam Operations

The releases from Glen Canyon Dam are approximately 22,400 cfs which is very near the full capacity of the power plant allowing for 100 megawatts of reserve generation and 40 megawatts of regulation. As the elevation of Lake Powell increases, the capacity of the power plant will also increase and operation of the power plant will be adjusted day by day to release the maximum volume possible. It is anticipated that the release volume for June will be approximately 1,369 kaf with 7 generating units operating at full capacity. The actual release volume for June will largely depend on the generation unit efficiencies that occur throughout the month and could be higher or lower than this anticipated volume.

While the release rate over the next several months is likely to be steady at or near full power plant capacity, the instantaneous releases from Glen Canyon Dam may fluctuate somewhat to provide approximately 40 megawatts of system regulation. These instantaneous release adjustments maintain stable conditions within the electrical generation and transmission system and result in momentary release fluctuations within a range of about 1100 cfs above or below the targeted hourly release rate. The momentary fluctuations for regulation are very short lived and typically balance out over the hour.

Spinning and non-spinning reserve generation is also maintained at Glen Canyon Dam. In order for Colorado River Storage Project (CRSP) power plants to participate in the electrical generation and transmissions system, these dams must maintain a level of generation capacity in reserve to assist the local control area to maintain electrical supply when unanticipated generation outages occur within the control area. The CRSP power plants are required to maintain 100 megawatts (approximately 2,675 cfs of release) of capacity in reserve for these unanticipated outages. When an electrical outage occurs, CRSP power plants can be called upon to provide up to an additional 100 megawatts of generation above what was originally scheduled for a duration of 2 hours or less. Under normal circumstances, calls for reserve generation occur fairly infrequently and are for much less than the required 100 megawatts. Because Glen Canyon Power plant is the largest facility of the CRSP power plants, typically most of the CRSP reserve requirement is maintained there rather than the other CRSP power plants.

Annual Operations-Coordinated Operation of Lake Mead and Lake Powell under Interim Guidelines for Water Year 2011

In August of 2010, the 24-Month Study was used to project the January 1, 2010 elevations of Lake Powell and Lake Mead. Based on these projected elevations and pursuant to the December 2007 Record of Decision on Colorado River Interim Guidelines for Lower Basin Shortages and the Coordinated Operations of Lake Powell and Lake Mead (Interim Guidelines), the operating tier for water year 2011 was selected to be Upper Elevation Balancing. Operation of Glen Canyon Dam under Upper Elevation Balancing can result in an annual release as low as 7.0 maf when balancing or as high as would be required to achieve Equalization which could be as low as 8.23 maf or as high as 13 maf or greater depending on system conditions. The operational outcome of Upper Elevation Balancing is largely dependent on system conditions at the end of the water year that are projected in the April 24-Month Study. For more information on the Interim Guidelines click here: http://www.usbr.gov/lc/region/programs/strategies/RecordofDecision.pdf

Current Inflow Forecasts and Model Projections

Snowpack conditions above Lake Powell that occurred during the winter of 2010-2011 were well above average and resulted in a snowpack condition above Lake Powell on April 10, 2011 that was 119% of average. Typically the snowpack peaks during the first part of April and snow levels normally begin to decrease after about April 10th each year. Temperatures in April of 2011, however, were well below average which allowed the snowpack to continue to build through the month of April. On May 1, 2011 the snowpack above Lake Powell reached its peak level for the year which was approximately 130% of the average seasonal peak snowpack condition. Below average temperatures in the basin persisted in May and by June 1, 2011 only about 30% of the snowpack had melted. The as of June 8, 2011 about 50% of the accumulated snowpack for 2011 had melted. There is still significant snowpack within the basin which will support high inflow conditions for several months.

The Water Supply forecast for Lake Powell (April through July Unregulated Inflow Volume) is now 12.6 maf (159% of average) and the water year unregulated inflow to Powell for 2011 is projected to be 16.7 maf (128% of average). The last water year where

Powell for 2011 is projected to be 16.7 maf (138% of average). The last water year where Lake Powell observed that level of unregulated inflow was 1997 when the unregulated inflow volume was 17.4 maf (145% of average) and only 5 of 47 years since the closure of Glen Canyon Dam have had unregulated inflow volumes greater than what is projected for this year.

The unregulated inflow forecast for Lake Powell over the next 3 months based on the May preliminary Water Supply forecast is as follows: June-6,100 kaf (198% of average); July-3,300 kaf (212% of average); August-950 kaf (155% of average). This forecast was last updated on June 3, 2011. Incorporating these new forecasts the most probable Lake Powell unregulated inflow volume projection for water year 2011 is 16.7 maf (138% of average). This is the median unregulated inflow volume that is forecasted to occur for water year 2011. There is a 50% chance that the unregulated inflow volume will be higher or lower than this volume. A reasonable range of possible inflows is defined by a minimum probable inflow volume and a maximum probable inflow volume. These volumes represent what would be expected to be achieved or exceeded 90% of the time (minimum inflow volume) and 10% of the time (maximum inflow volume). The forecasted water year (2011) minimum probable inflow volume issued for May is 15.1 maf (125% of average). The forecasted water year (2011) maximum probable inflow volume issued for May is 18.5 maf (154% of average). Given this range, there is still a significant amount of uncertainty for how 2011 will play over the next 4 months.

The May 2011 24-Month Study, with the 2011 most probable inflow condition projected the annual release volume to be 12.46 maf. This release volume is the estimated maximum volume that can be released through Glen Canyon Power plant by September 30, 2011. This annual release volume does not achieve the Equalization objective of the Interim Guidelines by September 30th, 2011. As hydrologic conditions change during the remainder of water year 2011, actual and projected releases from Glen Canyon Dam will be adjusted to achieve the Equalization objective of the Interim Guidelines as practicably as is possible by September 30th, 2011. If the Equalization objective is not achieved by September 30th, releases from Glen Canyon Dam will likely remain at power plant capacity until the Equalization objective is achieved.

Updated elevation projections for Lake Powell through water year 2011 and 2012 based on the most recently published 24-Month Study are maintained at http://www.usbr.gov/uc/water/crsp/studies/lppwse.html

Colorado River Basin Hydrology

In the Upper Colorado River Basin during water year 2010, the overall precipitation accumulated through September 30, 2010 was approximately 90% of average based on the 30 year average for the period from 1971 through 2000. For Water Year 2011 thus far, the estimated monthly precipitation within the Upper Colorado River Basin (above Lake Powell) as a percentage of average has been: (October - 135%, November - 95%, December - 225%, January - 50%, February - 100%, March - 85%, April - 155%, May - 155%)

The Climate Prediction Center outlook (dated May 19, 2011) for temperature over the next 3 months indicates that temperatures in the Upper Colorado River Basin are expected to be

above average while precipitation over the next 3 months is projected to be near average in the northern reaches of the basin while below average in the southern reaches of the basin.

Upper Colorado River Basin Drought

The Upper Colorado River Basin has experienced a protracted multi-year drought since early 2000. During this drought, the inflows to Lake Powell have been below average in every year except water years 2005, 2008 and likely 2011. In the summer of 1999, Lake Powell was close to full with reservoir storage at 23.5 million acre-feet, or 97 percent of capacity. During the next 5 years (2000 through 2004) unregulated inflow to Lake Powell was well below average. This resulted in Lake Powell storage decreasing during this period to 8.0 million acre-feet (33 percent of capacity) which occurred on April 8, 2005. During 2005, 2008 and 2009, drought conditions eased somewhat with near or above average inflow conditions and net gains in storage to Lake Powell. 2011 will be another above average inflow year so drought conditions have eased somewhat in the Colorado River Basin over the past 6 years. As of June 7, 2011 the storage in Lake Powell was approximately 14.68 million acre-feet (60.4 % of capacity) which is still below desired levels. The overall reservoir storage in the Colorado River Basin as of June 7, 2011 is approximately 33.82 million acre-feet (56.9 % of capacity).

RRFW thanks Rick Clayton of US Bureau of Reclamation for this update.

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# # #

From: **RRFW Riverwire** riverwire@rrfw.org
Subject: RRFW Riverwire - Glen Canyon Dam Update
Date: July 8, 2011 at 8:45 PM
To: john@livingrivers.org

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RRFW Riverwire

Glen Canyon Dam Update

July 8, 2011

Glen Canyon Dam Lake Powell

The unregulated inflow volume to Lake Powell for June 2011 was 5.40 maf (175% of average). This was below the forecasted volume for June, which was 6.1 maf (198% of average) but was still the third wettest June on record since the closure of Glen Canyon Dam. The observed inflow to Lake Powell peaked on June 11th and 12th at just over 96,000 cfs. Inflows are now declining but are still averaging about 80,000 cfs (as of July 5, 2011). The forecasted unregulated inflow volume for July was increased from 3.30 maf to 3.53 maf (226% of average) which would be the 3rd wettest July for Lake Powell since the operation of Glen Canyon Dam began in 1963.

The reservoir elevation of Lake Powell has increased significantly so far this runoff season. On April 9, 2011 the elevation of Lake Powell was 3609.7 feet above sea level which was the lowest elevation observed so far in 2011. Since that time the elevation of Lake Powell has increased by 42.7 feet to 3652.4 feet on July 5, 2011. The elevation is projected to continue to rise and should peak near 3660 by the end of July. The last time Lake Powell's reservoir elevation was at this level was in October of 2001 (over 10 years ago) near the beginning of the recent drought.

Current Dam Operations

Releases from Glen Canyon Dam are approximately 24,400 cfs which is very near the full capacity of the powerplant. This release rate includes reserving enough generation capacity for up to 100 MW of reserve generation and 40 MW of system regulation. As the elevation of Lake Powell increases, the capacity of the powerplant will change and operation of Glen Canyon Dam will be adjusted daily to maximize release volumes. It is anticipated that the release volume for July will be approximately 1,465 kaf. The actual release volume for July will largely depend on generation unit efficiencies that occur throughout the month and could be higher or lower than this estimated release volume.

While the release rate over the next several months is likely to be steady, the instantaneous releases from Glen Canyon Dam may fluctuate somewhat to provide 40 MW of system regulation. These instantaneous release adjustments maintain stable conditions within the electrical generation and transmission system and result in momentary release fluctuations within a range of about 1100 cfs above or below the targeted hourly release rate. The momentary fluctuations for regulation are very short lived and typically balance out over the hour.

Spinning and non-spinning reserve generation is also maintained at Glen Canyon Dam. In

order for Colorado River Storage Project (CRSP) powerplants to participate in the electrical generation and transmissions system, these powerplants must maintain a level of generation capacity available in reserve to assist the local control area for when unanticipated generation outages occur. The current CRSP powerplant reserve requirement is 100 MW (equivalent to approximately 2,675 cfs of release from Glen Canyon Dam). When an electrical outage occurs within the control area, CRSP powerplants can be called upon to provide up to 100 MW of additional generation for up to 2 hours. Under normal circumstances, calls for reserves infrequent and for much less than the required 100 MW. Because Glen Canyon Powerplant is the largest facility of the CRSP powerplants, most of the CRSP reserve requirement is maintained at Glen Canyon Dam.

Annual Operations-Coordinated Operation of Lake Mead and Lake Powell under Interim Guidelines for Water Year 2011

In August of 2010, the 24-Month Study was used to project the January 1, 2010 elevations of Lake Powell and Lake Mead. Based on these projected elevations and pursuant to the December 2007 Record of Decision on Colorado River Interim Guidelines for Lower Basin Shortages and the Coordinated Operations of Lake Powell and Lake Mead (Interim Guidelines), the operating tier for water year 2011 was selected to be Upper Elevation Balancing. Operation of Glen Canyon Dam under Upper Elevation Balancing can result in annual releases as low as 7.0 maf to as high as 13 maf or greater depending on system conditions. The operational outcome of the Upper Elevation Balancing Tier is largely dependent on system conditions at the end of the water year that are projected in the April 24-Month Study.

The April 2011 24-Month Study projected the end of water year elevation for Lake Powell would be above 3643 feet which is the Equalization Level for 2011. For this reason, pursuant to the Interim Guidelines, Equalization will govern the operation of Glen Canyon Dam for the remaining months of water year 2011. For more information on the Interim Guidelines click http://www.usbr.gov/lc/region/programs/strategies/RecordofDecision.pdf

Current Inflow Forecasts and Model Projections

The Water Supply forecast for Lake Powell (April through July Unregulated Inflow Volume) is 12.0 maf (151% of average) and the water year unregulated inflow to Powell for 2011 is projected to be 16.2 maf (135% of average). The unregulated inflow forecasts for Lake Powell over the next 3 months are as follows: July-3,530 kaf (226% of average); August-950 kaf (155% of average): September-670 kaf (141% of average). These forecasts were last updated on July 1, 2011. Incorporating these new forecasts, the projected most probable unregulated inflow for water year 2011 is now 16.2 maf (131% of average). This is the median projection for water year 2011. There is a 50% chance that the actual volume could be higher and there is a 50% the actual volume could be lower than this projected volume.

The June 24-Month Study projects a Lake Powell WY 2011 annual release volume of 12.44 maf. Due to recent increases to the inflow forecast for Lake Powell, Equalization may not be fully achieved by the end of the water year. The projected Lake Powell releases will be updated each month to reflect changing hydrology in order to achieve the operation specified by the Equalization Tier.

specified by the Equalization Tier.

The July 2011 24-Month Study will published on July 8, 2011 and will be available here:
http://www.usbr.gov/uc/water/crsp/studies/24Month_07.pdf
Updated elevation projections for Lake Powell through water year 2011 and 2012 based on the most recently published 24-Month Study are maintained at:
http://www.usbr.gov/uc/water/crsp/studies/lppwse.html

Upper Colorado River Basin Hydrology

The Upper Colorado River Basin has experienced a protracted multi-year drought since early 2000. During this drought, the inflows to Lake Powell have been below average in every year except water years 2005, 2008 and likely 2011. In the summer of 1999, Lake Powell was close to full with reservoir storage at 23.5 million acre-feet, or 97 percent of capacity. During the next 5 years (2000 through 2004) unregulated inflow to Lake Powell was well below average. This resulted in Lake Powell storage decreasing during this period to 8.0 million acre-feet (33 percent of capacity) which occurred on April 8, 2005.

During 2005, 2008 and 2009, drought conditions eased somewhat with near or above average inflow conditions and net gains in storage to Lake Powell. This year (2011) will likely be another above average inflow year. As of July 5, 2011 the storage in Lake Powell was approximately 17.52 million acre-feet (72.0 % of capacity) which is still below the desired operating level for this time of year. The overall reservoir storage in the Colorado River Basin as of July 5, 2011 is approximately 37.48 million acre-feet (63.0 % of capacity).

RRFW thanks Rick Clayton of the USBOR for this information.

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From: **RRFW Riverwire** riverwire@rrfw.org
Subject: RRFW Riverwire - Glen Canyon Dam Update
Date: August 7, 2011 at 1:40 PM
To: john@livingrivers.org

RR

RRFW Riverwire

Glen Canyon Dam Update

August 7, 2011

Glen Canyon Dam Lake Powell

The unregulated inflow volume to Lake Powell so far in July (as of July 28th) has been 4.15 million acre feet (maf). At the current rate the unregulated inflow volume for July will likely be approximately 4.33 maf which is 278% of average. This July volume will likely be the 2nd wettest July on record since the closure of Glen Canyon Dam (1963). Only 1995 had a wetter July than this year at 4.41 maf. The expected unregulated inflow volume for the April through July period is approximately 12.9 maf (162% of average).

The reservoir elevation of Lake Powell has increased significantly so far this runoff season. On April 9, 2011 the elevation of Lake Powell was 3609.7 feet above sea level which was the lowest elevation observed so far in 2011. Since that time the elevation of Lake Powell has increased by over 50 feet and on July 28, 2011 the reservoir elevation of Lake Powell was 3660.79 feet above sea level (39.21 feet from full pool). The last time Lake Powell's reservoir elevation was at this level was in October of 2001 (over 10 years ago) near the beginning of the recent drought. The live storage of Lake Powell on July 28, 2011 was 18.60 maf which is 76% of capacity. The elevation of Lake Powell is very near the peak elevation that will occur this year. Inflows to Lake Powell are steadily declining and by early August will be less than the release rate at Glen Canyon Dam. When this occurs, the elevation will gradually begin to decline and this condition will continue through the fall and winter months.

Current Dam Operations

Releases from Glen Canyon Dam are approximately 24,100 cubic feet per second (cfs) which is very near the full capacity of the power plant. The release volume for July will likely be approximately 1.485 maf. Releases in August will be similar to July with releases projected to be approximately 24,000 cfs. On August 2nd, 1 unit at Glen Canyon Dam will be out of service from approximately 7:00 am to 4:00 pm for a short term maintenance project. This will reduce the release rate during this period to approximately 20,000 cfs. At the end of August, releases will likely be gradually reduced to approximately 15,000 cfs as a transition to the Steady Flow Experiment to be conducted during September and October of 2011. This year will be the 4th year of a 5 year study of steady flows during September and October as describe in the 2008 Environmental Assessment and Finding of No Significant Impact. The target release rate for the steady flow experiment this year is approximately 15,000 cfs depending on the available capacity of Glen Canyon Power Plant.

While the release rate over the next several months is likely to be steady, the instantaneous

releases from Glen Canyon Dam may fluctuate somewhat to provide 40 Mega Watts (MW) of system regulation. These instantaneous release adjustments maintain stable conditions within the electrical generation and transmission system and result in momentary release fluctuations within a range of about 1100 cfs above or below the targeted hourly release rate. The momentary fluctuations for regulation are very short lived and typically balance out over the hour.

Spinning and non-spinning reserve generation is also maintained at Glen Canyon Dam. In order for Colorado River Storage Project (CRSP) power plants to participate in the electrical generation and transmissions system, these powerplants must maintain a level of generation capacity available in reserve to assist the local control area for when unanticipated generation outages occur. The current CRSP power plant reserve requirement is 100 MW (equivalent to approximately 2,675 cfs of release from Glen Canyon Dam). When an electrical outage occurs within the control area, CRSP power plants can be called upon to provide up to 100 MW of additional generation for up to 2 hours. Under normal circumstances, calls for reserves infrequent and for much less than the required 100 MW. Because Glen Canyon Power plant is the largest facility of the CRSP power plants, most of the CRSP reserve requirement is maintained at Glen Canyon Dam.

Annual Operations-Coordinated Operation of Lake Mead and Lake Powell under Interim Guidelines for Water Year 2011

In August of 2010, the 24-Month Study was used to project the January 1, 2010 elevations of Lake Powell and Lake Mead. Based on these projected elevations and pursuant to the December 2007 Record of Decision on Colorado River Interim Guidelines for Lower Basin Shortages and the Coordinated Operations of Lake Powell and Lake Mead (Interim Guidelines), the operating tier for water year 2011 was selected to be Upper Elevation Balancing. Operation of Glen Canyon Dam under Upper Elevation Balancing can result in annual releases as low as 7.0 maf to as high as 13 maf or greater depending on system conditions. The operational outcome of the Upper Elevation Balancing Tier is largely dependent on system conditions at the end of the water year that are projected in the April 24-Month Study.

The April 2011 24-Month Study projected the end of water year elevation for Lake Powell would be above 3643 feet which is the Equalization Level for 2011. For this reason, pursuant to the Interim Guidelines, Equalization will govern the operation of Glen Canyon Dam for the remaining months of water year 2011. For more information on the Interim Guidelines click here:

http://www.usbr.gov/lc/region/programs/strategies/RecordofDecision.pdf

Current Inflow Forecasts and Model Projections

The Water Supply forecast for Lake Powell (April through July Unregulated Inflow Volume) is 12.0 maf (151% of average) and the water year unregulated inflow to Powell for 2011 is projected to be 16.2 maf (135% of average). The unregulated inflow forecasts for Lake Powell over the next 3 months are as follows: July-4,000 kaf (257% of average); August-1,000 kaf (162% of average): September-670 kaf (141% of average). These forecasts were last updated on July 15, 2011. Incorporating these new forecasts, the

forecasts were last updated on July 15, 2011. Incorporating these new forecasts, the projected most probable unregulated inflow for water year 2011 is now 16.7 maf (139% of average). This is the median projection for water year 2011. There is a 50% chance that the actual volume could be higher and there is a 50% the actual volume could be lower than this projected volume.

The July 24-Month Study projected a Lake Powell WY 2011 annual release volume of 12.45 maf. Due to recent increases to the inflow forecast for Lake Powell, Equalization may not be fully achieved by the end of the water year. The projected Lake Powell releases will be updated each month to reflect changing hydrology in order to achieve the operation specified by the Equalization Tier.

The July 2011 24-Month Study has been published and will be available here:

http://www.usbr.gov/uc/water/crsp/studies/24Month_07.pdf

Updated elevation projections for Lake Powell through water year 2011 and 2012 based on the most recently published 24-Month Study are maintained at:

http://www.usbr.gov/uc/water/crsp/studies/lppwse.html

Upper Colorado River Basin Hydrology

The Upper Colorado River Basin has experienced a protracted multi-year drought since early 2000. During this drought, the inflows to Lake Powell have been below average in every year except water years 2005, 2008 and likely 2011. In the summer of 1999, Lake Powell was close to full with reservoir storage at 23.5 million acre-feet, or 97 percent of capacity. During the next 5 years (2000 through 2004) unregulated inflow to Lake Powell was well below average. This resulted in Lake Powell storage decreasing during this period to 8.0 million acre-feet (33 percent of capacity) which occurred on April 8, 2005.

During 2005, 2008 and 2009, drought conditions eased somewhat with near or above average inflow conditions and net gains in storage to Lake Powell. This year (2011) will likely be another above average inflow year. As of July 28, 2011 the storage in Lake Powell was approximately 18.60 million acre-feet (76.0 % of capacity) which is still below the desired operating level for this time of year. The overall reservoir storage in the Colorado River Basin as of July 28, 2011 is approximately 39.20 million acre-feet (65.9 % of capacity).

RRFW thanks Rick Clayton of the USBOR for this information.

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From: **RRFW Riverwire** riverwire@rrfw.org
Subject: RRFW Riverwire - Glen Canyon Dam Update
Date: October 14, 2011 at 9:05 PM
To: john@livingrivers.org

RR

RRFW Riverwire

Glen Canyon Dam Update

October 13, 2011

Glen Canyon Dam Lake Powell

During September 2011 the unregulated inflow volume to Lake Powell was 532 thousand acre feet (kaf) or 112% of average. This was approximately 93 kaf below what was projected in the September 24-Month Study and resulted in the elevation of Lake Powell ending September about 0.92 feet below what was projected in the September 24-Month Study. The September 30th, 2011 elevation of Lake Powell was 3653.01 feet above sea level which corresponds to a live storage of approximately 17.59 million acre feet (maf) and 72.3% of the full capacity of 24.32 maf.

For water year 2011, the observed unregulated inflow volume to Lake Powell was 16.77 maf (139% of average for the 1971-2000 historical period of record). The 2011 water year unregulated inflow volume was the 6th wettest out of 48 years since the closure of Glen Canyon Dam (1963). Water year unregulated inflow volumes of the magnitude observed in water year 2011 (or greater) would statistically be expected to occur in about 12-14% of all years.

The 2011 water year release volume from Glen Canyon Dam was 12.52 maf and this was the largest water year release volume made from Glen Canyon Dam since water year 1998. During water year 2011 the above average inflow volume combined with the large water year release volume from Glen Canyon Dam resulted in Lake Powell realizing a net gain in elevation (year over year) of 19.35 feet which translates to an increase in live storage in Lake Powell of 2.32 maf.

Current Dam Operations

Releases from Glen Canyon Dam are now being made for a steady flow experiment that will continue to the end of October. Releases from Glen Canyon Dam are steady at approximately 15,500 cfs and will likely remain at the level through October 31, 2011 to complete the 2 month steady flow experiment.

In early November through November 10, 2011, releases will likely continue to be steady near 15,500 cfs due to ongoing maintenance work at Glen Canyon Power-plant on units 5 and 6. On or about November 11, 2011 releases will likely be increased to approximately 22,600 cfs when units 5 and 6 are returned to service. The projected release volume for November is 1200 kaf.

While the release rate from Glen Canyon Dam over the next several months will likely be near steady, the instantaneous releases from Glen Canyon Dam may fluctuate somewhat to provide 40 MW of system regulation. These instantaneous release adjustments maintain stable conditions within the electrical generation and transmission system and result in momentary release fluctuations within a range of about 1100 cfs above or below the targeted hourly release rate. The momentary fluctuations for regulation are very short lived and typically balance out over the hour.

Spinning and non-spinning reserve generation is also maintained at Glen Canyon Dam. In order for Colorado River Storage Project (CRSP) power-plants to participate in the electrical generation and transmissions system, these power-plants must maintain a level of generation capacity available in reserve to assist the local control area for when unanticipated generation outages occur. The current CRSP power plant reserve requirement is 100 MW (equivalent to approximately 2,675 cfs of release from Glen Canyon Dam). When an electrical outage occurs within the control area, CRSP power-plants can be called upon to provide up to 100 MW of additional generation for up to 2 hours. Under normal circumstances, calls for reserves are infrequent and for much less than the required 100 MW. Because Glen Canyon Power-plant is the largest facility of the CRSP power-plants, most of the CRSP reserve requirement is maintained at Glen Canyon Dam.

Current Inflow Forecasts and Model Projections

Over the next three months (October, November and December) the forecasted unregulated inflow to Lake Powell is projected to be above average with monthly percent of average forecasts of 119%, 115% and 120%, respectively. The hydrologic outlook forecast for water year 2012 has been revised in October and now projects that the most probable (median) unregulated inflow volume to be 11.6 maf (96% of average based on the period from 1971 through 2000). Based on this revised hydrologic outlook forecast, the October 24-Month Study projects the annual release volume for water year 2012 will likely be 12.26 maf. The October 24-Month Study also projects that the end of water year reservoir elevation and storage for Lake Powell will likely be 3645.00 feet (55.00 feet from full pool) and 16.60 maf (68% of capacity), respectively.

Upper Colorado River Basin Hydrology

Since water year 2005, hydrologic conditions in the Upper Colorado River Basin have been slightly below average with significant variability from year to year. The unregulated inflow to Lake Powell, which is a good measure of the hydrologic condition in the Colorado River Basin, has averaged 11.15 maf per year during the period from 2005 through 2011. This is slightly below the official average of 12.04 maf per year. The hydrologic variability during this period has been from a low water year unregulated inflow of 8.40 maf (70% of average) in water year 2006 to a high of over 16.77 maf (139% of average) which occurred in water year 2011.

Overall reservoir storage in the Colorado River Basin has increased by nearly 10 maf since the beginning of water year 2005 and this is a significant improvement over the drought conditions during water years 2000 through 2004. On October 1, 2004, the beginning of water year 2005, the total reservoir storage in the Colorado River Basin was 29.84 maf (50.2% of capacity). As of October 12, 2011, the total reservoir storage in the Colorado River Basin was 38.62 maf (64.9% of capacity).

RRFW thanks Rick Clayton of the USBOR for this information.

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# # #

From: **Tom Martin** tommartin@rrfw.org
Subject: FW: RRFW Riverwire - Glen Canyon Dam Update
Date: November 6, 2011 at 1:19 PM
To: John Weisheit john@livingrivers.org

TM

Hi Jo, interesting… this went to my Junk email folder.

Yes, I do get white spaces, and have to reformat and send to myself again for most riverwires. I dunno why that is, and assume it is something I am doing wrong in my Word program…

Yours, tom

From: RRFW Riverwire [mailto:jo@rrfw.ccsend.com] **On Behalf Of** RRFW Riverwire
Sent: Sunday, November 06, 2011 11:46 AM
To: tommartin@rrfw.org
Subject: *** SPAM ***RRFW Riverwire - Glen Canyon Dam Update

Hi Tom, I have a bunch of white space between paragraphs on my test email. Do you have those, too?

RRFW Riverwire

Glen Canyon Dam Update

November 6, 2011

Glen Canyon Dam Lake Powell

During October 2011 the unregulated inflow volume to Lake Powell was 575 thousand acre feet (kaf) which is 105% of average. This was approximately 75 kaf below what was projected in the October 24-Month Study and resulted in the elevation of Lake Powell ending October about 1.26 feet below what was projected in the October 24-Month Study. The October 31th, 2011 elevation of Lake Powell was 3650.27 feet above sea level which corresponds to a live storage of approximately 17.25 million acre feet (maf) and 70.9% of the full capacity of 24.32 maf.

For water year 2011, the observed unregulated inflow volume to Lake Powell was 16.77 maf (139% of average for the 1971-2000 historical period of record). The 2011 water year unregulated inflow volume was the 6th wettest out of 48 years since the closure of Glen Canyon Dam (1963). Water year unregulated inflow volumes of the magnitude observed in water year 2011 (or greater) would statistically be expected to occur in about 12-14% of all years.

The 2011 water year release volume from Glen Canyon Dam was 12.52 maf and this was the largest water year release volume made from Glen Canyon Dam since water year 1998. During water year 2011 the above average inflow volume combined with the large water year release volume from Glen Canyon Dam resulted in Lake Powell realizing a net gain in elevation (year over year) of 19.35 feet which translates to an increase in live storage in Lake Powell of 2.32 maf.

Current Dam Operations

Releases from Glen Canyon Dam for the 2011 steady flow experiment ended at midnight on October 31, 2011. Releases from Glen Canyon Dam are now being maximized within unit availability to release Equalization water for 2011. At the end of water year 2011 (September 30, 2011) the elevation of Lake Powell was 3653.01 feet above sea level and

(September 30, 2011) the elevation of Lake Powell was 3653.01 feet above sea level and this was 10.01 feet above the Equalization level for water year 2011 (3643 feet) and translated to a volume of 1.123 maf that was in storage above the 2011 Equalization level. Releases from Glen Canyon Dam are being made at the full capacity of the power-plant to release this additional volume in order to achieve the 2011 Equalization objective. Once this additional volume has been released, releases from Glen Canyon Dam will be reduced from the full capacity of the power-plant. Current projections are that this objective will likely be completed by late December 2011.

Beginning on November 4, 2011, releases from Glen Canyon Dam will be adjusted to approximately 15,025 cubic feet per second (cfs) until the end of the day on November 10, 2011. Releases will likely be steady during this period. Glen Canyon Dam will maintain 109 megawatts (MW) of generation capacity for possible calls on reserve generation and 40 MW of generation capacity for system regulation.

Beginning on November 11, 2011, releases from Glen Canyon Dam will be adjusted to approximately 19,325 cfs until the end of the day on November 17, 2011. Releases will likely be steady during this period. Glen Canyon Dam will maintain 69 MW of generation capacity for possible calls on reserve generation and 40 MW of generation capacity for system regulation.

Beginning on November 18, 2011, releases from Glen Canyon Dam will be adjusted to approximately 20,750 cfs until the end of the day on November 30, 2011. Releases will likely be steady during this period. Glen Canyon Dam will maintain 15 MW of generation capacity for possible calls on reserve generation and 40 MW of generation capacity for system regulation.

The total release volume for November will be approximately 1.100 maf in order to complete this release schedule. Hourly and daily average releases from Glen Canyon Dam for November 2011 will be scheduled through Western Area Power Administration. While daily fluctuations are not anticipated during November, all release adjustments will be scheduled to be consistent with the Glen Canyon Dam Operating Criteria (Federal Register, Volume 62, No. 41, March 3, 1997).

The anticipated release volume for December 2011 will be 1.225 maf. This will be confirmed in a subsequent notification toward the end of November.

While the release rate from Glen Canyon Dam over the next two months will likely be near steady, the instantaneous releases from Glen Canyon Dam may fluctuate somewhat to provide 40 MW of system regulation. These instantaneous release adjustments maintain stable conditions within the electrical generation and transmission system and result in momentary release fluctuations within a range of about 1,100 cfs above or below the targeted hourly release rate. The momentary fluctuations for regulation are very short lived and typically balance out over the hour.

Spinning and non-spinning reserve generation may also be maintained at Glen Canyon Dam. In order for Colorado River Storage Project (CRSP) power-plants to participate in the electrical generation and transmissions system, these power-plants must maintain a level of generation capacity available in reserve to assist the local control area for when unanticipated generation outages occur. The current CRSP power-plant reserve requirement is 100 MW (equivalent to approximately 2,675 cfs of release from Glen Canyon Dam). When an electrical outage occurs within the control area, CRSP power-plants can be called upon to provide up to 100 MW of additional generation for up to 2

hours. Under normal circumstances, calls for reserves are infrequent and for much less than the required 100 MW. Because Glen Canyon Power-plant is the largest facility of the CRSP power-plants, most of the CRSP reserve requirement is maintained at Glen Canyon Dam but at times this reserve requirement is maintained at other plants within the CRSP system.

Current Inflow Forecasts and Model Projections

Over the next three months (October, November and December) the forecasted unregulated inflow to Lake Powell is projected to be above average with monthly percent of average forecasts of 119%, 115% and 120%, respectively. The hydrologic outlook forecast for water year 2012 has been revised in October and now projects that the most probable (median) unregulated inflow volume to be 11.6 maf (96% of average based on the period from 1971 through 2000). Based on this revised hydrologic outlook forecast, the October 24-Month Study projects the annual release volume for water year 2012 will likely be 12.26 maf. The October 24-Month Study also projects that the end of water year reservoir elevation and storage for Lake Powell will likely be 3645.00 feet (55.00 feet from full pool) and 16.60 maf (68% of capacity), respectively.

The October 2011 24-Month Study has been published and is available here:

http://www.usbr.gov/uc/water/crsp/studies/24Month_10.pdf

This study will be updated to reflect November 2011conditions during the second week of November 2011. Updated elevation projections for Lake Powell through water year 2012 based on the most recently published 24-Month Study are maintained at:

http://www.usbr.gov/uc/water/crsp/studies/lppwse.html

Upper Colorado River Basin Hydrology

Since water year 2005, hydrologic conditions in the Upper Colorado River Basin have been slightly below average with significant variability from year to year. The unregulated inflow to Lake Powell, which is a good measure of the hydrologic condition in the Colorado River Basin, has averaged 11.15 maf per year during the period from 2005 through 2011. This is slightly below the official average of 12.04 maf per year. The hydrologic variability during this period has been from a low water year unregulated inflow of 8.40 maf (70% of average) in water year 2006 to a high of over 16.77 maf (139% of average) which occurred in water year 2011.

Overall reservoir storage in the Colorado River Basin has increased by nearly 10 maf since the beginning of water year 2005 and this is a significant improvement over the drought conditions during water years 2000 through 2004. On October 1, 2004, the beginning of water year 2005, the total reservoir storage in the Colorado River Basin was 29.84 maf (50.2% of capacity). As of October 12, 2011, the total reservoir storage in the Colorado River Basin was 38.62 maf (64.9% of capacity).

RRFW thanks Rick Clayton of the USBOR for this information.

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From: riverwire@rrfw.org
Subject: [Rafting_Grand_Canyon] RRFW Riverwire - Glen Canyon Dam Update
Date: December 14, 2011 at 7:49 PM
To: RGC Rafting_Grand_Canyon@yahoogroups.com

RRFW Riverwire - Glen Canyon Dam Update
Dec 14, 2011

Glen Canyon Dam / Lake Powell

During November 2011 the unregulated inflow volume to Lake Powell was 570 thousand acre feet (kaf) - 108% of average. This was very close to the forecast volume issued by the Colorado Basin River Forecast Center on November 1, 2011. The forecast volume was 600 kaf (110% of average). Releases from Glen Canyon Dam during November were 1099 kaf and the elevation of Lake Powell decreased by 4.59 ending November at an elevation of 3645.69 feet above sea level. Releases from Glen Canyon Dam are currently averaging approximately 20,300 cfs and are near steady. This release rate is likely to continue to near the end of December and then will likely be reduced to a daily average release of approximately 16,300 cfs with daily fluctuations for power generation.

Current Dam Operations

Releases from Glen Canyon Dam for the Steady Flow Experiment (see Experimental Releases from Glen Canyon Dam, Arizona 2008 through 2012, Final Environmental Assessment and Finding of No Significant Impact) ended at midnight on October 31, 2011. The steady flow target for 2011 was 15,500 cfs which was the maximum sustainable release rate from Glen Canyon Dam during September and October. Since then, releases from Glen Canyon Dam have been maximized at powerplant capacity which varies depending on unit efficiency and availability. Current releases are approximately 20,300 cfs.

Since March 2011, releases from Glen Canyon Dam have been maximized through the powerplant in order to achieve the Equalization objectives of the Interim Guidelines. The Equalization objective for water year 2011 was to release sufficient volume from Glen Canyon Dam during the water year such that the elevation of Lake Powell would be 3643 feet above sea level on September 30, 2011.

Inflows to Lake Powell during the spring and summer of 2011 were well above average and the 7 months of maximum powerplant capacity releases from Glen Canyon Dam were not sufficient to achieve an elevation of 3643 feet on September 30, 2011. The elevation of Lake Powell on September 30, 2011 was 3653.01 feet above sea level and this translates to a volume of 1.233 maf that was in storage in Lake Powell on September 30, 2011 that would have otherwise been released for Equalization during water year 2011 if the powerplant had the capacity to make these higher releases.

Releases through the powerplant during the first 3 months of water year 2012 (October, November and December, 2011) have continued at powerplant capacity in order to make up for the Equalization releases that were not made in water year 2011 due to the limitations of the powerplant. It is currently projected that the additional release volume will be completed by the end of December 2011 at which time releases from Glen Canyon Dam will be reduced. It is estimated that this release reduction will likely occur on or about December 28, 2011. The instantaneous release rate from Glen Canyon Dam may fluctuate somewhat to provide 40 MW of system regulation

fluctuate somewhat to provide 40 MW of system regulation.

These instantaneous release adjustments maintain stable conditions within the electrical generation and transmission system and result in momentary release fluctuations within a range of about 1100 cfs above or below the targeted hourly release rate. The momentary fluctuations for regulation are very short lived and typically balance out over the hour.

Spinning and non-spinning reserve generation may also be maintained at Glen Canyon Dam. In order for Colorado River Storage Project (CRSP) powerplants to participate in the electrical generation and transmissions system, these powerplants must maintain a level of generation capacity available in reserve to assist the local control area for when unanticipated generation outages occur. The current CRSP powerplant reserve requirement is 109 MW (equivalent to approximately 2,675 cfs of release from Glen Canyon Dam).

When an electrical outage occurs within the control area, CRSP powerplants can be called upon to provide up to 109 MW of additional generation for up to 2 hours. Under normal circumstances, calls for reserves are infrequent and for much less than the required 109 MW. Because Glen Canyon Powerplant is the largest facility of the CRSP powerplants, typically most of the CRSP reserve requirement is maintained at Glen Canyon Dam but at times this reserve requirement is maintained at other plants within the CRSP system.

Current Inflow Forecasts and Model Projections

Over the next three months (December, January and February) the forecasted unregulated inflow to Lake Powell is projected to be above average with monthly percent of average forecasts of 115%, 111% and 107%, respectively. Based on these updated forecast values and the Hydrologic Outlook for water year 2012 (provided in October, 2011) the current projection for the most probable unregulated inflow volume to Lake Powell for water year 2012 is 11.4 maf (95% of average). At this time of year, there is a high level of uncertainty associated with this projection. Based on this projection, the December 2011 24-Month Study projects the water year 2012 most probable release volume will be 11.9 maf under the Equalization Tier of the Interim Guidelines. The December 2011 24-Month Study also projects the elevation condition for Lake Powell and Lake Mead at the end of water year 2012 to be 3645.0 feet and 1139.4 feet, respectively.

Upper Colorado River Basin Hydrology

Since water year 2005, hydrologic conditions in the Upper Colorado River Basin have been slightly below average with significant variability from year to year. The unregulated inflow to Lake Powell, which is a good measure of the hydrologic condition in the Colorado River Basin, has averaged 11.15 maf per year during the period from 2005 through 2011. This is slightly below the official average of 12.04 maf per year. The hydrologic variability during this period has been from a low water year unregulated inflow of 8.40 maf (70% of average) in water year 2006 to a high of over 16.77 maf (139% of average) which occurred in water year 2011.

Overall reservoir storage in the Colorado River Basin has increased by nearly 10 maf since the beginning of water year 2005 and this is a significant improvement over the drought conditions during water years 2000 through 2004. On October 1, 2004, the beginning of water year 2005, the total reservoir storage in the Colorado River Basin was 29.84 maf (50.2% of capacity). As of December 6, 2011, the total reservoir storage in the

capacity). As of December 6, 2011, the total reservoir storage in the Colorado River Basin was 38.41 maf (64.6% of capacity).

RRFW thanks Rick Clayton, US Bureau of Reclamation

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http://www.rrfw.org/RaftingGrandCanyon/Main_Page

From: **RRFW Riverwire** riverwire@rrfw.org
Subject: RRFW Riverwire - Glen Canyon Dam Update January 2012
Date: January 19, 2012 at 4:10 PM
To: john@livingrivers.org

RR

RRFW Riverwire
Glen Canyon Dam Update

January 19, 2012

Glen Canyon Dam, Lake Powell

During December 2011 the unregulated inflow volume to Lake Powell was 359 thousand acre-feet (kaf). This represents 99% of average based on the historic period from 1981 through 2010. This was well below the volume forecasted for the month of December which was 500 kaf (138% of average). As a result, the elevation of Lake Powell at the end of December was 3639.7 feet above sea level which was 1.1 feet lower than projected at the beginning of December.

Snowpack conditions above Lake Powell are well below average for this time of year. As of January 9, 2012 the overall snowpack above Lake Powell was only 60% of average. Reclamation has received the first Water Supply forecast for 2012 and the April through July unregulated inflow to Lake Powell is projected to be 5.05 million acre-feet (maf) which is 71% of average. Based on this forecast, the projected most probable (i.e. 50% likely to be exceeded) annual release volume from Glen Canyon Dam in water year 2012 will be 9.46 maf. At this time of year however, there is a high level of uncertainty in hydrologic forecasts and the annual release volume from Glen Canyon Dam in WY2012 will ultimately be based on actual hydrology rather than forecasted hydrology.

Current Dam Operations

In response to the Water Supply forecast issued for Lake Powell in January, Reclamation has reduced the release volume for January from 1000 kaf to 850 kaf. This reduction began on January 10, 2012. Releases from Glen Canyon Dam are currently averaging about 13,200 cubic feet-per-second (cfs) with fluctuations for power generation throughout the day that peak near 17,500 cfs in the afternoons. Early morning low releases are about 9,500 cfs. This operation is consistent with the Glen Canyon Operating Criteria (Federal Register, Volume 62, No. 41, March 3, 1997).

It is forecasted that in February, releases from Glen Canyon Dam will most likely be about 650 kaf which is a daily average of 11,300 cfs. Fluctuations will range between 7,000 cfs off peak to 13,000 cfs on-peak. In March, current forecasts estimate a likely release of 600 kaf which is a daily average of 9,758 cfs. Fluctuations will range between 7,000 cfs off peak and 13,000 cfs on peak. February's release volume will most likely not change. While the release volume in March won't be less than 600 kaf, if the basin hydrology becomes wetter than currently expected, there is a moderate chance that Reclamation will increase the release volume.

In addition to hourly release fluctuations for load following power generation, the instantaneous releases from Glen Canyon Dam may also fluctuate somewhat to provide 40 MW of system regulation. These instantaneous release adjustments stabilize the electrical generation and transmission system and translate to a range of about 1100 cfs above or below the hourly release rate that is scheduled for a given hour. Typically, fluctuations for system regulation are very short lived and balance out over the hour and do not have noticeable impacts on river flow conditions.

Releases from Glen Canyon Dam can also fluctuate beyond the typical load following pattern when called upon as a partner that shares reserve requirements within the electrical generator community (i.e. control area). There are many generators that supply electricity to the transmission system within the control area. At times, a participating generator may experience operating conditions such that it cannot make its scheduled delivery of electricity to the system (i.e. outage). To provide system reliability, all participating electricity generators within the control area maintain a specified level of generation capacity (i.e. reserves) that can be called upon when an outage occurs. Glen Canyon Dam typically maintains 109 megawatts (MW) of reserves for this purpose.

Reserve agreements allow the controllers of the transmission system to call upon Glen Canyon Dam for up to 109 MW of additional generation beyond what is originally scheduled for a given hour. These calls for reserve

109 MW of additional generation beyond what is originally scheduled for a given hour. These calls for reserve generation can be maintained for up to 2 hours in total duration. The 109 MW reserve requirement for Glen Canyon Dam translates to approximately 2,700 cfs of flow in the river and calls for reserves can have noticeable impacts on river flow conditions. Calls for reserves are fairly infrequent and typically are for much less than the maximum requirement of 109 MW.

In August 2011, as part of the Colorado River Annual Operating Plan process, the Operating Tier for Glen Canyon Dam was determined to be the Equalization Tier under the 2008 Interim Guidelines. Under the Equalization Tier, with 1.233 maf of release volume carried over from 2011 to 2012, the annual release volume for WY2012 could be as low as 9.46 maf to as high as 13.1 maf or higher depending on actual inflow conditions. As inflow and storage conditions for Lake Powell and Lake Mead change throughout the year, Reclamation will make practicable adjustments to the operation of Glen Canyon Dam to release the appropriate annual volume during 2012. The overall goal during 2012 in terms of annual release will be to achieve the objectives of the Equalization Tier of the Interim Guidelines.

Current Inflow Forecasts and Model Projections

Over the next three months (January, February, March) the forecasted unregulated inflow volume to Lake Powell is projected to be 375 kaf (104% of average), 410 kaf (104% of average) and 575 kaf (86% of average), respectively. These percent of averages are all based on the historic period from 1981 through 2010. Combining this forecast with the January Water Supply Forecast and extending projections to the end of WY2012, the most probable (i.e. 50% likely to be exceeded) unregulated inflow volume for WY2012 is now projected to be 8.55 maf (79% of average). The minimum probable (i.e. 90% likely to be exceeded) unregulated inflow volume for WY2012 is now projected to be 5.48 maf (51% of average). The maximum probable (i.e. 10% likely to be exceeded) unregulated inflow volume for WY2012 is now projected to be 12.65 maf (117% of average).

Based on this range of possible inflow conditions, the January 24-Month Study projects the annual release volume for WY2012 to be as lows as 9.46 maf (under the minimum probable inflow condition) to as high as 13.01 maf (under the maximum probable inflow condition). Under the most probable inflow condition, the annual release volume is projected to be 9.46 maf and the elevation of Lake Powell at the end of WY2012 is projected to be 3643.9 feet above sea level. This elevation corresponds to a live storage volume of 16.47 maf (68% of full capacity).

Upper Colorado River Basin Hydrology

Since water year 2005, hydrologic conditions in the Upper Colorado River Basin have been near average with significant variability from year to year. The unregulated inflow to Lake Powell, which is a good measure of the hydrologic condition in the Colorado River Basin, has averaged 10.98 maf (101% of average (period 1981-2010) per year during the period from 2005 through 2011. The hydrologic variability during this period has been from a low water year unregulated inflow of 8.62 maf (80% of average) in water year 2006 to a high of 15.97 maf (147% of average) which occurred in water year 2011.

Overall reservoir storage in the Colorado River Basin has increased by nearly 10 maf since the beginning of water year 2005 and this is a significant improvement over the drought conditions during water years 2000 through 2004. On October 1, 2004, the beginning of water year 2005, the total reservoir storage in the Colorado River Basin was 29.84 maf (50.2% of capacity). As of January 10, 2012 the total reservoir storage in the Colorado River Basin was 38.54 maf (64.8% of capacity).

RRFW thanks Rick Clayton of the USBOR for this information.

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From: **RRFW Riverwire** riverwire@rrfw.org
Subject: RRFW Riverwire - Glen Canyon Dam Update February 2012
Date: February 11, 2012 at 2:05 PM
To: john@livingrivers.org

RR

RRFW Riverwire
Glen Canyon Dam Update

February 11, 2012

Glen Canyon Dam, Lake Powell

In January 2012 the unregulated inflow volume to Lake Powell was 356 thousand acre feet (kaf), or 99% of average. This volume is very close to the final forecast for January issued by the Colorado Basin River Forecast Center on January 5th which was 375 kaf. The elevation of Lake Powell on January 31st, 2012 was 3636.90 feet above sea level (63.10 feet below full pool). During January, the elevation of Lake Powell decreased by 3.52 feet and it is likely that the elevation will continue to decrease near this rate for approximately 2 more months. By late March or early April, when the snowpack begins to melt, inflows will likely increase to a point where they are greater than releases and the elevation will begin to rise. Snowpack conditions above Lake Powell are 77% of average as of February 8, 2012.

The current Water Supply forecast (April through July Unregulated Inflow Volume) for Lake Powell for 2012 is 5.05 million acre feet (maf) which is 71% of average. Based on this inflow forecast, it is currently projected that the most probable annual release from Glen Canyon Dam in water year 2012 will be 9.46 maf. At this time of year however, there is a high level of uncertainty in hydrologic forecasts and the annual release volume from Glen Canyon Dam in WY2012 will ultimately be based on the actual inflows that occur during 2012 rather than this Water Supply forecast.

Current Dam Operations

In August 2011, pursuant to the Interim Guidelines, the Operating Tier for Glen Canyon Dam was established to be the Equalization Tier. Under the Equalization Tier for 2012, with 1.233 maf of release carried over from 2011 to 2012, the annual release volume for 2012 could be as low as 9.46 maf or higher depending on actual inflow conditions. As hydrologic conditions for Lake Powell and Lake Mead change throughout the year, Reclamation will adjust operations of Glen Canyon Dam to release the appropriate annual volume during 2012 to achieve Equalization objectives as practicably as possible by September 30, 2012.

Releases from Glen Canyon Dam are currently averaging about 12,500 cubic feet per second (cfs) with fluctuations for power generation throughout the day that peak near 13,000 cfs in the afternoons and with early morning low level releases are about 7,000 cfs. This operation is consistent with the Glen Canyon Operating Criteria (Federal Register, Volume 62, No. 41, March 3, 1997). The release volume for February is scheduled to be 650 kaf. In March, the monthly release volume will likely be 600 kaf and fluctuating releases from Glen Canyon Dam will likely average about 10,100 cfs each day with scheduled daily fluctuations occurring within the range from 7,000 cfs to 13,000 cfs.

In addition to daily scheduled fluctuations for power generation, the instantaneous releases from Glen Canyon Dam may also fluctuate to provide 40 megawatts (MW) of system regulation. These instantaneous release adjustments stabilize the electrical generation and transmission system and translate to a range of about 1100 cfs above or below the hourly scheduled release rate. Typically, fluctuations for system regulation are very short lived and balance out over the hour and do not have noticeable impacts on downstream river flow conditions.

Releases from Glen Canyon Dam can also fluctuate beyond scheduled fluctuations for power generation when called upon as a partner that shares reserve requirements within the electrical generator community (i.e. balancing area). There are many generators that supply electricity to the transmission system within the balancing area. At times, a participating generator may experience operating conditions such that it cannot make its scheduled delivery of electricity to the system (i.e. unscheduled outage). To provide system reliability, all participating electricity generators within the balancing area maintain a specified level of generation capacity (i.e. reserves) that can be called upon when an unscheduled outage occurs. Glen Canyon Dam typically maintains 113 MW of reserves for this purpose.

Reserve agreements allow the controllers of the balancing area to call upon Glen Canyon Dam to produce up to an additional 113 MW of electricity beyond what is originally scheduled for a given hour. Reserve calls can be maintained for a maximum of 2 hours after which time the generation rate should be returned to the original schedule. The 113 MW reserve requirement for Glen Canyon Dam translates to approximately 2,800 cfs of flow in the river. When the balancing area controllers call for reserve generation from Glen Canyon Dam, releases from the dam can exceed scheduled levels and have a noticeable impact on the river downstream from Glen Canyon Dam. But these calls for reserves are fairly infrequent and typically are for much less than the required level of 113 MW.

Current Inflow Forecasts and Model Projections

Over the next three months (February, March and April) the forecasted unregulated inflow volume to Lake Powell is projected to be 390 kaf (99% of average), 550 kaf (83% of average) and 800 kaf (76% of average), respectively. These percent of averages are all based on the historic period from 1981 through 2010. Combining this forecast with the February Water Supply Forecast and extending projections to the end of WY2012, the most probable (i.e. 50% likely to be exceeded) unregulated inflow volume for WY2012 is projected to be 8.48 maf (78% of average). There is significant uncertainty associated with this forecast. Recent analysis indicates that it is reasonably possible for the actual unregulated inflow volume to be as low as 5.48 maf (51% of average) or as high as 12.65 maf (117% of average) depending on the range of precipitation patterns that could occur over the next several months.

Based on the reasonable range inflow conditions that could occur this year, the annual release volume from Glen Canyon Dam could be as low as 9.46 maf to as high as 12.92 maf. Under the most probable inflow condition, the annual release volume is projected to be 9.46 maf and the elevation of Lake Powell at the end of WY2012 is projected to be 3643.2 feet above sea level. This elevation corresponds to a live storage volume of 16.38 maf (67% of full capacity).

Upper Colorado River Basin Hydrology

Since water year 2005, hydrologic conditions in the Upper Colorado River Basin have been near average with significant variability from year to year. The unregulated inflow to Lake Powell, which is a good measure of the hydrologic condition in the Colorado River Basin, has averaged 10.98 maf (101% of average (period 1981-2010)) per year during the period from 2005 through 2011. The hydrologic variability during this period has been from a low water year unregulated inflow of 8.62 maf (80% of average) in water year 2006 to a high of 15.97 maf (147% of average) which occurred in water year 2011.

Overall reservoir storage in the Colorado River Basin has increased by nearly 10 maf since the beginning of water year 2005 and this is a significant improvement over the drought conditions during water years 2000 through 2004. On October 1, 2004, the beginning of water year 2005, the total reservoir storage in the Colorado River Basin was 29.84 maf (50.2% of capacity). As of January 30, 2012 the total reservoir storage in the Colorado River Basin was 38.35 maf (64.3% of capacity).

RRFW thanks Rick Clayton of the USBOR for this information.

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From: **RRFW Riverwire** riverwire@rrfw.org
Subject: RRFW Riverwire - Glen Canyon Dam Update March 2012
Date: March 20, 2012 at 11:20 AM
To: john@livingrivers.org

RR

RRFW Riverwire
Glen Canyon Dam Update

March 20, 2012

Glen Canyon Dam, Lake Powell

In January 2012 the unregulated inflow volume to Lake Powell was 356 thousand acre feet (kaf), or 99% of average. This volume is very close to the final forecast for January issued by the Colorado Basin River Forecast Center on January 5th which was 375 kaf. The elevation of Lake Powell on January 31st, 2012 was 3636.90 feet above sea level (63.10 feet below full pool). During January, the elevation of Lake Powell decreased by 3.52 feet and it is likely that the elevation will continue to decrease near this rate for approximately 2 more months. By late March or early April, when the snowpack begins to melt, inflows will likely increase to a point where they are greater than releases and the elevation will begin to rise. Snowpack conditions above Lake Powell are 77% of average as of February 8, 2012.

The current Water Supply forecast (April through July Unregulated Inflow Volume) for Lake Powell for 2012 is 5.05 million acre feet (maf) which is 71% of average. Based on this inflow forecast, it is currently projected that the most probable annual release from Glen Canyon Dam in water year 2012 will be 9.46 maf. At this time of year however, there is a high level of uncertainty in hydrologic forecasts and the annual release volume from Glen Canyon Dam in WY2012 will ultimately be based on the actual inflows that occur during 2012 rather than this Water Supply forecast.

Current Dam Operations

In August 2011, pursuant to the Interim Guidelines, the Operating Tier for Glen Canyon Dam was established to be the Equalization Tier. Under the Equalization Tier for 2012, with 1.233 maf of release carried over from 2011 to 2012, the annual release volume for 2012 could be as low as 9.46 maf or higher depending on actual inflow conditions. As hydrologic conditions for Lake Powell and Lake Mead change throughout the year, Reclamation will adjust operations of Glen Canyon Dam to release the appropriate annual volume during 2012 to achieve Equalization objectives as practicably as possible by September 30, 2012.

Releases from Glen Canyon Dam are currently averaging about 12,500 cubic feet per second (cfs) with fluctuations for power generation throughout the day that peak near 13,000 cfs in the afternoons and with early morning low level releases are about 7,000 cfs. This operation is consistent with the Glen Canyon Operating Criteria (Federal Register, Volume 62, No. 41, March 3, 1997). The release volume for February is scheduled to be 650 kaf. In March, the monthly release volume will likely be 600 kaf and fluctuating releases from Glen Canyon Dam will likely average about 10,100 cfs each day with scheduled daily fluctuations occurring within the range from 7,000 cfs to 13,000 cfs.

In addition to daily scheduled fluctuations for power generation, the instantaneous releases from Glen Canyon Dam may also fluctuate to provide 40 megawatts (MW) of system regulation. These instantaneous release adjustments stabilize the electrical generation and transmission system and translate to a range of about 1100 cfs above or below the hourly scheduled release rate. Typically, fluctuations for system regulation are very short lived and balance out over the hour and do not have noticeable impacts on downstream river flow conditions.

Releases from Glen Canyon Dam can also fluctuate beyond scheduled fluctuations for power generation when called upon as a partner that shares reserve requirements within the electrical generator community (i.e. balancing area). There are many generators that supply electricity to the transmission system within the balancing area. At times, a participating generator may experience operating conditions such that it cannot make its scheduled delivery of electricity to the system (i.e. unscheduled outage). To provide system reliability, all participating electricity generators within the balancing area maintain a specified level of generation capacity (i.e. reserves) that can be called upon when an unscheduled outage occurs. Glen Canyon Dam typically maintains 113 MW of reserves for this purpose.

Reserve agreements allow the controllers of the balancing area to call upon Glen Canyon Dam to produce up to an additional 113 MW of electricity beyond what is originally scheduled for a given hour. Reserve calls can be maintained for a maximum of 2 hours after which time the generation rate should be returned to the original schedule. The 113 MW reserve requirement for Glen Canyon Dam translates to approximately 2,800 cfs of flow in the river. When the balancing area controllers call for reserve generation from Glen Canyon Dam, releases from the dam can exceed scheduled levels and have a noticeable impact on the river downstream from Glen Canyon Dam. But these calls for reserves are fairly infrequent and typically are for much less than the required level of 113 MW.

Current Inflow Forecasts and Model Projections

Over the next three months (February, March and April) the forecasted unregulated inflow volume to Lake Powell is projected to be 390 kaf (99% of average), 550 kaf (83% of average) and 800 kaf (76% of average), respectively. These percent of averages are all based on the historic period from 1981 through 2010. Combining this forecast with the February Water Supply Forecast and extending projections to the end of WY2012, the most probable (i.e. 50% likely to be exceeded) unregulated inflow volume for WY2012 is projected to be 8.48 maf (78% of average). There is significant uncertainty associated with this forecast. Recent analysis indicates that it is reasonably possible for the actual unregulated inflow volume to be as low as 5.48 maf (51% of average) or as high as 12.65 maf (117% of average) depending on the range of precipitation patterns that could occur over the next several months.

Based on the reasonable range inflow conditions that could occur this year, the annual release volume from Glen Canyon Dam could be as low as 9.46 maf to as high as 12.92 maf. Under the most probable inflow condition, the annual release volume is projected to be 9.46 maf and the elevation of Lake Powell at the end of WY2012 is projected to be 3643.2 feet above sea level. This elevation corresponds to a live storage volume of 16.38 maf (67% of full capacity).

Upper Colorado River Basin Hydrology

Since water year 2005, hydrologic conditions in the Upper Colorado River Basin have been near average with significant variability from year to year. The unregulated inflow to Lake Powell, which is a good measure of the hydrologic condition in the Colorado River Basin, has averaged 10.98 maf (101% of average (period 1981-2010)) per year during the period from 2005 through 2011. The hydrologic variability during this period has been from a low water year unregulated inflow of 8.62 maf (80% of average) in water year 2006 to a high of 15.97 maf (147% of average) which occurred in water year 2011.

Overall reservoir storage in the Colorado River Basin has increased by nearly 10 maf since the beginning of water year 2005 and this is a significant improvement over the drought conditions during water years 2000 through 2004. On October 1, 2004, the beginning of water year 2005, the total reservoir storage in the Colorado River Basin was 29.84 maf (50.2% of capacity). As of January 30, 2012 the total reservoir storage in the Colorado River Basin was 38.35 maf (64.3% of capacity).

RRFW thanks Rick Clayton of the USBOR for this information.

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From: **RRFW Riverwire** riverwire@rrfw.org
Subject: RRFW Riverwire - Glen Canyon Dam Update May 2012
Date: May 10, 2012 at 9:45 PM
To: john@livingrivers.org

RR

RRFW Riverwire
Glen Canyon Dam Update

May 9, 2012

Glen Canyon Dam, Lake Powell

Snowpack conditions above Lake Powell have been well below average all year and are now nearly melted out. The runoff from the melting snow has been less than impressive and the inflow to Lake Powell so far has peaked at just over 15,000 cubic feet per second (cfs). It is possible that this peak could be exceeded if temperature conditions warm quickly in the coming weeks. The Colorado Basin River Forecast Center will update the Water Supply Forecast for Lake Powell (April through July Unregulated Inflow Volume) in early May. In April this forecast was for 3.50 maf (49% of average) of unregulated inflow to Lake Powell.

The monthly unregulated inflow volume to Lake Powell for April was 764 thousand acre-feet (kaf) (72% of average). This was 36 kaf below what was forecasted in early April. The release volume from Glen Canyon Dam in April was 606 kaf which was 6,000 acre-feet above what was scheduled for release during the month. As a result of the difference between the projections made in early April and actual conditions and operations that occurred in April, the elevation of Lake Powell at the end of April was 0.17 feet (about 2 inches) higher than projected. On April 30, 2012 the elevation of Lake Powell was 3635.76 feet above sea level (64.24 feet below full pool).

Current Dam Operations

Releases from Glen Canyon Dam are now averaging about 10,050 cfs with fluctuations for power generation throughout the day that peak near 13,000 cfs in the afternoons and with early morning low level releases are about 7,000 cfs and this operation is consistent with the Glen Canyon Operating Criteria (Federal Register, Volume 62, No. 41, March 3, 1997). The release volume for May is scheduled to be 600 kaf. In June, the monthly release volume will likely be about 714 kaf. Release fluctuations in June are projected to be in the range from about 9,000 cfs during the early morning hours to an afternoon peak of about 15,000 cfs.

In addition to daily scheduled fluctuations for power generation, the instantaneous releases from Glen Canyon Dam may also fluctuate to provide 40 MW of system regulation. These instantaneous release adjustments stabilize the electrical generation and transmission system and translate to a range of about 1100 cfs above or below the hourly scheduled release rate. Typically, fluctuations for system regulation are very short lived and balance out over the hour and do not have noticeable impacts on downstream river flow conditions.

Releases from Glen Canyon Dam can also fluctuate beyond scheduled fluctuations for power generation when called upon as a partner that shares reserve requirements within the electrical generator community (i.e. balancing area). There are many generators that supply electricity to the transmission system within the balancing area. At times, a participating generator may experience operating conditions such that it cannot make its scheduled delivery of electricity to the system (i.e. unscheduled outage). To provide system reliability, all participating electricity generators within the balancing area maintain a specified level of generation capacity (i.e. reserves) that can be called upon when an unscheduled outage occurs. Glen Canyon Dam typically maintains 113 megawatts (MW) of reserves for this purpose.

Reserve agreements allow the controllers of the balancing area to call upon Glen Canyon Dam to produce up to an additional 113 MW of electricity beyond what is originally scheduled for a given hour. Reserve calls can be maintained for a maximum of 2 hours after which time the generation rate should be returned to the original schedule. The 113 MW reserve requirement for Glen Canyon Dam translates to approximately 2,800 cfs of flow in the river. When the balancing area controllers call for reserve generation from Glen Canyon Dam, releases from the dam can exceed scheduled levels and have a noticeable impact on the river downstream from Glen Canyon Dam. But these calls for reserves are fairly infrequent and typically are for much less than the required level of 113 MW.

In August 2011, pursuant to the Interim Guidelines, the Operating Tier for Glen Canyon Dam was established

In August 2011, pursuant to the Interim Guidelines, the Operating Tier for Glen Canyon Dam was established to be the Equalization Tier. Under the Equalization Tier for 2012, with 1.233 million acre feet (maf) of release carried over from 2011 to 2012, the annual release volume for 2012 could be as low as 9.46 maf or higher depending on actual inflow conditions. As hydrologic conditions for Lake Powell and Lake Mead change throughout the year, Reclamation will adjust operations of Glen Canyon Dam to release the appropriate annual volume during 2012 to achieve Equalization objectives as practicably as possible by September 30, 2012.

Current Inflow Forecasts and Model Projections

Over the next three months (May, June and July) the forecasted unregulated inflow volume to Lake Powell is projected to be 1,050 kaf (45% of average), 1,150 kaf (43% of average) and 500 kaf (46% of average), respectively. These percent of averages are all based on the historic period from 1981 through 2010. Combining this forecast with the April Water Supply Forecast and extending projections to the end of WY2012, the most probable (i.e. 50% likely to be exceeded) unregulated inflow volume for WY2012 is projected to be 6.79 maf (63% of average).

Comparing this projected water year unregulated inflow volume to the driest year on record (2002) in which the unregulated inflow volume was only 2.64 maf (24% of average), water year 2012 will likely be very dry yet not close to the driest year on record. There is still a fair amount of uncertainty associated with the forecast conditions for the remainder of the water year.. Recent analysis indicates that it is reasonably possible for the actual unregulated inflow volume for water year 2012 to be as low as 4.9 maf (45% of average) or as high as 9.2 maf (85% of average) depending on the range of precipitation patterns that could occur over the next several months.

Based on the reasonable range inflow conditions that could occur this year, the annual release volume from Glen Canyon Dam could be as low as 9.46 maf to as high as 9.81 maf. Under the most probable inflow condition, the annual release volume is projected to be 9.46 maf and the elevation of Lake Powell at the end of WY2012 is projected to be 3632.5 feet above sea level. This elevation corresponds to a live storage volume of 15.14 maf (62 % of full capacity). These projections are based on conditions in the April 24-Months Study.

The April 2012 24-Month Study has been published and is available here:
http://www.usbr.gov/uc/water/crsp/studies/24Month_04.pdf

Upper Colorado River Basin Hydrology

Since water year 2005, hydrologic conditions in the Upper Colorado River Basin have been near average with significant variability from year to year. The unregulated inflow to Lake Powell, which is a good measure of the hydrologic condition in the Colorado River Basin, has averaged a water year volume of 10.98 maf (101% of average (period 1981-2010)) during the period from 2005 through 2011. The hydrologic variability during this period has been from a low water year unregulated inflow volume of 8.62 maf (80% of average) in water year 2006 to a high water year unregulated inflow volume of 15.97 maf (147% of average) which occurred in water year 2011.

Overall reservoir storage in the Colorado River Basin has increased by over 8 maf since the beginning of water year 2005 and this is a significant improvement over the drought conditions during water years 2000 through 2004. On October 1, 2004, the beginning of water year 2005, the total reservoir storage in the Colorado River Basin was 29.84 maf (50.2% of capacity). On October 1, 2011, the beginning of water year 2012, the total reservoir storage in the Colorado River Basin was 38.66 maf (64.8% of capacity). As of May 2, 2012 the total reservoir storage in the Colorado River Basin was 37.17 maf (62.3% of capacity).

RRFW thanks Rick Clayton of the USBOR for this information.

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From: **RRFW Riverwire** riverwire@rrfw.org
Subject: RRFW Riverwire - Glen Canyon Dam Update June 2012
Date: June 15, 2012 at 5:50 PM
To: john@livingrivers.org

RR

RRFW Riverwire
Glen Canyon Dam Update

June 15, 2012

Current Dam Operations

Releases from Glen Canyon Dam are now averaging about 12,600 cubic feet per second (cfs) with fluctuations for power generation throughout the day that peak near 15,000 cfs in the afternoons and with early morning low level releases are about 9,000 cfs and this operation is consistent with the Glen Canyon Operating Criteria (Federal Register, Volume 62, No. 41, March 3, 1997). The release volume for June is scheduled to be 708 kaf. In July, the monthly release volume will likely be about 889 kaf. Release fluctuations in July are projected to be in the range from about 10,000 cfs during the early morning hours to an afternoon peak of about 18,000 cfs.

The Water Supply Forecast for Lake Powell (April through July Unregulated Inflow Volume) has been updated for June and the forecasted unregulated inflow volume for the period from April through July for Lake Powell is now 2.01 million acre feet (maf) (28% of average). This is the third driest June forecast for Lake Powell since these forecasts began to be issued. Only 1977 and 2002 had lower June forecasts and these years ultimately were the 2 driest water years in the historic record for Lake Powell (1963-2011).

The monthly unregulated inflow volume to Lake Powell for May was 792 thousand acre-feet (kaf) (34% of average). This was 142 kaf above what was forecasted in early May. The release volume from Glen Canyon Dam in May was 601 kaf which was 1,000 acre-feet above what was scheduled for release during the month. As a result of the difference between the projections made in early May and actual conditions and operations that occurred in May, the elevation of Lake Powell at the end of May was 1.10 feet higher than projected. On May 31, 2012 the elevation of Lake Powell was 3636.83 feet above sea level (63.17 feet below full pool).

In addition to daily scheduled fluctuations for power generation, the instantaneous releases from Glen Canyon Dam may also fluctuate to provide 40 Megawatts (MW) of system regulation. These instantaneous release adjustments stabilize the electrical generation and transmission system and translate to a range of about 1100 cfs above or below the hourly scheduled release rate. Typically, fluctuations for system regulation are very short lived and balance out over the hour and do not have noticeable impacts on downstream river flow conditions.

Releases from Glen Canyon Dam can also fluctuate beyond scheduled fluctuations for power generation when called upon as a partner that shares reserve requirements within the electrical generator community (i.e. balancing area). There are many generators that supply electricity to the transmission system within the balancing area. At times, a participating generator may experience operating conditions such that it cannot make its scheduled delivery of electricity to the system (i.e. unscheduled outage). To provide system reliability, all participating electricity generators within the balancing area maintain a specified level of generation capacity (i.e. reserves) that can be called upon when an unscheduled outage occurs. Glen Canyon Dam typically maintains 113 MW of reserves for this purpose.

Reserve agreements allow the controllers of the balancing area to call upon Glen Canyon Dam to produce up to an additional 113 MW of electricity beyond what is originally scheduled for a given hour. Reserve calls can be maintained for a maximum of 2 hours after which time the generation rate should be returned to the original schedule. The 113 MW reserve requirement for Glen Canyon Dam translates to approximately 2,800 cfs of flow in the river. When the balancing area controllers call for reserve generation from Glen Canyon Dam, releases from the dam can exceed scheduled levels and have a noticeable impact on the river downstream from Glen Canyon Dam. But these calls for reserves are fairly infrequent and typically are for much less than the required level of 113 MW.

In August 2011, pursuant to the Interim Guidelines, the Operating Tier for Glen Canyon Dam was established to be the Equalization Tier. Under the Equalization Tier when conditions dry out as they have this year, the minimum annual release from Lake Powell can generally be as low as 8.23 maf. However, water year 2011

minimum annual release from Lake Powell can generally be as low as 8.23 maf. However, water year 2011 was a very wet Equalization year and not all of the Equalization release volume for 2011 could be achieved by September 30, 2011. As a result, 1.233 maf of the 2011 Equalization release volume was actually released after the end of water year 2011. This increased the minimum release volume for water year 2012 under Equalization to 9.463 maf. Under the dry hydrologic conditions currently projected for Lake Powell, the water year 2012 release volume is projected to be at this minimum Equalization level of 9.463 maf. As hydrologic conditions for Lake Powell and Lake Mead change throughout the year, Reclamation will adjust operations of Glen Canyon Dam to release the appropriate annual volume during 2012 to achieve Equalization objectives as practicably as possible by September 30, 2012.

Current Inflow Forecasts and Model Projections

Over the next three months (June, July and August) the forecasted unregulated inflow volume to Lake Powell is projected to be 350 kaf (13% of average), 100 kaf (9% of average) and 150 kaf (30% of average), respectively. These percent of averages are all based on the historic period from 1981 through 2010. The most probable (i.e. 50% likely to be exceeded) unregulated inflow volume for WY2012 is projected to be 5.01 maf (46% of average). Comparing this projected water year unregulated inflow volume to the driest year on record (2002) in which the unregulated inflow volume was only 2.64 maf (24% of average), water year 2012 will likely be very dry, yet not nearly as dry as conditions were in 2002. The currently projected water year unregulated inflow volume of 5.01 maf would rank as the 3rd driest year on record since the closure of Glen Canyon Dam (1963).

The annual release volume from Glen Canyon Dam will likely be 9.463 maf and the elevation of Lake Powell at the end of WY2012 is projected to be 3621.3 feet above sea level. This elevation corresponds to a live storage volume of 13.90 maf (57 % of full capacity). These projections are based on conditions in the June 24-Months Study.

Upper Colorado River Basin Hydrology

Since water year 2005, hydrologic conditions in the Upper Colorado River Basin have been near average with significant variability from year to year. The unregulated inflow to Lake Powell, which is a good measure of the hydrologic condition in the Colorado River Basin, has averaged a water year volume of 10.98 maf (101% of average (period 1981-2010)) during the period from 2005 through 2011. The hydrologic variability during this period has been from a low water year unregulated inflow volume of 8.62 maf (80% of average) in water year 2006 to a high water year unregulated inflow volume of 15.97 maf (147% of average) which occurred in water year 2011.

Overall reservoir storage in the Colorado River Basin has increased by over 8 maf since the beginning of water year 2005 and this is a significant improvement over the drought conditions during water years 2000 through 2004. On October 1, 2004, the beginning of
water year 2005, the total reservoir storage in the Colorado River Basin was 29.84 maf (50.2% of capacity). On October 1, 2011, the beginning of water year 2012, the total reservoir storage in the Colorado River Basin was 38.66 maf (64.8% of capacity). As of June 12, 2012 the total reservoir storage in the Colorado River Basin was 36.59 maf (61.4% of capacity).

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From: **RRFW Riverwire** riverwire@rrfw.org
Subject: RRFW Riverwire - Glen Canyon Dam Update July 2012
Date: July 11, 2012 at 8:45 PM
To: john@livingrivers.org

RR

RRFW Riverwire

Glen Canyon Dam Update

July 11, 2012

Glen Canyon Dam / Lake Powell

For the Water Supply period April through July, 2012 will most likely be the third driest year on record since the closure of Glen Canyon Dam in 1963. Only 1977 and 2002 will have had lower April-July unregulated inflow volumes to Lake Powell than what is most likely to occur in 2012.

The monthly unregulated inflow volume to Lake Powell for June was 353 thousand acre-feet (kaf) (13% of average). This was very nearly equal to the forecasted unregulated inflow volume at the beginning of June which was 350 kaf. The release volume from Glen Canyon Dam in June was 709 kaf which was 1,000 acre-feet above what was scheduled for release during the month. The end of June elevation and storage of Lake Powell was 3633.90 feet (66.10 feet from full pool) and 15.29 million acre-feet (maf) (62.88% of full capacity).

The Water Supply Forecast for Lake Powell (April through July Unregulated Inflow Volume) for July remained unchanged from June at 2.01 maf (28% of average).

Current Dam Operations

In August 2011, pursuant to the Interim Guidelines, the Operating Tier for Glen Canyon Dam was established to be the Equalization Tier. Under the Equalization Tier when conditions dry out as they have this year, the minimum annual release from Lake Powell can generally be as low as 8.23 maf.

However, water year 2011 was a very wet Equalization year and not all of the Equalization release volume for 2011 could be achieved by September 30, 2011. As a result, 1.233 maf of the 2011 Equalization release volume was actually released after the end of water year 2011. This increased the minimum release volume for water year 2012 under Equalization to 9.463 maf.

Under the dry hydrologic conditions currently projected for Lake Powell, the water year 2012 release volume is projected to be at this minimum Equalization level of 9.463 maf. As hydrologic conditions for Lake Powell and Lake Mead change throughout the year, Reclamation will adjust operations of Glen Canyon Dam to release the appropriate annual volume during 2012 to achieve Equalization objectives as practicably as possible by September 30, 2012.

Releases from Glen Canyon Dam are now averaging about 14,500 cubic feet per second (cfs) with fluctuations for power generation throughout the day that peak near 18,000 cfs in the afternoons and with early morning low level releases are about 10,000 cfs and this operation is consistent with the Glen Canyon Operating Criteria (Federal Register, Volume 62, No. 41, March 3, 1997). The release volume for July is scheduled to be 889 kaf and this volume is elevated slightly in order to target a release volume in August of 800 kaf. In August, fluctuations are projected to peak near 17,000 cfs during the afternoons with early morning low releases near 9,000 cfs. In September and October, as part of the 2008 FONSI, releases from Glen Canyon Dam will be steady for a steady flow experiment. The targeted release rate for September and October of 2012 is 8,000 cfs.

In addition to daily scheduled fluctuations for power generation, the instantaneous releases from Glen Canyon Dam may also fluctuate to provide 40 megawatts (MW) of system regulation. These instantaneous release adjustments stabilize the electrical generation and transmission system and translate to a range of about 1100 cfs above or below the hourly scheduled release rate. Typically, fluctuations for system regulation are very short lived and balance out over the hour and do not have noticeable impacts on downstream river flow conditions.

Releases from Glen Canyon Dam can also fluctuate beyond scheduled fluctuations for power generation when called upon as a partner that shares reserve requirements within the electrical generator community (i.e.

called upon as a partner that shares reserve requirements within the electrical generator community (i.e. balancing area). There are many generators that supply electricity to the transmission system within the balancing area. At times, a participating generator may experience operating conditions such that it cannot make its scheduled delivery of electricity to the system (i.e. unscheduled outage). To provide system reliability, all participating electricity generators within the balancing area maintain a specified level of generation capacity (i.e. reserves) that can be called upon when an unscheduled outage occurs. Glen Canyon Dam typically maintains 113 MW of reserves for this purpose.

Reserve agreements allow the controllers of the balancing area to call upon Glen Canyon Dam to produce up to an additional 113 MW of electricity beyond what is originally scheduled for a given hour. Reserve calls can be maintained for a maximum of 2 hours after which time the generation rate should be returned to the original schedule. The 113 MW reserve requirement for Glen Canyon Dam translates to approximately 2,800 cfs of flow in the river. When the balancing area controllers call for reserve generation from Glen Canyon Dam, releases from the dam can exceed scheduled levels and have a noticeable impact on the river downstream from Glen Canyon Dam. But these calls for reserves are fairly infrequent and typically are for much less than the required level of 113 MW.

Current Inflow Forecasts and Model Projections

Over the next three months (July, August and September) the forecasted unregulated inflow volume to Lake Powell is projected to be 100 kaf (9% of average), 150 kaf (30% of average) and 200 kaf (49% of average), respectively. These percent of averages are all based on the historic period from 1981 through 2010. The most probable (i.e. 50% likely to be exceeded) unregulated inflow volume for WY2012 is projected to be 5.0 maf (46% of average). Comparing this projected water year unregulated inflow volume to the driest year on record (2002) in which the unregulated inflow volume was only 2.64 maf (24% of average), water year 2012 will likely be very dry, yet not nearly as dry as conditions were in 2002. The currently projected water year unregulated inflow volume of 5.0 maf would rank as the 3rd driest year on record since the closure of Glen Canyon Dam (1963).

The annual release volume from Glen Canyon Dam will likely be 9.463 maf and the elevation of Lake Powell at the end of WY2012 is projected to be 3622.6 feet above sea level which is 77.4 feet from the full pool elevation of 3700 feet. This elevation corresponds to a live storage volume of 14.04 maf (58 % of full capacity). These projections are based on conditions in the July 24-Months Study.

The June 2012 24-Month Study has been published and is available here. The July 2012 24-Month Study will be published by July 13, 2012 and a link to this study will be provided at this website. Updated elevation projections for Lake Powell through water year 2012 based on the most recently published 24-Month Study are maintained at: Lake Powell Projected Elevations.

Upper Colorado River Basin Hydrology

Since water year 2005, hydrologic conditions in the Upper Colorado River Basin have been near average with significant variability from year to year. The unregulated inflow to Lake Powell, which is a good measure of the hydrologic condition in the Colorado River Basin, has averaged a water year volume of 10.98 maf (101% of average (period 1981-2010)) during the period from 2005 through 2011. The hydrologic variability during this period has been from a low water year unregulated inflow volume of 8.62 maf (80% of average) in water year 2006 to a high water year unregulated inflow volume of 15.97 maf (147% of average) which occurred in water year 2011.

Overall reservoir storage in the Colorado River Basin has increased by over 8 maf since the beginning of water year 2005 and this is a significant improvement over the drought conditions during water years 2000 through 2004. On October 1, 2004, the beginning of water year 2005, the total reservoir storage in the Colorado River Basin was 29.84 maf (50.2% of capacity). On October 1, 2011, the beginning of water year 2012, the total reservoir storage in the Colorado River Basin was 38.66 maf (64.8% of capacity). As of July 8, 2012 the total reservoir storage in the Colorado River Basin was 35.80 maf (60.0% of capacity).

RRFW thanks Rick Clayton of the USBOR for this information.

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From: **RRFW Riverwire** riverwire@rrfw.org
Subject: RRFW Riverwire - Glen Canyon Dam Update August 2012
Date: August 13, 2012 at 5:15 PM
To: john@livingrivers.org

RR

RRFW Riverwire
Glen Canyon Dam Update

August 13, 2012

Present Dam Operations

The monthly unregulated inflow volume to Lake Powell for July was 154 thousand acre-feet (kaf) or 14% of average. The release volume from Glen Canyon Dam in July was 886 kaf. The end of July elevation and storage of Lake Powell was 3628.45 feet (71.55 feet from full pool) and 14.68 million acre feet (maf) or 60.4% of full capacity. The reservoir elevation is now declining.

The April through July unregulated inflow volume for 2012 was 2.06 maf or 29% of average, placing the 2012 April to July season as the third driest on record since the closure of Glen Canyon Dam in 1963. Only 1977 and 2002 had lower April-July unregulated inflow volumes to Lake Powell than what occurred in 2012. In terms of reservoir elevation and storage, Lake Powell reached its peak for water year 2012 on June 3rd at 3636.90 ft, or 63.1 feet from full pool and 15.640 maf equaling 64.30% of capacity, respectively. The peak elevation in 2012 is 24 feet below the 2011 peak elevation of 3660.90ft.

Current Dam Operations

Releases from Glen Canyon Dam are now averaging about 13,500 cubic feet per second (cfs) with fluctuations for power generation throughout the day that peak near 17,000 cfs in the afternoons and with early morning low level releases are about 9,000 cfs and this operation is consistent with the Glen Canyon Operating Criteria (Federal Register, Volume 62, No. 41, March 3, 1997). The release volume for August is scheduled to be 800 kaf and meets the targeted release volume of the 2012 Hydrograph that was approved by the Secretary of the Interior. In September and October, as part of the 2008 FONSI, releases from Glen Canyon Dam will be steady for a steady flow experiment. The targeted release rate for September and October of 2012 is 8,000 cfs, with volumes of 476 kaf and 491kaf, respectively.

In addition to daily scheduled fluctuations for power generation, the instantaneous releases from Glen Canyon Dam may also fluctuate to provide 40 megawatts (MW) of system regulation. These instantaneous release adjustments stabilize the electrical generation and transmission system and translate to a range of about 1100 cfs above or below the hourly scheduled release rate. Typically, fluctuations for system regulation are very short lived and balance out over the hour and do not have noticeable impacts on downstream river flow conditions.

Releases from Glen Canyon Dam can also fluctuate beyond scheduled fluctuations for power generation when called upon as a partner that shares reserve requirements within the electrical generator community (i.e. balancing area). There are many generators that supply electricity to the transmission system within the balancing area. At times, a participating generator may experience operating conditions such that it cannot make its scheduled delivery of electricity to the system (i.e. unscheduled outage). To provide system reliability, all participating electricity generators within the balancing area maintain a specified level of generation capacity (i.e. reserves) that can be called upon when an unscheduled outage occurs. Glen Canyon Dam typically maintains 113 MW of reserves for this purpose.

Reserve agreements allow the controllers of the balancing area to call upon Glen Canyon Dam to produce up to an additional 113 MW of electricity beyond what is originally scheduled for a given hour. Reserve calls can be maintained for a maximum of 2 hours after which time the generation rate should be returned to the original schedule. The 113 MW reserve requirement for Glen Canyon Dam translates to approximately 2,800 cfs of flow in the river. When the balancing area controllers call for reserve generation from Glen Canyon Dam, releases from the dam can exceed scheduled levels and have a noticeable impact on the river downstream from Glen Canyon Dam. But these calls for reserves are fairly infrequent and typically are for much less than the required level of 113 MW.

In August 2011, pursuant to the Interim Guidelines, the Operating Tier for Glen Canyon Dam was established

In August 2011, pursuant to the Interim Guidelines, the Operating Tier for Glen Canyon Dam was established to be the Equalization Tier. Under the Equalization Tier when conditions dry out as they have this year, the minimum annual release from Lake Powell can generally be as low as 8.23 maf. However, water year 2011 was a very wet Equalization year and not all of the Equalization release volume for 2011 could be achieved by September 30, 2011. As a result, 1.233 maf of the 2011 Equalization release volume was actually released after the end of water year 2011. This increased the minimum release volume for water year 2012 under Equalization to 9.463 maf. Under the dry hydrologic conditions currently projected for Lake Powell, the water year 2012 release volume is projected to be at this minimum Equalization level of 9.463 maf. As hydrologic conditions for Lake Powell and Lake Mead change throughout the year, Reclamation will adjust operations of Glen Canyon Dam to release the appropriate annual volume during 2012 to achieve Equalization objectives as practicably as possible by September 30, 2012.

Current Inflow Forecasts and Model Projections

Over the next three months (July, August and September) the forecasted unregulated inflow volume to Lake Powell is projected to be 200 kaf (40% of average), 250 kaf (61% of average) and 350 kaf (68% of average), respectively. These percent of averages are all based on the historic period from 1981 through 2010. The most probable (i.e. 50% likely to be exceeded) unregulated inflow volume for WY2012 is projected to be 5.15 maf (48% of average). Comparing this projected water year unregulated inflow volume to the driest year on record (2002) in which the unregulated inflow volume was only 2.64 maf (24% of average), water year 2012 will likely be very dry, yet not nearly as dry as conditions were in 2002. The currently projected water year unregulated inflow volume of 5.15 maf would rank as the 3rd driest year on record since the closure of Glen Canyon Dam (1963).

The 2012 annual release volume from Glen Canyon Dam will likely be 9.463 maf and the elevation of Lake Powell at the end of WY2012 is projected to be 3623.1 feet above sea level which is 76.9 feet from the full pool elevation of 3700 feet. This elevation corresponds to a live storage volume of 14.09 maf (58 % of full capacity). These projections are based on conditions in the August 24-Month Study.

The hydrologic outlook forecast for water year 2013 projects that the most probable (median) unregulated inflow volume will be 8.85maf (82% of average based on the period 1981-2010). Based on this hydrologic outlook, the August 2012 24-Month Study projects the annual release from lake Powell during water year 2013 will be 8.23 maf and the end of water year 2013 reservoir elevation and storage for Lake Powell to be 3618.19 feet (81.8 feet from full pool) and 13.573 maf (55.8% capacity), respectively.

The August 2012 24-Month Study has been published and is available here:
http://www.usbr.gov/uc/water/crsp/studies/24Month_08.pdf

The September 2012 24-Month Study will be published by September 15, 2012 and a link to this study will be provided at this website. Updated elevation projections for Lake Powell through water year 2013 based on the most recently published 24-Month Study are maintained at:
http://www.usbr.gov/uc/water/crsp/studies/lppwse2.html

Upper Colorado River Basin Hydrology

Since water year 2005, hydrologic conditions in the Upper Colorado River Basin have been near average with significant variability from year to year. The unregulated inflow to Lake Powell, which is a good measure of the hydrologic condition in the Colorado River Basin, has averaged a water year volume of 10.98 maf (101% of average (period 1981-2010)) during the period from 2005 through 2011. The hydrologic variability during this period has been from a low water year unregulated inflow volume of 8.62 maf (80% of average) in water year 2006 to a high water year unregulated inflow volume of 15.97 maf (147% of average) which occurred in water year 2011. However, based on observed inflows and current forecasts, water year 2012 unregulated inflow is expected to be 5.15 maf (47.6% of average), which would be the lowest water year unregulated inflow volume since 2002.

Overall reservoir storage in the Colorado River Basin has increased by over 8 maf since the beginning of water year 2005 and this is a significant improvement over the drought conditions during water years 2000 through 2004. On October 1, 2004, the beginning of water year 2005, the total reservoir storage in the Colorado River Basin was 29.84 maf (50.2% of capacity). On October 1, 2011, the beginning of water year 2012, the total reservoir storage in the Colorado River Basin was 38.66 maf (64.8% of capacity). As of August 9, 2012 the total reservoir storage in the Colorado River Basin was 35.18 maf (59.0% of capacity).

RRFW thanks Katrina Grantz of the USBOR for this information.

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# # #

From: **RRFW Riverwire** riverwire@rrfw.org
Subject: Glen Canyon Dam Update and High Flow Notification
Date: September 19, 2012 at 11:10 AM
To: john@livingrivers.org

RR

RRFW Riverwire

Glen Canyon Dam Update and High Flow Notification

September 19, 2012

Glen Canyon Dam / Lake Powell

Current Status:

Releases from Glen Canyon Dam in September and October will be approximately 8,030 cubic feet per second (cfs) and steady throughout the day with no daily fluctuations for hydropower generation. The reservoir elevation is 3622.7 feet (57.8% full) and declining. The scheduled release volume for September is 478 thousand acre feet (kaf), resulting in a total scheduled water year 2012 release volume of 9.463 million acre feet (maf). The scheduled release volume for November is 600 kaf with fluctuations for power generation throughout the day.

A High Flow Experiment (http://www.usbr.gov/uc/envdocs/ea/gc/HFEProtocol/index.html) will occur in November 2012. Reclamation anticipates that the experiment will occur during the window of November 8-25, 2012; however, the duration and actual start date of the experiment have not yet been determined. During the High Flow Experiment, total releases from Glen Canyon Dam at full bypass may reach approximately 42,000cfs. The total experiment, including ramping, could last anywhere from three and half to six and a half days. Once information on the start date and duration of the event become available, that information will be updated here.

To view the most current reservoir elevation, content, inflow and release, visit Lake Powell Data (http://www.usbr.gov/uc/water/rsvrs/ops/crsp_40_gc.html).

The monthly unregulated inflow volume to Lake Powell for August was 101 kaf (20% of average). The release volume from Glen Canyon Dam in August was 800 kaf. The end of August elevation and storage of Lake Powell was 3623.82 feet (76.18 feet from full pool) and 14.15 maf (58.2% of full capacity). The reservoir elevation is now declining.

The April through July unregulated inflow volume for 2012 was 2.06 maf (29% of average), placing the 2012 April to July season as the third driest on record since the closure of Glen Canyon Dam in 1963. Only 1977 and 2002 had lower April-July unregulated inflow volumes to Lake Powell than what occurred in 2012. In terms of reservoir elevation and storage, Lake Powell reached its peak for water year 2012 on June 3rd at 3636.90 ft (63.1 feet from full pool) and 15.640 maf (64.30% of capacity), respectively. The peak elevation in 2012 is 24 feet below the 2011 peak elevation of 3660.90 ft.

Current Dam Operations

In August 2011, pursuant to the Interim Guidelines, the Operating Tier for Glen Canyon Dam was established to be the Equalization Tier. Under the Equalization Tier when conditions dry out as they have this year, the minimum annual release from Lake Powell can generally be as low as 8.23 maf. However, water year 2011 was a very wet Equalization year and not all of the Equalization release volume for 2011 could be achieved by September 30, 2011. As a result, 1.233 maf of the 2011 Equalization release volume was actually released after the end of water year 2011. This increased the minimum release volume for water year 2012 under Equalization to 9.463 maf. Under the dry hydrologic conditions currently projected for Lake Powell, the water year 2012 release volume is projected to be at this minimum Equalization level of 9.463 maf. As hydrologic conditions for Lake Powell and Lake Mead change throughout the year, Reclamation will adjust operations of Glen Canyon Dam to release the appropriate annual volume during 2012 to achieve Equalization objectives as practicably as possible by September 30, 2012.

Releases from Glen Canyon Dam are now averaging approximately 8,030 cfs and are steady with no fluctuations for hydropower generation. In September and October, as part of the 2008 FONSI, releases from Glen Canyon Dam will be steady for a steady flow experiment. 2012 is the last year of the 5-year steady flow

Glen Canyon Dam will be steady for a steady flow experiment. 2012 is the last year of the 5-year steady flow experiment. The targeted release rate for September and October of 2012 is 8,030 cfs, with volumes of 478 kaf and 494kaf, respectively. The scheduled release volume for September is 478 kaf, resulting in a total scheduled water year 2012 release volume of 9.463 maf. The scheduled release volume for November is 600 kaf with fluctuations for power generation throughout the day consistent with the Glen Canyon Operating Criteria (Federal Register, Volume 62, No. 41, March 3, 1997).

In addition to daily scheduled fluctuations for power generation, the instantaneous releases from Glen Canyon Dam may also fluctuate to provide 40 MW of system regulation. These instantaneous release adjustments stabilize the electrical generation and transmission system and translate to a range of about 1100 cfs above or below the hourly scheduled release rate. Typically, fluctuations for system regulation are very short lived and balance out over the hour and do not have noticeable impacts on downstream river flow conditions.

Releases from Glen Canyon Dam can also fluctuate beyond scheduled fluctuations for power generation when called upon as a partner that shares reserve requirements within the electrical generator community (i.e. balancing area). There are many generators that supply electricity to the transmission system within the balancing area. At times, a participating generator may experience operating conditions such that it cannot make its scheduled delivery of electricity to the system (i.e. unscheduled outage). To provide system reliability, all participating electricity generators within the balancing area maintain a specified level of generation capacity (i.e. reserves) that can be called upon when an unscheduled outage occurs. Glen Canyon Dam typically maintains 113 MW of reserves for this purpose.

Reserve agreements allow the controllers of the balancing area to call upon Glen Canyon Dam to produce up to an additional 113 MW of electricity beyond what is originally scheduled for a given hour. Reserve calls can be maintained for a maximum of 2 hours after which time the generation rate should be returned to the original schedule. The 113 MW reserve requirement for Glen Canyon Dam translates to approximately 2,800 cfs of flow in the river. When the balancing area controllers call for reserve generation from Glen Canyon Dam, releases from the dam can exceed scheduled levels and have a noticeable impact on the river downstream from Glen Canyon Dam. But these calls for reserves are fairly infrequent and typically are for much less than the required level of 113 MW.

Current Inflow Forecasts and Model Projections

The September 24-Month study projects the annual release volume for water year 2012 will be 9.463 maf and the end of water year reservoir elevation and storage for Lake Powell will be 3622.12 (77.88 feet from full pool) and 13.989 maf (57.5% capacity), respectively.

The hydrologic outlook forecast for water year 2013 projects that the most probable (median) unregulated inflow volume will be 8.83maf (81% of average based on the period 1981-2010). Based on this hydrologic outlook, the September 24-Month Study projects the annual release from lake Powell during water year 2013 will be 8.23 maf and the end of water year 2013 reservoir elevation and storage for Lake Powell to be 3617.51 feet (82.5 feet from full pool) and 13.501 maf (55.5% capacity), respectively.

Upper Colorado River Basin Hydrology

Since water year 2005, hydrologic conditions in the Upper Colorado River Basin have been near average with significant variability from year to year. The unregulated inflow to Lake Powell, which is a good measure of the hydrologic condition in the Colorado River Basin, has averaged a water year volume of 10.98 maf (101% of average (period 1981-2010)) during the period from 2005 through 2011. The hydrologic variability during this period has been from a low water year unregulated inflow volume of 8.62 maf (80% of average) in water year 2006 to a high water year unregulated inflow volume of 15.97 maf (147% of average) which occurred in water year 2011. However, based on observed inflows and current forecasts, water year 2012 unregulated inflow is expected to be 5.00 maf (46.0% of average), which would be the lowest water year unregulated inflow volume since 2002.

Overall reservoir storage in the Colorado River Basin has increased by over 8 maf since the beginning of water year 2005 and this is a significant improvement over the drought conditions during water years 2000 through 2004. On October 1, 2004, the beginning of water year 2005, the total reservoir storage in the Colorado River Basin was 29.84 maf (50.2% of capacity). On October 1, 2011, the beginning of water year 2012, the total reservoir storage in the Colorado River Basin was 38.66 maf (64.8% of capacity). As of September 11, 2012 the total reservoir storage in the Colorado River Basin was 34.46 maf (57.7% of capacity).

RRFW thanks Katrina Grantz of the USBOR for this information.

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From: **RRFW Riverwire** riverwire@rrfw.org
Subject: Glen Canyon Dam Update October 2012
Date: October 24, 2012 at 9:05 PM
To: john@livingrivers.org

RR

RRFW Riverwire
Glen Canyon Dam Update October 2012

October 24, 2012

Glen Canyon Dam / Lake Powell

Current Status

Releases from Glen Canyon Dam in October are averaging approximately 8,030 cfs (cubic feet per second) and are steady with no fluctuations for hydropower generation. The scheduled release volume for October is 494 kaf (thousand acre-feet). In September and October, as part of the 2008 FONSI (Finding of No Significant Impact), releases from Glen Canyon Dam will be steady for a steady flow experiment. 2012 is the last year of the 5-year steady flow experiment. The anticipated release volume for November is 600 kaf with fluctuations for power generation throughout the day consistent with the Glen Canyon Operating Criteria (Federal Register, Volume 62, No. 41, March 3, 1997). However, the release volume may be adjusted in the event of a High Flow Experiment. (see below).

This fall marks the first season under a multi-year High Flow Protocol announced earlier this year by Secretary Salazar. Under this Protocol, high flow releases are linked to sediment input and other resource conditions below Glen Canyon Dam. Preliminary sediment estimates appear favorable for a high flow experimental release to occur during the period of November 18 - 25, 2012 should sediment and other conditions warrant.

Reclamation's planning activities for the high flow release are focusing on an anticipated date of November 19, 2012 for the bypass release to begin; however, no final decisions on the dates, duration or amount of the release have been made. Dam operations to ramp up to powerplant capacity prior to the bypass event would begin on November 18. During the High Flow Experiment, total releases from Glen Canyon Dam at full bypass may reach approximately 42,000 cfs. The total experiment, including ramping, could last anywhere from one and a half to six and a half days. November releases from Glen Canyon Dam prior to and after the high flow experiment would fluctuate between 5,000cfs and 8,000cfs. As more information on the potential high flow release becomes available, that information will be updated here.

To view the most current reservoir elevation, content, inflow and release, click on: Lake Powell Data.

The unregulated inflow volume to Lake Powell in September was 104 thousand acre-feet (kaf) (25% of average). The release volume from Glen Canyon Dam in September was 481 kaf. The end of September elevation and storage of Lake Powell were 3621.6 feet (78.4 feet from full pool) and 13.93 maf (million acre-feet) (57.3% of full capacity). The reservoir elevation is now declining.

The water year unregulated inflow volume for 2012 was 4.91maf (45.3% of average), placing the 2012 as the third driest on record since the closure of Glen Canyon Dam in 1963. Only 2002 and 1977 were drier, receiving 2.64 maf and 3.53 maf, respectively. In terms of reservoir elevation and storage, Lake Powell reached its peak for water year 2012 on June 3rd at 3636.9 ft (63.1 feet from full pool) and 15.64 maf (64.3% of capacity), respectively. The peak elevation in 2012 was 24 feet below the 2011 peak elevation of 3660.9 ft.

Releases for Water Year 2012 totaled 9.466 maf. Pursuant to the 2007 Interim Guidelines, Lake Powell operated under the Equalization Tier in 2012. Due to the dry hydrologic conditions experienced in 2012, the Equalization release objective was 9.463 maf, which is 8.23 maf plus 1.233 maf (the Equalization release volume from 2011 that could not be achieved by September 30, 2011). Throughout water year 2012, Reclamation adjusted operations of Glen Canyon Dam to release the appropriate annual volume during 2012 to achieve Equalization objectives as practicably as possible by September 30, 2012.

Current Dam Operations

The operating tier for 2013 is the Upper Elevation Balancing Tier, as establish in August 2012 and pursuant to the Interim Guidelines. However, if hydrologic conditions and projections become wetter, it is possible that

the Interim Guidelines. However, if hydrologic conditions and projections become wetter, it is possible that beginning in April, the Equalization tier will govern the operations of Lake Powell for the remainder of the water year. Based on analysis of a range of inflow scenarios, the current probability of realizing an inflow volume that would trigger Equalization in 2013 is approximately 20 percent. As hydrologic conditions for Lake Powell and Lake Mead change throughout the year, Reclamation will adjust operations of Glen Canyon Dam to release the appropriate annual volume during 2013 to achieve the governing operating tier objectives as practicably as possible by September 30, 2013.

Releases from Glen Canyon Dam in October are averaging approximately 8,030 cfs and are steady with no fluctuations for hydropower generation. The scheduled release volume for October is 494 kaf. In September and October, as part of the 2008 FONSI, releases from Glen Canyon Dam will be steady for a steady flow experiment. 2012 is the last year of the 5-year steady flow experiment.

The anticipated release volume for November is 600 kaf with fluctuations for power generation throughout the day consistent with the Glen Canyon Operating Criteria (Federal Register, Volume 62, No. 41, March 3, 1997). However, the release volume may be adjusted in the event of a High Flow Experiment. This fall marks the first season of a multi-year High-Flow Protocol, under which high flow releases are linked to sediment input and other resource conditions below Glen Canyon Dam. Preliminary analysis appears favorable for a high flow experimental release to occur during the period of November 18 - 25, 2012. During the High Flow Experiment, total releases from Glen Canyon Dam at full bypass may reach approximately 42,000 cfs. The total experiment, including ramping, could last anywhere from one and a half to six and a half days. In the event of a high flow experiment, releases from Glen Canyon Dam prior to and after the high flow experiment are anticipated to fluctuate between 5,000cfs and 8,000cfs.

In December, the release volume will likely be about 800 kaf, with fluctuations throughout the day from about 8,000 cfs in the early morning to about 16,000cfs in the early evening.

In addition to daily scheduled fluctuations for power generation, the instantaneous releases from Glen Canyon Dam may also fluctuate to provide 40 MW of system regulation. These instantaneous release adjustments stabilize the electrical generation and transmission system and translate to a range of about 1,100 cfs above or below the hourly scheduled release rate. Typically, fluctuations for system regulation are very short lived and balance out over the hour and do not have noticeable impacts on downstream river flow conditions.

Releases from Glen Canyon Dam can also fluctuate beyond scheduled fluctuations for power generation when called upon as a partner that shares reserve requirements within the electrical generator community (i.e. balancing area). To provide system reliability, all participating electricity generators within the balancing area maintain a specified level of generation capacity (i.e. reserves) that can be called upon when an unscheduled outage occurs. Glen Canyon Dam typically maintains 43 MW of reserves (approximately 1,100 cfs) for this purpose. Reserve calls can be maintained for a maximum of 2 hours after which time the generation rate should be returned to the original schedule. If reserves from Glen Canyon Dam are called upon, releases from the dam can exceed scheduled levels and can have a noticeable impact on the river downstream from Glen Canyon Dam. Calls for reserves are fairly infrequent and typically are for much less than 43 MW.

Current Inflow Forecasts and Model Projections

The hydrologic outlook forecast for water year 2013 projects that the most probable (median) unregulated inflow volume will be 7.60 maf (70% of average based on the period 1981-2010). Based on this hydrologic outlook, the October 24-Month study projects the annual release volume for water year 2013 will be 8.23 maf and the end of water year reservoir elevation and storage for Lake Powell will be 3608.52 (91.48 feet from full pool) and 12.582 maf (51.7% capacity), respectively.

If hydrologic conditions and projections become wetter, it is possible that beginning in April, the Equalization tier will govern the operations of Lake Powell for the remainder of the water year and the release volume for 2013 could be greater than 8.23 maf. Based on analysis of a range of inflow scenarios, the current probability of realizing an inflow volume that would trigger Equalization in 2013 is approximately 20 percent.

Upper Colorado River Basin Hydrology

Since water year 2005, hydrologic conditions in the Upper Colorado River Basin have resulted in significant year to year variability. The unregulated inflow to Lake Powell, which is a good measure of the hydrologic condition in the Colorado River Basin, has averaged a water year volume of 10.22 maf (94% of average (period 1981-2010)) during the period from 2005 through 2012. The hydrologic variability during this period has been from a low water year unregulated inflow volume of 4.91 maf (45% of average) in water year 2012 to a

high water year unregulated inflow volume of 15.97 maf (147% of average) in water year 2011. Based on observed inflows and current forecasts, water year 2013 unregulated inflow is expected to be 7.60 maf (70% of average).

Overall reservoir storage in the Colorado River Basin has increased by over 4 maf since the beginning of water year 2005 and this is an improvement over the drought conditions during water years 2000 through 2004. On October 1, 2004, the beginning of water year 2005, the total reservoir storage in the Colorado River Basin was 29.8 maf (50% of capacity). On October 1, 2012, the beginning of water year 2013, the total reservoir storage in the Colorado River Basin was 33.9 maf (57 % of capacity).

RRFW thanks Katrina Grantz, US Bureau of Reclamation, for this information.

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# # #

From: **RRFW Riverwire** riverwire@rrfw.org
Subject: Glen Canyon Dam Update November 2012
Date: November 7, 2012 at 9:10 PM
To: john@livingrivers.org

RR

RRFW Riverwire
Glen Canyon Dam Update November 2012

November 7, 2012

Current Status

Releases from Glen Canyon Dam are currently averaging approximately 8,020 cubic feet per second (cfs) with fluctuations for hydropower generation between approximately 7,000 cfs (nighttime) and 9,000 cfs (daytime). The reservoir elevation is 3619.2 feet and declining.

On November 18-23, 2012, the Department of Interior will conduct the first High Flow Experiment under a multi-year High Flow Protocol announced earlier this year by Secretary Salazar. Under this Protocol, high flow releases are linked to sediment input and other resource conditions below Glen Canyon Dam.

Beginning on the evening of November 18th, releases from Glen Canyon Dam will begin ramping up to full power plant capacity (approximately 27,300 cfs). At midday on November 19th, bypass tubes at Glen Canyon Dam will be opened and releases will continue to increase up to full power plant and bypass capacity (approximately 42,300 cfs) by the evening of November 19th. Releases will be maintained at peak release for 24 hours and then begin ramping back down. Releases will return to normal operations in the evening of November 23rd. The entire experiment, including ramping is expected to last 5 days, with 24 hours at peak release.

November releases from Glen Canyon Dam prior to and after the High Flow Experiment are expected to fluctuate between 7,000cfs and 9,000cfs. The elevation of Lake Powell is expected to decrease approximately 2 ½ feet during the 5 day experiment.
To view the most current reservoir elevation, content, inflow and release, click on:
http://www.usbr.gov/uc/water/rsvrs/ops/crsp_40_gc.html

The unregulated inflow volume to Lake Powell in October was 189 thousand acre-feet (kaf) (37% of average). The release volume from Glen Canyon Dam in October was 498 kaf. The end of October elevation and storage of Lake Powell were 3619.5 feet (80.5 feet from full pool) and 13.71 million acre feet (maf) (56.4% of full capacity). The reservoir elevation is now declining.

The water year unregulated inflow volume for 2012 was 4.91maf (45.3% of average), placing the 2012 as the third lowest on record since the closure of Glen Canyon Dam in 1963. In terms of reservoir elevation and storage, Lake Powell reached its peak for water year 2012 on June 3rd at 3636.9 ft (63.1 feet from full pool) and 15.64 maf (64.3% of capacity), respectively.

Releases for Water Year 2012 totaled 9.466 maf. Pursuant to the 2007 Interim Guidelines, Lake Powell operated under the Equalization Tier in 2012, releasing 9.463 maf, which is 8.233 maf plus 1.233 maf (the Equalization release volume from 2011 that could not be achieved by September 30, 2011). Throughout water year 2012, Reclamation adjusted operations of Glen Canyon Dam to release the appropriate annual volume during 2012 to achieve Equalization objectives as practicably as possible by September 30, 2012.

Current Dam Operations

The operating tier for 2013 is the Upper Elevation Balancing Tier, as establish in August 2012 and pursuant to the Interim Guidelines. However, if hydrologic conditions and projections become wetter, it is possible that beginning in April, the Equalization tier will govern the operations of Lake Powell for the remainder of the water year. Based on analysis of a range of inflow scenarios, the current probability of realizing an inflow volume that would trigger Equalization in 2013 is approximately 20 percent. As hydrologic conditions for Lake Powell and Lake Mead change throughout the year, Reclamation will adjust operations of Glen Canyon Dam to release the appropriate annual volume during 2013 to achieve the governing operating tier objectives as practicably as possible by September 30, 2013.

Releases from Glen Canyon Dam in November in the days prior to and after the High Flow Experiment on November 18-23 will be approximately 8,020 cfs with daily fluctuations between 7,000cfs and 9,000cfs and are consistent with the Glen Canyon Operating Criteria (Federal Register, Volume 62, No. 41, March 3, 1997). The scheduled release volume for November, including the High Flow Experiment, is 724 kaf.

In December, the release volume will likely be about 800 kaf, with fluctuations throughout the day from about 8,250 cfs in the early morning to about 16,250 cfs in the early evening. In January, the release volume will likely be about 800 kaf with daily fluctuations for hydropower.

In addition to daily scheduled fluctuations for power generation, the instantaneous releases from Glen Canyon Dam may also fluctuate to provide 40 Megawatts (MW) of system regulation. These instantaneous release adjustments stabilize the electrical generation and transmission system and translate to a range of about 1,100 cfs above or below the hourly scheduled release rate. Typically, fluctuations for system regulation are very short lived and balance out over the hour and do not have noticeable impacts on downstream river flow conditions.

Releases from Glen Canyon Dam can also fluctuate beyond scheduled fluctuations for power generation when called upon as a partner that shares reserve requirements within the electrical generator community (i.e. balancing area). To provide system reliability, all participating electricity generators within the balancing area maintain a specified level of generation capacity (i.e. reserves) that can be called upon when an unscheduled outage occurs. Glen Canyon Dam typically maintains 43 MW of reserves (approximately 1,100 cfs) for this purpose. Reserve calls can be maintained for a maximum of 2 hours after which time the generation rate should be returned to the original schedule. If reserves from Glen Canyon Dam are called upon, releases from the dam can exceed scheduled levels and can have a noticeable impact on the river downstream from Glen Canyon Dam. Calls for reserves are fairly infrequent and typically are for much less than 43 MW.

Current Inflow Forecasts and Model Projections

The hydrologic outlook forecast for water year 2013 projects that the most probable (median) unregulated inflow volume will be 7.60 maf (70% of average based on the period 1981-2010). Based on this hydrologic outlook, the October 24-Month study projects the annual release volume for water year 2013 will be 8.23 maf and the end of water year reservoir elevation and storage for Lake Powell will be 3608.52 (91.48 feet from full pool) and 12.582 maf (51.7% capacity), respectively.

If hydrologic conditions and projections become wetter, it is possible that beginning in April, the Equalization tier will govern the operations of Lake Powell for the remainder of the water year and the release volume for 2013 could be greater than 8.23 maf. Based on analysis of a range of inflow scenarios, the current probability of realizing an inflow volume that would trigger Equalization in 2013 is approximately 20 percent.

Upper Colorado River Basin Hydrology

Since water year 2005, the Upper Colorado River Basin has experienced significant year to year hydrologic variability. The unregulated inflow to Lake Powell, which is a good measure of hydrologic conditions in the Colorado River Basin, has averaged a water year volume of 10.22 maf (94% of average (period 1981-2010)) during the period from 2005 through 2012. The hydrologic variability during this period has been from a low water year unregulated inflow volume of 4.91 maf (45% of average) in water year 2012 to a high water year unregulated inflow volume of 15.97 maf (147% of average) in water year 2011. Based on observed inflows and current forecasts, water year 2013 unregulated inflow is expected to be 7.59 maf (70% of average).

Overall reservoir storage in the Colorado River Basin has increased by over 4 maf since the beginning of water year 2005 and this is an improvement over the persistent drought conditions during water years 2000 through 2004. From the beginning of water year 2005 to the beginning of water year 2013, the total reservoir storage in the Colorado River Basin increased from 29.8 maf (50% of capacity) to 33.9 maf (57 % of capacity). However, this period experienced increases and decreases in total Colorado Basin storage in response to wet and dry hydrology.

RRFW thanks Katrina Grantz of the USBOR for this information.

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From: **RRFW Riverwire** riverwire@rrfw.org
Subject: Glen Canyon Dam Update December 2012
Date: December 15, 2012 at 1:45 PM
To: john@livingrivers.org

RR

RRFW Riverwire
Glen Canyon Dam Update December 2012

December 15, 2012

Glen Canyon Dam/Lake Powell

Recent Reservoir Operations

The unregulated inflow volume to Lake Powell in November was 246 thousand acre-feet (kaf) (52% of average). The release volume from Glen Canyon Dam in November was 730 kaf. The end of November elevation and storage of Lake Powell were 3615.1 feet (85 feet from full pool) and 13.25 maf (54% of full capacity). The reservoir elevation will continue to decline through the fall and winter months.

From November 18-23, 2012, the Department of Interior conducted the first High Flow Experiment under a multi-year High Flow Protocol announced earlier this year by Secretary Salazar. Under this Protocol, high flow releases are linked to sediment input and other resource conditions below Glen Canyon Dam. Beginning on the evening of November 18th, releases from Glen Canyon Dam began ramping up to full power plant capacity (approximately 28,000 cfs). At midday on November 19th, bypass tubes at Glen Canyon Dam were opened and releases continued to increase up to full power plant and bypass capacity (approximately 43,000 cfs) by the evening of November 19th. Releases were maintained at peak release for 24 hours and then began ramping back down. Releases returned to normal operations in the evening of November 23rd. The entire experiment, including ramping lasted 5 days, with 24 hours at peak release. November releases from Glen Canyon Dam prior to and after the High Flow Experiment fluctuated between 7,000cfs and 9,000cfs. The elevation of Lake Powell decreased approximately 2.75 feet during the 5-day experiment. Approximately 77,800 acre-feet was bypassed during the experiment. The total annual release from Glen Canyon Dam in water year 2013 will not change as a result of the High Flow Experiment.

Current and Planned Reservoir Operations

The operating tier for 2013 is the Upper Elevation Balancing Tier, as establish in August 2012 and pursuant to the Interim Guidelines. However, if hydrologic conditions and projections become wetter, it is possible that beginning in April, the Equalization tier will govern the operations of Lake Powell for the remainder of the water year. Based on analysis of a range of inflow scenarios, however, the current probability of realizing an inflow volume that would trigger Equalization in 2013 is less than 5 percent. As hydrologic conditions for Lake Powell and Lake Mead change throughout the year, Reclamation will adjust operations of Glen Canyon Dam to release the appropriate annual volume during 2013 to achieve the governing operating tier objectives as practicably as possible by September 30, 2013.

Releases from Glen Canyon Dam in December are currently averaging approximately 13,000 cfs with daily fluctuations between 8,250cfs and 16,250cfs and consistent with the Glen Canyon Operating Criteria (Federal Register, Volume 62, No. 41, March 3, 1997). The scheduled release volume for December 2012 is 800 kaf.

In January, the release volume will likely be about 800 kaf, with fluctuations throughout the day from about 8,500 cfs in the early morning to about 16,500 cfs in the evening. In February, the release volume will likely be about 600 kaf with daily fluctuations for hydropower between approximately 8,000 cfs and 14,000 cfs.

In addition to daily scheduled fluctuations for power generation, the instantaneous releases from Glen Canyon Dam may also fluctuate to provide 40 MW of system regulation. These instantaneous release adjustments stabilize the electrical generation and transmission system and translate to a range of about 1,100 cfs above or below the hourly scheduled release rate. Typically, fluctuations for system regulation are very short lived and balance out over the hour and do not have noticeable impacts on downstream river flow conditions.

Releases from Glen Canyon Dam can also fluctuate beyond scheduled fluctuations for power generation when called upon as a partner that shares reserve requirements within the electrical generator community (i.e. balancing area). Reserves provide system reliability in the event of an unscheduled outage. Glen Canyon Dam

balancing area). Reserves provide system reliability in the event of an unscheduled outage. Glen Canyon Dam typically maintains 43 MW of reserves (approximately 1,100 cfs). Reserve calls can be maintained for a maximum of 2 hours after which time the generation rate should be returned to the original schedule. If reserves from Glen Canyon Dam are called upon, releases from the dam can exceed scheduled levels and can have a noticeable impact on the river downstream from Glen Canyon Dam. Calls for reserves are fairly infrequent and typically are for much less than 43 MW.

Current Inflow Forecasts and Model Projections

The hydrologic forecast for Lake Powell for water year 2013 projects that the most probable (median) unregulated inflow volume will be 5.76 maf (53% of average based on the period 1981-2010). Based on this hydrologic outlook, the December 24-Month study projects the annual release volume for water year 2013 will be 8.23 maf and the end of water year reservoir elevation and storage for Lake Powell will be 3594.8 and 11.26 maf (48% capacity), respectively.

If hydrologic conditions and projections become significantly wetter, it is possible that beginning in April, the Equalization tier will govern the operations of Lake Powell for the remainder of the water year and the release volume for 2013 could be greater than 8.23 maf. However, based on analysis of a range of inflow scenarios, the current probability of realizing an inflow volume that would trigger Equalization in 2013 is less than 5 percent.

Upper Colorado River Basin Hydrology

Since water year 2005, the Upper Colorado River Basin has experienced significant year to year hydrologic variability. The unregulated inflow to Lake Powell, which is a good measure of hydrologic conditions in the Colorado River Basin, has averaged a water year volume of 10.22 maf (94% of average (period 1981-2010)) during the period from 2005 through 2012. The hydrologic variability during this period has been from a low water year unregulated inflow volume of 4.91 maf (45% of average) in water year 2012 to a high water year unregulated inflow volume of 15.97 maf (147% of average) in water year 2011. Based on observed inflows and current forecasts, water year 2013 unregulated inflow is expected to be 5.76 maf (53% of average).

Overall reservoir storage in the Colorado River Basin has increased by over 4 maf since the beginning of water year 2005 and this is an improvement over the persistent drought conditions during water years 2000 through 2004. From the beginning of water year 2005 to the beginning of water year 2013, the total reservoir storage in the Colorado River Basin increased from 29.8 maf (50% of capacity) to 33.9 maf (57 % of capacity). However, this period experienced year to year increases and decreases in total Colorado Basin storage in response to wet and dry hydrology.

This information courtesy Katrina Grantz, US Bureau of Reclamation.

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Forward email

From: **RRFW Riverwire** riverwire@rrfw.org
Subject: Glen Canyon Dam Update January 2013
Date: January 12, 2013 at 8:50 PM
To: john@livingrivers.org

RR

RRFW Riverwire
Glen Canyon Dam Update January 2013

January 12, 2013

Glen Canyon Dam / Lake Powell

Recent Reservoir Operations The unregulated inflow volume to Lake Powell in December was 195 thousand acre-feet (kaf) (54% of average). The release volume from Glen Canyon Dam in December was 801 kaf. The end of December elevation and storage of Lake Powell were 3609.8 feet (90 feet from full pool) and 12.71 million acre-feet (maf) (52% of full capacity). The reservoir elevation will continue to decline through the winter months.

Current and Planned Reservoir Operations

The operating tier for 2013 is the Upper Elevation Balancing Tier, as establish in August 2012 and pursuant to the Interim Guidelines. However, if hydrologic conditions and projections become wetter, it is possible that beginning in April, the Equalization tier will govern the operations of Lake Powell for the remainder of the water year. Based on analysis of a range of inflow scenarios, however, the current probability of realizing an inflow volume that would trigger Equalization in 2013 is less than 5 percent. As hydrologic conditions for Lake Powell and Lake Mead change throughout the year, Reclamation will adjust operations of Glen Canyon Dam to release the appropriate annual volume during 2013 to achieve the governing operating tier objectives as practicably as possible by
September 30, 2013.

Releases from Glen Canyon Dam in January are currently averaging approximately 13,000 cfs (cubic feet per second) with daily fluctuations between approximately 8,500cfs and 16,500cfs and consistent with the Glen Canyon Operating Criteria (Federal Register, Volume 62, No. 41, March 3, 1997). The scheduled release volume for January 2013 is 800 kaf.

In February, the release volume will likely be about 600 kaf, with fluctuations throughout the day from about 8,000 cfs in the early morning to about 14,000 cfs in the evening. In March, the release volume will likely be about 600 kaf with daily fluctuations for hydropower between approximately 7,000 cfs and 13,000 cfs.

In addition to daily scheduled fluctuations for power generation, the instantaneous releases from Glen Canyon Dam may also fluctuate to provide 40 MW of system regulation. These instantaneous release adjustments stabilize the electrical generation and transmission system and translate to a range of about 1,100 cfs above or below the hourly scheduled release rate. Typically, fluctuations for system regulation are very short lived and balance out over the hour and do not have noticeable impacts on downstream river flow conditions.

Releases from Glen Canyon Dam can also fluctuate beyond scheduled fluctuations for power generation when called upon as a partner that shares reserve requirements within the electrical generator community (i.e. balancing area). Reserves provide system reliability in the event of an unscheduled outage. Glen Canyon Dam typically maintains 43 MW of reserves (approximately 1,100 cfs). Reserve calls can be maintained for a maximum of 2 hours after which time the generation rate should be returned to the original schedule. If reserves from Glen Canyon Dam are called upon, releases from the dam can exceed scheduled levels and can have a noticeable impact on the river downstream from Glen Canyon Dam. Calls for reserves are fairly infrequent and typically are for much less than 43 MW.

Current Inflow Forecasts and Model Projections

The hydrologic forecast for Lake Powell for the April to July water supply season projects that the most probable (median) unregulated inflow volume will be 4.4 maf (61% of average based on the period 1981-2010). Based on this hydrologic outlook, the January 24-Month study projects the annual release volume for water year 2013 will be 8.23 maf and the end of water year reservoir elevation and storage for Lake Powell will be 3600.8 and 11.82 maf (48% capacity), respectively.

be 3600.8 and 11.83 maf (49% capacity), respectively.

If hydrologic conditions and projections become significantly wetter, it is possible that beginning in April, the Equalization tier will govern the operations of Lake Powell for the remainder of the water year and the release volume for 2013 could be greater than 8.23 maf. However, based on analysis of a range of inflow scenarios, the current probability of realizing an inflow volume that would trigger Equalization in 2013 is less than 5 percent.

Upper Colorado River Basin Hydrology

Since water year 2005, the Upper Colorado River Basin has experienced significant year to year hydrologic variability. The unregulated inflow to Lake Powell, which is a good measure of hydrologic conditions in the Colorado River Basin, has averaged a water year volume of 10.22 maf (94% of average (period 1981-2010)) during the period from 2005 through 2012. The hydrologic variability during this period has been from a low water year unregulated inflow volume of 4.91 maf (45% of average) in water year 2012 to a high water year unregulated inflow volume of 15.97 maf (147% of average) in water year 2011. Based on observed inflows and current forecasts, water year 2013 unregulated inflow is expected to be 6.57 maf (61% of average).

Overall reservoir storage in the Colorado River Basin has increased by over 4 maf since the beginning of water year 2005 and this is an improvement over the persistent drought conditions during water years 2000 through 2004. From the beginning of water year 2005 to the beginning of water year 2013, the total reservoir storage in the Colorado River Basin increased from 29.8 maf (50% of capacity) to 33.9 maf (57 % of capacity). However, during this time, total Colorado Basin storage experienced year to year increases and decreases in response to wet and dry hydrology.

This update courtesy of Katrina Grantz, Bureau of Reclamation

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# # #

From: **RRFW Riverwire** riverwire@rrfw.org
Subject: Glen Canyon Dam Update February 2013
Date: February 27, 2013 at 9:10 PM
To: john@livingrivers.org

RR

RRFW Riverwire
Glen Canyon Dam Update February 2013

February 27, 2013

Glen Canyon Dam / Lake Powell

Current Status

The unregulated inflow volume to Lake Powell in January was 168 thousand acre-feet (kaf) (47% of average). The release volume from Glen Canyon Dam in January was 801 kaf. The end of January elevation and storage of Lake Powell were 3604.4 feet (95.6 feet from full pool) and 12.18 million acre-feet (maf) (50% of full capacity). The reservoir elevation will continue to decline through the winter months.

Current Operations

The operating tier for 2013 is the Upper Elevation Balancing Tier, as establish in August 2012 and pursuant to the Interim Guidelines. However, if hydrologic conditions and projections become wetter, it is possible that beginning in April, the Equalization tier will govern the operations of Lake Powell for the remainder of the water year. Based on analysis of a range of inflow scenarios, however, the current probability of realizing an inflow volume that would trigger Equalization in 2013 is less than 5 percent. As hydrologic conditions for Lake Powell and Lake Mead change throughout the year, Reclamation will adjust operations of Glen Canyon Dam to release the appropriate annual volume during 2013 to achieve the governing operating tier objectives as practicably as possible by September 30, 2013.

Releases from Glen Canyon Dam in February are currently averaging approximately 11,000 cubic feet per second (cfs) with daily fluctuations between approximately 8,000cfs and 14,000cfs and consistent with the Glen Canyon Operating Criteria (Federal Register, Volume 62, No. 41, March 3, 1997). Releases in February are currently fluctuating between a nighttime low with a peak in the mid-morning and again in the evening. The scheduled release volume for February 2013 is 600 kaf.

In March, the release volume will likely be about 600 kaf, with fluctuations for hydropower of approximately 7,000 cfs in the nighttime and double peaking up to 13,000 cfs during the mid-morning and evening hours. In April, the release volume will likely be about 550 kaf with double-peaking fluctuations between approximately 6,500 cfs and 11,500 cfs.

In addition to daily scheduled fluctuations for power generation, the instantaneous releases from Glen Canyon Dam may also fluctuate to provide 40 MW of system regulation. These instantaneous release adjustments stabilize the electrical generation and transmission system and translate to a range of about 1,100 cfs above or below the hourly scheduled release rate. Typically, fluctuations for system regulation are very short lived and balance out over the hour and do not have noticeable impacts on downstream river flow conditions.

Releases from Glen Canyon Dam can also fluctuate beyond scheduled fluctuations for power generation when called upon as a partner that shares reserve requirements within the electrical generator community (i.e. balancing area). Reserves provide system reliability in the event of an unscheduled outage. Glen Canyon Dam typically maintains

43 MW of reserves (approximately 1,100 cfs). Reserve calls can be maintained for a maximum of 2 hours after which time the generation rate should be returned to the original schedule. If reserves from Glen Canyon Dam are called upon, releases from the dam can exceed scheduled levels and can have a noticeable impact on the river downstream from Glen Canyon Dam. Calls for reserves are fairly infrequent and typically are for much less than 43 MW.

Inflow Forecasts and Model Projections

The hydrologic forecast for Lake Powell for the April to July water supply season projects that the most

The hydrologic forecast for Lake Powell for the April to July water supply season projects that the most probable (median) unregulated inflow volume will be 3.85 maf (54% of average based on the period 1981-2010). Based on this hydrologic outlook, the January 24-Month study projects the annual release volume for water year 2013 will be 8.23 maf and the end of water year reservoir elevation and storage for Lake Powell will be 3593.3 and 11.12 maf (46% capacity), respectively.

If hydrologic conditions and projections become significantly wetter, it is possible that beginning in April, the Equalization tier will govern the operations of Lake Powell for the remainder of the water year and the release volume for 2013 could be greater than 8.23 maf. However, based on analysis of a range of inflow scenarios, the current probability of realizing an inflow volume that would trigger Equalization in 2013 is less than 5 percent.

Upper Colorado River Basin Hydrology

Since water year 2005, the Upper Colorado River Basin has experienced significant year to year hydrologic variability. The unregulated inflow to Lake Powell, which is a good measure of hydrologic conditions in the Colorado River Basin, has averaged a water year volume of 10.22 maf (94% of average (period 1981-2010)) during the period from 2005 through 2012. The hydrologic variability during this period has been from a low water year unregulated inflow volume of 4.91 maf (45% of average) in water year 2012 to a high water year unregulated inflow volume of 15.97 maf (147% of average) in water year 2011. Based on observed inflows and current forecasts, water year 2013 unregulated inflow is expected to be 5.81 maf (54% of average).

Overall reservoir storage in the Colorado River Basin has increased by over 4 maf since the beginning of water year 2005 and this is an improvement over the persistent drought conditions during water years 2000 through 2004. From the beginning of water year 2005 to the beginning of water year 2013, the total reservoir storage in the Colorado River Basin increased from 29.8 maf (50% of capacity) to 33.9 maf (57 % of capacity). However, during this time, total Colorado Basin storage experienced year to year increases and decreases in response to wet and dry hydrology.

Update courtesy of Katrina Grantz, US Bureau of Reclamation

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# # #

From: **RRFW Riverwire** riverwire@rrfw.org
Subject: Glen Canyon Dam Update March 2013
Date: March 17, 2013 at 10:40 AM
To: john@livingrivers.org

RR

RRFW Riverwire
Glen Canyon Dam Update March 2013

March 17, 2013

Glen Canyon Dam/Lake Powell

The unregulated inflow volume to Lake Powell in February was 262 thousand acre-feet (kaf) (67% of average). The release volume from Glen Canyon Dam in February was 600 kaf. The end of February elevation and storage of Lake Powell were 3601.5 feet (98.5 feet from full pool) and 11.89 maf (49% of full capacity). The reservoir elevation will continue to decline until snowmelt and spring runoff begin to fill the reservoir in late spring.

Current Operations

Releases from Glen Canyon Dam in March are currently averaging approximately 10,000 cubic feet per second (cfs) with daily fluctuations consistent with the Glen Canyon Operating Criteria (Federal Register, Volume 62, No. 41, March 3, 1997). Releases in March are currently fluctuating between a nighttime low of approximately 7,000cfs and a peak in the mid-morning and again in the evening of approximately 13,000cfs. The scheduled release volume for March 2013 is 600 kaf.

In April, the release volume will likely be about 550 kaf, with fluctuations for hydropower of approximately 6,500 cfs in the nighttime and double peaking up to 11,500 cfs during the mid-morning and evening hours. In May, the release volume will likely be about 600 kaf with double-peaking fluctuations between approximately 7,000 cfs and 13,000 cfs.

In addition to daily scheduled fluctuations for power generation, the instantaneous releases from Glen Canyon Dam may also fluctuate to provide 40 Megawatts (MW) of system regulation. These instantaneous release adjustments stabilize the electrical generation and transmission system and translate to a range of about 1,100 cfs above or below the hourly scheduled release rate. Typically, fluctuations for system regulation are very short lived and balance out over the hour and do not have noticeable impacts on downstream river flow conditions.

Releases from Glen Canyon Dam can also fluctuate beyond scheduled fluctuations for power generation when called upon as a partner that shares reserve requirements within the electrical generator community (i.e. balancing area). Reserves provide system reliability in the event of an unscheduled outage. Glen Canyon Dam typically maintains 43 MW of reserves (approximately 1,100 cfs). Reserve calls can be maintained for a maximum of 2 hours after which time the generation rate should be returned to the original schedule. If reserves from Glen Canyon Dam are called upon, releases from the dam can exceed scheduled levels and can have a noticeable impact on the river downstream from Glen Canyon Dam. Calls for reserves are fairly infrequent and typically are for much less than 43 MW.

The operating tier for 2013 is the Upper Elevation Balancing Tier, as establish in August 2012 and pursuant to the Interim Guidelines. However, if the April 24-Month study projects the September 30 Lake Powell elevation to be greater than the 2013 Equalization elevation of 3,646.0 feet, the Equalization Tier will govern operations of Lake Powell for the remainder of the water year and the water year release volume from Lake Powell may be greater than 8.23 maf. Based on analysis of a range of inflow scenarios, an adjustment to Equalization is not anticipated in 2013. As hydrologic conditions for Lake Powell and Lake Mead change throughout the year, Reclamation will adjust operations of Glen Canyon Dam to release the appropriate annual volume during 2013 to achieve the governing operating tier objectives as practicably as possible by September 30, 2013.

Inflow Forecasts and Model Projections

The hydrologic forecast for Lake Powell for the April to July water supply season projects that the most probable (median) unregulated inflow volume will be 3.4 maf (47% of average based on the period 1981-2010). The forecast has continued to decrease throughout the winter season. Based on the current forecast

2010). The forecast has continued to decrease throughout the winter season. Based on the current forecast, the March 24-Month study projects the annual release volume for water year 2013 will be 8.23 maf and the end of water year reservoir elevation and storage for Lake Powell will be 3589.5 and 10.78 maf (44% capacity), respectively.

Consistent with Section 6.B.3 of the Interim Guidelines, if hydrologic conditions and projections become dramatically wetter, it is possible that beginning in April, the Equalization tier will govern the operations of Lake Powell for the remainder of the water year and the release volume for 2013 could be greater than 8.23 maf. However, given current conditions and observed inflows, the Powell unregulated inflow forecast would need to increase by over 7 maf over the next several weeks to trigger an adjustment to equalization this year. Based on analysis of a range of inflow scenarios
and forecasts, an adjustment to equalization is not anticipated in 2013.

Upper Colorado River Basin Hydrology

Since 2005, the Upper Colorado River Basin has experienced significant year to year hydrologic variability. The unregulated inflow to Lake Powell, which is a good measure of hydrologic conditions in the Colorado River Basin, has averaged a water year volume of 10.22 maf (94% of average (period 1981-2010)) during the period from 2005 through 2012. The hydrologic variability during this period has been from a low water year unregulated inflow volume of 4.91 maf (45% of average) in water year 2012 to a high water year unregulated inflow volume of 15.97 maf (147% of average) in water year 2011. Based on observed inflows and current forecasts, water year 2013 unregulated inflow is expected to be 5.31 maf (49% of average).

Overall reservoir storage in the Colorado River Basin has increased by approximately 4 maf since the beginning of water year 2005 and this is an improvement over the persistent drought conditions during water years 2000 through 2004. From the beginning of water year 2005 to the beginning of water year 2013, the total reservoir storage in the Colorado River Basin increased from 29.8 maf (50% of capacity) to 33.9 maf (57 % of capacity).
However, during this time, total Colorado Basin storage experienced year to year increases and decreases in response to wet and dry hydrology. Given observed inflows and current forecasts, the projected end of water year 2013 total reservoir storage is approximately 29.7 maf (50% of capacity).

Update courtesy of Katrina Grantz, US Bureau of Reclamation

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# # #

From: **RRFW Riverwire** riverwire@rrfw.org
Subject: Glen Canyon Dam Update June 2013
Date: June 21, 2013 at 8:55 AM
To: john@livingrivers.org

RR

RRFW Riverwire
Glen Canyon Dam Update June 2013

June 21, 2013

Current Status

The unregulated inflow volume to Lake Powell in May was 1,121 thousand acre-feet (kaf) (48% of average). The release volume from Glen Canyon Dam in May was 602 kaf. The end of May elevation and storage of Lake Powell were 3599.4 feet (100.6 feet from full pool) and 11.68 million acre-feet (maf) (48% of full capacity). The reservoir elevation is expected to remain within several feet of the current elevation throughout spring and summer as inflow from runoff roughly matches reservoir releases. In late summer, the reservoir elevation will begin to decline again.

Current Operations

Releases from Glen Canyon Dam in June are currently averaging approximately
13,000 cubic feet per second (cfs) with daily fluctuations between approximately 9,000 cfs at nighttime and approximately 17,000 cfs during the daytime and consistent with the Glen Canyon Operating Criteria (Federal Register, Volume 62, No. 41, March 3, 1997). The scheduled release volume for June 2013 is 800 thousand acre feet (kaf).

In July, the release volume will likely be about 847 kaf, with daily fluctuations for hydropower between approximately 10,000 cfs in the nighttime and approximately 18,000 cfs in the daytime. In August, the release volume will likely be about 800 kaf with daily fluctuations between approximately 9,000 cfs and 17,000 cfs.

In addition to daily scheduled fluctuations for power generation, the instantaneous releases from Glen Canyon Dam may also fluctuate to provide 40 megawatts (MW) of system regulation. These instantaneous release adjustments stabilize the electrical generation and transmission system and translate to a range of about 1,100 cfs above or below the hourly scheduled release rate. Typically, fluctuations for system regulation are very short lived and balance out over the hour and do not have noticeable impacts on downstream river flow conditions.

Releases from Glen Canyon Dam can also fluctuate beyond scheduled fluctuations for power generation when called upon as a partner that shares reserve requirements within the electrical generator community (i.e. balancing area). Reserves provide system reliability in the event of an unscheduled outage. Glen Canyon Dam typically maintains 43 MW of reserves (approximately 1,100 cfs). Reserve calls can be maintained for a maximum of
2 hours after which time the generation rate should be returned to the original schedule. If reserves from Glen Canyon Dam are called upon, releases from the dam can exceed scheduled levels and can have a noticeable impact on the river downstream from Glen Canyon Dam. Calls for reserves are fairly infrequent and typically are for much less than 43 MW.

The operating tier for 2013 is the Upper Elevation Balancing Tier, as establish in August 2012 and pursuant to the Interim Guidelines. Since the April 2103 projected end of water year elevation at Lake Powell was below the 2013 Equalization Elevation of 3,646.0 feet and the projected end of water year elevation at Lake Mead was above elevation 1,075.0 feet, Section 6.B.1 and 6.B.4 of the Interim Guidelines provide for an annual release volume of 8.23 maf from Lake Powell during water year 2013. Reclamation will schedule operations at Glen Canyon Dam to achieve as practicably as possible an 8.23 maf annual release volume by September 30, 2013.

Inflow Forecasts and Model Projections

The hydrologic forecast for Lake Powell for the April to July water supply season projects that the most probable (median) unregulated inflow volume will be 3.0 maf (42% of average based on the period 1981-2010). The April-July most probable forecast did not change from last month and the overall water supply

2010). The April-July most probable forecast did not change from last month and the overall water supply outlook remains significantly below average. The minimum probable and maximum probable forecasts are 2.48 maf (35%) and
3.48 maf (49%), respectively. Based on the current forecast, the June 24- Month
study projects Lake Powell elevation will decline approximately 11 feet from June to September and end the water year at 3588.8 feet with 10.71 maf in storage (44% capacity). The annual release volume from Lake Powell during water year 2013 is scheduled to be 8.23 maf. Reclamation will schedule operations at Glen Canyon Dam to achieve as practicably as possible an 8.23 maf annual release volume by September 30, 2013.

Consistent with Section 6.C.1 of the Interim Guidelines, if the August 24-Month study projects the January 1, 2014, Lake Powell elevation to be less than 3,575.0 feet and at or above 3,525.0 feet and the Lake Mead elevation to be at or above 1,025.0 feet, the operational tier for Lake Powell in water year 2014 would be the Mid-Elevation Release Tier and the water year release volume from Lake Powell would be 7.48 maf. This June 2013 24-Month study projects that, with an 8.23 maf annual release pattern in water year 2014, the January 1, 2014, Lake Powell elevation would be 3,577.05 feet and the Lake Mead elevation would be 1,105.27 feet. Therefore, the 2014 Lake Powell operational tier is currently projected to be the Upper Elevation Balancing Tier with an annual release volume of 8.23 maf and no projected shift in April to the Equalization Tier.

However, if hydrology should become slightly drier than is currently projected and the August 24- Month Study projects the January 1, 2014 Lake Powell elevation to be less than 3,575.00 feet, the Mid-Elevation Release Tier will govern and the annual release volume from Lake Powell will be 7.48 maf. Based on analysis of a range of inflow scenarios, the current probability of realizing an inflow volume that would result in the Mid-Elevation Release Tier and a 7.48 maf annual release is approximately 45 percent.

Upper Colorado River Basin Hydrology

Since 2005 the Upper Colorado River Basin has experienced significant year to year hydrologic variability. During the period 2005 through 2012, the unregulated inflow to Lake Powell, which is a good measure of hydrologic conditions in the Colorado River Basin, averaged a water year volume of 10.22 maf (94% of average (period 1981-2010)). The unregulated inflow has ranged from a low of 4.91 maf (45% of average) in water year 2012 to a high of 15.97 maf (147% of average) in water year 2011. This has been an improvement over the persistent drought conditions of 2000 to 2004, which averaged a water year unregulated inflow of 5.73 maf. However, based on observed inflows and current forecasts, water year 2013 unregulated inflow is expected to be 4.77 maf (44% of average), which would be a second below-average year in a row.

At the beginning of water year 2013, total system storage in the Colorado River Basin was 33.9 maf (57 % of capacity), which was an increase of about 4 maf since water year 2005 which began at 29.8 maf (50% of capacity). Since 2005, however, total Colorado Basin storage has experienced year to year increases and decreases in response to wet and dry hydrology. In addition, conditions in both 2012 and 2013 have been significantly drier than average and given observed inflows and current forecasts, the current projected end of water year 2013 total reservoir storage is approximately 29.3 maf (49% of capacity).

This update courtesy of Katrina Grantz, Bureau of Reclamation

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# # #

Forward email
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From: **RRFW Riverwire** riverwire@rrfw.org
Subject: Glen Canyon Dam Update July 2013
Date: July 10, 2013 at 9:25 PM
To: john@livingrivers.org

RR

RRFW Riverwire

Glen Canyon Dam Update July 2013

July 10, 2013

Current Status

The unregulated inflow volume to Lake Powell in June was 939 thousand acre-feet (kaf) (35% of average). The release volume from Glen Canyon Dam in June was 800 kaf. The end of June elevation and storage of Lake Powell were 3600.1 feet (99.9 feet from full pool) and 11.76 million acre-feet (maf) (48% of full capacity), respectively. The reservoir elevation peaked in mid-June at 3601.2 ft and is now declining. The elevation will continue to decline through the fall and winter until spring runoff in 2014.

Current Operations

Releases from Glen Canyon Dam in July are currently averaging approximately 14,000 cubic feet per second (cfs) with daily fluctuations between approximately 10,000 cfs at nighttime and approximately 18,000 cfs during the daytime and consistent with the Glen Canyon Operating Criteria (Federal Register, Volume 62, No. 41, March 3, 1997). The scheduled release volume for July 2013 is 847 kaf.

In August, the release volume will likely be about 800 kaf, with daily fluctuations for hydropower between approximately 9,000 cfs in the nighttime and approximately 17,000 cfs in the daytime. In September, the release volume will likely be about 600 kaf with daily fluctuations between approximately 7,000 cfs and 13,000 cfs.

In addition to daily scheduled fluctuations for power generation, the instantaneous releases from Glen Canyon Dam may also fluctuate to provide 40 Megawatts (MW) of system regulation. These instantaneous release adjustments stabilize the electrical generation and transmission system and translate to a range of about 1,200 cfs above or below the hourly scheduled release rate. Typically, fluctuations for system regulation are short lived and generally balance out over the hour with minimal or no noticeable impacts on downstream river flow conditions.

Releases from Glen Canyon Dam can also fluctuate beyond scheduled fluctuations for power generation when called upon as a partner that shares reserve requirements within the electrical generator community (i.e. balancing area). Reserves provide system reliability in the event of an unscheduled outage. Glen Canyon Dam typically maintains 43 MW of reserves (approximately 1,200 cfs). Reserve calls can be maintained for a maximum of 2 hours after which time the generation rate should be returned to the original schedule. If reserves from Glen Canyon Dam are called upon, releases from the dam can exceed scheduled levels and can have a noticeable impact on the river downstream from Glen Canyon Dam. Calls for reserves are fairly infrequent and typically are for much less than 43 MW.

The operating tier for 2013 is the Upper Elevation Balancing Tier, as established in August 2012 and pursuant to the Interim Guidelines. Since the April 2013 projected end of water year elevation at Lake Powell was below the 2013 Equalization Elevation of 3,646.0 feet and the projected end of water year elevation at Lake Mead was above elevation 1,075.0 feet

of water year elevation at Lake Mead was above elevation 1,075.0 feet, Section 6.B.1 and 6.B.4 of the Interim Guidelines provide for an annual release volume of 8.23 maf from Lake Powell during water year 2013. Reclamation will schedule operations at Glen Canyon Dam to achieve as practicably as possible an 8.23 maf annual release volume by September 30, 2013.

Inflow Forecasts and Model Projections

The hydrologic forecast for Lake Powell for the April to July water supply season projects that the most probable (median) unregulated inflow volume will be 2.67 maf (37% of average based on the period 1981-2010). The April-July most probable forecast decreased from last month and the overall water supply outlook remains significantly below average. Based on the current forecast, the July 24-Month study projects Lake Powell elevation will decline approximately 13 feet from July to September and end the water year at 3587.0 feet with 10.5 maf in storage (43% capacity). The annual release volume from Lake Powell during water year 2013 is scheduled to be 8.23 maf. Reclamation will schedule operations at Glen Canyon Dam to achieve as practicably as possible an 8.23 maf annual release volume by September 30, 2013.

Consistent with Section 6.C.1 of the Interim Guidelines, if the August 24-Month study projects the January 1, 2014, Lake Powell elevation to be less than 3,575.0 feet and at or above 3,525.0 feet and the Lake Mead elevation to be at or above 1,025.0 feet, the operational tier for Lake Powell in water year 2014 will be the Mid-Elevation Release Tier and the water year release volume from Lake Powell would be 7.48 maf. This July 2013 24-Month study projects that, with an 8.23 maf annual release pattern in water year 2014, the January 1, 2014 Lake Powell elevation would be 3,574.97 feet and the Lake Mead elevation would be 1,105.73 feet. Therefore, the 2014 Lake Powell operational tier is currently projected to be the Mid-Elevation Release Tier with an annual release volume of 7.48 maf. However, if hydrology should become slightly wetter than is currently projected and the August 24-Month Study projects the January 1, 2014 Lake Powell elevation to be more than 3,575.00 feet, the Upper Elevation Balancing Tier will govern and the annual release volume from Lake Powell will be 8.23 maf or possibly greater. Based on analysis of a range of inflow scenarios, the current probability of realizing an inflow volume that would result in the Upper Elevation Balancing Tier is slightly less than 50 percent.

Upper Colorado River Basin Hydrology

Since 2005 the Upper Colorado River Basin has experienced significant year to year hydrologic variability. During the period 2005 through 2012, the unregulated inflow to Lake Powell, which is a good measure of hydrologic conditions in the Colorado River Basin, averaged a water year volume of 10.22 maf (94% of average (period 1981-2010)). The unregulated inflow has ranged from a low of 4.91 maf (45% of average) in water year 2012 to a high of 15.97 maf (147% of average) in water year 2011. This has been an improvement over the persistent drought conditions of 2000 to 2004, which averaged a water year unregulated inflow of 5.73 maf. However, based on observed inflows and current forecasts, water year 2013 unregulated inflow is expected to be 4.43 maf (41% of average), which would be a second below-average year in a row. At the beginning of water year 2013, total system storage in the Colorado River Basin was 33.9 maf (57 % of capacity), which was an increase of about 4 maf since water year 2005 which began at 29.8 maf (50% of capacity). Since 2005, however, total Colorado Basin storage has experienced year to year increases and decreases in response to wet and dry hydrology. In addition, conditions in both 2012 and 2013 have been significantly drier than average and given observed inflows and current forecasts, the current projected end of water year 2013 total reservoir

storage is approximately 22.6 maf (45% of capacity).

This update courtesy of Paul Davidson, Bureau of Reclamation

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# # #

From: **RRFW Riverwire** riverwire@rrfw.org
Subject: Glen Canyon Dam Update August 2013
Date: August 19, 2013 at 9:40 PM
To: john@livingrivers.org

RR

RRFW Riverwire
Glen Canyon Dam Update August 2013

Current Status

The unregulated inflow volume to Lake Powell in July was 143 thousand acre-feet (kaf) (13% of average). The release volume from Glen Canyon Dam in July was 848 kaf. The end of July elevation and storage of Lake Powell were 3594.2 feet (106 feet from full pool) and 11.20 million acre-feet (maf) (46% of full capacity), respectively. The reservoir elevation peaked in mid-June at 3601.2 ft and is now declining. The elevation will continue to decline through the fall and winter until spring runoff in 2014.

Current Operations

The operating tier for 2013 is the Upper Elevation Balancing Tier, as established in August 2012 and pursuant to the Interim Guidelines. Since the April 2013 projected end of water year elevation at Lake Powell was below the 2013 Equalization Elevation of 3,646.0 feet and the projected end of water year elevation at Lake Mead was above elevation 1,075.0 feet, Section 6.B.1 and 6.B.4 of the Interim Guidelines provide for an annual release volume of 8.23 maf from Lake Powell during water year 2013. Reclamation will schedule operations at Glen Canyon Dam to achieve as practicably as possible an 8.23 maf annual release volume by September 30, 2013.

Releases from Glen Canyon Dam in August are currently averaging approximately 13,000 cfs with daily fluctuations between approximately 9,000 cfs at nighttime and approximately 17,000 cfs during the daytime and consistent with the Glen Canyon Operating Criteria (Federal Register, Volume 62, No. 41, March 3, 1997). The scheduled release volume for August 2013 is 800 kaf.

In September, the release volume will likely be about 600 kaf, with daily fluctuations for hydropower between approximately 7,000 cfs in the nighttime and approximately 13,000 cfs in the daytime. In October, the release volume will likely be about 480 kaf with daily fluctuations between approximately 5,000 cfs and 10,000 cfs.

In addition to daily scheduled fluctuations for power generation, the instantaneous releases from Glen Canyon Dam may also fluctuate to provide 40 MW of system regulation. These instantaneous release adjustments stabilize the electrical generation and transmission system and translate to a range of about 1,200 cfs above or below the hourly scheduled release rate. Under system normal conditions, fluctuations for regulation are typically short lived and generally balance out over the hour with minimal or no noticeable impacts on downstream river flow conditions.

Releases from Glen Canyon Dam can also fluctuate beyond scheduled fluctuations for power generation when called upon as a partner that shares reserve requirements within the electrical generator community (i.e. balancing area). Reserves provide system reliability in the event of an unscheduled outage. Glen Canyon Dam typically maintains 43 MW of reserves (approximately 1,200 cfs). Reserve calls can be maintained for a maximum of 2 hours after which time the generation rate should be returned to the original schedule. If reserves from Glen Canyon Dam are called upon, releases from the dam can exceed scheduled levels and can have a noticeable impact on the river downstream from Glen Canyon Dam. Calls for reserves are fairly infrequent and typically are for much less than 43 MW.

Inflow Forecasts and Model Projections

The hydrologic forecast for Lake Powell, issued by the Colorado Basin River Forecast Center, projects that the most probable (median) unregulated inflow volume for water year 2013 will be 4.33 maf (40% of average based on the period 1981-2010). The water year 2013 forecast decreased from last month, due to significantly below average inflows in July. Based on the current forecast, the August 24-Month study projects Lake Powell elevation will decline approximately 8 feet through August and September and end the water year at 3585.7 feet with 10.4 maf in storage (43% capacity). The annual release volume from Lake Powell during water year 2013 is scheduled to be 8.23 maf. Reclamation will schedule operations at Glen Canyon Dam to achieve as practicably as possible an 8.23 maf annual release volume by September 30, 2013.

The hydrologic forecast for Lake Powell for water year 2014 projects that the most probable (median) unregulated inflow

volume will be 8.32 maf (77% of average based on the period 1981-2010). At this early point in the season, there is significant uncertainty regarding next year's water supply. The forecast ranges from a minimum probable (90% exccedence) of 5.0 maf (46% of average) to a maximum probable (10% exceedence) of 15.5 maf (143% of average). There is a 10% chance that inflows could be higher than the maximum probable and a 10% chance they could be lower than the minimum probable.

Consistent with Section 6.C.1 of the Interim Guidelines, if the August 24-Month study projects the January 1, 2014, Lake Powell elevation to be less than 3,575.0 feet and at or above 3,525.0 feet and the Lake Mead elevation to be at or above 1,025.0 feet, the operational tier for Lake Powell in water year 2014 will be the Mid-Elevation Release Tier and the water year release volume from Lake Powell would be 7.48 maf. The August 2013 24-Month study projects that, with an 8.23 maf annual release pattern in water year 2014, the January 1, 2014, Lake Powell elevation would be 3,573.69 feet and the Lake Mead elevation would be 1,107.39 feet. Therefore, consistent with Section 6.C.1 of the Interim Guidelines, the Lake Powell operational tier for water year 2014 is the Mid-Elevation Release Tier with an annual release volume of 7.48 maf. This determination will be documented in the 2014 AOP, which is currently in the final stages of development.

Upper Colorado River Basin Hydrology

Since 2005 the Upper Colorado River Basin has experienced significant year to year hydrologic variability. During the period 2005 through 2012, the unregulated inflow to Lake Powell, which is a good measure of hydrologic conditions in the Colorado River Basin, averaged a water year volume of 10.22 maf (94% of average (period 1981-2010)). The unregulated inflow has ranged from a low of 4.91 maf (45% of average) in water year 2012 to a high of 15.97 maf (147% of average) in water year 2011. This has been an improvement over the persistent drought conditions of 2000 to 2004, which averaged a water year unregulated inflow of 5.73 maf. However, based on observed inflows and current forecasts, water year 2013 unregulated inflow is expected to be 4.33 maf (40% of average), which would be a second significantly below-average year in a row. If this occurs, the period 2000-2013 would be the driest 14-year period on record with an average annual unregulated inflow of 8.20 maf per year. (For comparison, the standard 1981-2010 period average is 10.83 maf).

At the beginning of water year 2013, total system storage in the Colorado River Basin was 33.9 maf (57 % of capacity), which was an increase of about 4 maf since water year 2005 which began at 29.8 maf (50% of capacity). Since 2005, however, total Colorado Basin storage has experienced year to year increases and decreases in response to wet and dry hydrology. In addition, conditions in both 2012 and 2013 have been significantly drier than average and based on observed inflows and current forecasts, the current projected end of water year 2013 total Colorado Basin reservoir storage is approximately 29.0 maf (49% of capacity).

This update courtesy of Katrina Grantz, Bureau of Reclamation

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# # #

Forward email

From: **RRFW Riverwire** riverwire@rrfw.org
Subject: Glen Canyon Dam Update September 2013
Date: September 13, 2013 at 9:05 PM
To: john@livingrivers.org

RR

RRFW Riverwire
Glen Canyon Dam Update September 2013

Current Status

The unregulated inflow volume to Lake Powell in August was 273 thousand acre-feet (kaf) (55% of average). The release volume from Glen Canyon Dam in August was 801 kaf. The end of August elevation and storage of Lake Powell were 3589.6 feet (110 feet from full pool) and 10.79 million acre-feet (maf) (44% of full capacity), respectively. The reservoir elevation peaked in mid-June at 3601.2 feet and is now declining. The elevation will continue to decline through the fall and winter until spring runoff in 2014.

Current Operations

Releases from Glen Canyon Dam in September are currently averaging approximately 10,600 cubic feet per second (cfs) with daily fluctuations between approximately 6,600 cfs at nighttime and approximately 12,600 cfs during the daytime and consistent with the Glen Canyon Operating Criteria (Federal Register, Volume 62, No. 41, March 3, 1997). The scheduled release volume for September 2013 is 600 kaf.

In October, the release volume will likely be about 480 kaf, with daily fluctuations for hydropower between approximately 5,000 cfs in the nighttime and approximately 10,000 cfs in the daytime. The anticipated release volume for November is 500 kaf with fluctuations for power generation throughout the day consistent with the Glen Canyon Operating Criteria (Federal Register, Volume 62, No. 41, March 3, 1997). However, the release volume may be adjusted in November in the event of a high flow experimental release.

In addition to daily scheduled fluctuations for power generation, the instantaneous releases from Glen Canyon Dam may also fluctuate to provide 40 megawatts (MW) of system regulation. These instantaneous release adjustments stabilize the electrical generation and transmission system and translate to a range of about 1,200 cfs above or below the hourly scheduled release rate. Under system normal conditions, fluctuations for regulation are typically short lived and generally balance out over the hour with minimal or no noticeable impacts on downstream river flow conditions.

Releases from Glen Canyon Dam can also fluctuate beyond scheduled fluctuations for power generation when called upon as a partner that shares reserve requirements within the electrical generator community (i.e. balancing area). Reserves provide system reliability in the event of an unscheduled outage. Glen Canyon Dam typically maintains 43 MW of reserves (approximately 1,200 cfs). Reserve calls can be maintained for a maximum of 2 hours after which time the generation rate should be returned to the original schedule. If reserves from Glen Canyon Dam are called upon, releases from the dam can exceed scheduled levels and can have a noticeable impact on the river downstream from Glen Canyon Dam. Calls for reserves are fairly infrequent and typically are for much less than 43 MW.

The operating tier for water year 2013 is the Upper Elevation Balancing Tier, as established in August 2012 and pursuant to the Interim Guidelines. Since the April 2013 projected end of water year elevation at Lake Powell was below the 2013 Equalization Elevation of 3,646.0 feet and the projected end of water year elevation at Lake Mead was above elevation 1,075.0 feet, Section 6.B.1 and 6.B.4 of the Interim Guidelines provide for an annual release volume of 8.23 maf from Lake Powell during water year 2013. Reclamation will schedule operations at Glen Canyon Dam to achieve as practicably as possible an 8.23 maf annual release volume by September 30, 2013.

Inflow Forecasts and Model Projections

The hydrologic forecast for Lake Powell, issued by the Colorado Basin River Forecast Center, projects that the most probable (median) unregulated inflow volume for water year 2013 will be 4.46 maf (41% of average based on the period 1981-2010). The water year 2013 forecast increased slightly from last month, due to higher than expected inflows in August. Based on the current forecast, the September 24-Month study projects Lake Powell elevation will decline approximately 2 feet through September and end the water year at 3586.4

Lake Powell elevation will decline approximately 3 feet through September and end the water year at 3586.4 feet with 10.5 maf in storage (43% capacity). The annual release volume from Lake Powell during water year 2013 is scheduled to be 8.23 maf. Reclamation will schedule operations at Glen Canyon Dam to achieve as practicably as possible an 8.23 maf annual release volume by September 30, 2013.

The hydrologic forecast for water year 2014 for Lake Powell, issued by the Colorado Basin River Forecast Center, projects that the most probable (median) unregulated inflow volume will be 8.41 maf (78% of average based on the period 1981-2010). At this early point in the season, there is significant uncertainty regarding next year's water supply. The forecast ranges from a minimum probable of 5.0 maf (46% of average) to a maximum probable of 15.5 maf (143% of average). There is a 10% chance that inflows could be higher than the maximum probable and a 10% chance they could be lower than the minimum probable.

Consistent with Section 6.C.1 of the Interim Guidelines, the Lake Powell operational tier for water year 2014 is the Mid-Elevation Release Tier with an annual release volume of 7.48 maf. This was determined in the August 2013 24-Month study tier determination run which projected that, with an 8.23 maf annual release pattern in water year 2014, the January 1, 2014, Lake Powell elevation would be below 3,575.0 feet and the Lake Mead elevation would be above 1,025.0 feet. This determination will be documented in the 2014 AOP, which is currently in the final stages of development.

Upper Colorado River Basin Hydrology

Since 2005 the Upper Colorado River Basin has experienced significant year to year hydrologic variability. During the period 2005 through 2012, the unregulated inflow to Lake Powell, which is a good measure of hydrologic conditions in the Colorado River Basin, averaged a water year volume of 10.22 maf (94% of average (period 1981-2010)). The unregulated inflow has ranged from a low of 4.91 maf (45% of average) in water year 2012 to a high of 15.97 maf (147% of average) in water year 2011. This has been an improvement over the persistent drought conditions of 2000 to 2004, which averaged a water year unregulated inflow of 5.73 maf. However, based on observed inflows and current forecasts, water year 2013 unregulated inflow is expected to be 4.46 maf (41% of average), which would be a second significantly below-average year in a row. If this occurs, the period 2000-2013 would be the driest 14-year period on record with an average annual unregulated inflow of 8.20 maf per year. (For comparison, the standard 1981-2010 period average is 10.83 maf).

At the beginning of water year 2013, total system storage in the Colorado River Basin was 33.9 maf (57 % of capacity), which was an increase of about 4 maf since water year 2005 which began at 29.8 maf (50% of capacity). Since 2005, however, total Colorado Basin storage has experienced year to year increases and decreases in response to wet and dry hydrology. In addition, conditions in both 2012 and 2013 have been significantly drier than average and based on observed inflows and current forecasts, the current projected end of water year 2013 total Colorado Basin reservoir storage is approximately 27.1 maf (45% of capacity).

This update courtesy of Katrina Grantz, Bureau of Reclamation

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# # #

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From: **RRFW Riverwire** riverwire@rrfw.org
Subject: Glen Canyon Dam Update October 2013
Date: October 22, 2013 at 3:50 PM
To: john@livingrivers.org

RR

RRFW Riverwire
Glen Canyon Dam Update October 2013

October 21, 2013

Current Operations

Releases from Glen Canyon Dam in October are currently averaging approximately 8,000 cubic Feet per second (cfs) with daily fluctuations between approximately 5,000 cfs at nighttime and approximately 10,000 cfs during the daytime and consistent with the Glen Canyon Operating Criteria (Federal Register, Volume 62, No. 41, March 3, 1997). The scheduled release volume for October 2013 is 480 thousand acre feet (kaf).

The anticipated release volume for November is 500 kaf with fluctuations for power generation throughout the day consistent with the Glen Canyon Operating Criteria (Federal Register, Volume 62, No. 41, March 3, 1997). However, the release volume may be adjusted in the event of a High Flow Experiment. Under the High-Flow Protocol, high flow releases are linked to sediment input and other resource conditions below Glen Canyon Dam. Preliminary analysis appears favorable for a high flow experimental release to occur during the period of November 8 to 18, 2013. During the High Flow Experiment, total releases from Glen Canyon Dam at full bypass may reach approximately 37,200 cfs. The total experiment, including ramping, could last up to about five and a half days. In the event of a high flow experiment, releases from Glen Canyon Dam prior to and after the high flow experiment are anticipated to fluctuate between 5,000cfs and 8,000cfs.

In December, the release volume will likely be about 600 kaf, with fluctuations throughout the day for hydropower generation.

In addition to daily scheduled fluctuations for power generation, the instantaneous releases from Glen Canyon Dam may also fluctuate to provide 40 Mega Watts (MW) of system regulation. These instantaneous release adjustments stabilize the electrical generation and transmission system and translate to a range of about 1,200 cfs above or below the hourly scheduled release rate. Under system normal conditions, fluctuations for regulation are typically short lived and generally balance out over the hour with minimal or no noticeable impacts on downstream river flow conditions.

Releases from Glen Canyon Dam can also fluctuate beyond scheduled fluctuations for power generation when called upon as a partner that shares reserve requirements within the electrical generator community (i.e. balancing area). Reserves provide system reliability in the event of an unscheduled outage. Glen Canyon Dam typically maintains 43 MW of reserves (approximately 1,200 cfs). Reserve calls can be maintained for a maximum of 2 hours after which time the generation rate should be returned to the original schedule. If reserves from Glen Canyon Dam are called upon, releases from the dam can exceed scheduled levels and can have a noticeable impact on the river downstream from Glen Canyon Dam. Calls for reserves are fairly infrequent and typically are for much less than 43 MW.

The operating tier for water year 2014 is the Mid-Elevation Release Tier with an annual release volume of 7.48 million acre feet (maf), as established in August 2013 and pursuant to the Interim Guidelines, Section 6.C.1. Reclamation will schedule operations at Glen Canyon Dam to achieve as practicably as possible a 7.48 maf annual release volume by September 30, 2014.

Current Status

The unregulated inflow volume to Lake Powell in September was 857 kaf (210% of average). The release volume from Glen Canyon Dam in September was 600 kaf. The end of September elevation and storage of Lake Powell were 3591.3 feet (108.7 feet from full pool) and 10.93 maf (45% of full capacity), respectively. Due to above average runoff from monsoonal activity in September, Lake Powell elevation increased by about 2 feet over an 11-day period in September. The reservoir elevation is now declining and will continue to decline through the fall and winter until spring runoff in 2014.

The water year 2013 unregulated inflow volume was 5.12 maf (47% of average), placing 2013 as the fourth driest on record since the closure of Glen Canyon Dam in 1963. Water years 2002, 1977, and 2012 were drier, receiving 2.64 maf, 3.53 maf, and 4.91 maf, respectively. In terms of reservoir elevation and storage, Lake Powell reached its peak for water

3.53 maf, and 4.91 maf, respectively. In terms of reservoir elevation and storage, Lake Powell reached its peak for water year 2013 on June 18 at 3,601.2 ft (98.8 feet from full pool) which is 35.7 feet lower than last year's peak elevation of 3636.9 ft. The end of water year 2013 elevation and storage of Lake Powell were 3591.3 feet (108.7 feet from full pool) and 10.93maf (45% of capacity), respectively. This is 3.0 maf less than 2012 end of water year storage which was 13.93 maf (57% of capacity).

Releases for Water Year 2013 totaled 8.232 maf. Pursuant to the Interim Guidelines, Lake Powell operated under the Upper Elevation Balancing Tier in 2013. Throughout water year 2013, Reclamation adjusted operations of Glen Canyon Dam to release the appropriate annual volume during 2013 to achieve Upper Elevation Balancing Tier objectives as practicably as possible by September 30, 2012.

Inflow Forecasts and Model Projections

The hydrologic forecast for water year 2014 for Lake Powell, issued by the Colorado Basin River Forecast Center, projects that the most probable (median) unregulated inflow volume will be 9.65 maf (78% of average based on the period 1981-2010). The water year 2013 forecast increased by 1.24 maf since last month, primarily due to much higher than expected monsoonal precipitation and runoff in September. At this early point in the season, there is significant uncertainty regarding next year's water supply. The forecast ranges from a minimum probable of 6.5 maf (60% of average) to a maximum probable of 16.5 maf (162% of average). There is a 10% chance that inflows could be higher than the maximum probable and a 10% chance they could be lower than the minimum probable.

Based on the current forecast, the October 24-Month study projects Lake Powell elevation will peak near approximately 3,604 ft next summer and end the water year near 3,598 feet with approximately 11.6 maf in storage (48% capacity). Note that projections of elevation and storage have significant uncertainty at this point in the season, primarily due to uncertainty regarding next season's snowpack and resulting inflow to Lake Powell. Under the minimum probable inflow scenario, the projected summer peak is
3,586 ft and end of water year storage is 9.3 maf (38% capacity). Under the maximum probable inflow scenario the projected summer peak is 3,661 ft and end of water year storage is 18.4 maf (76% capacity). There is a 10% chance that inflows will be higher, resulting in higher elevation and storage, and 10% chance that inflows will be lower, resulting in lower elevation and storage. The annual release volume from Lake Powell during water year 2014 is projected to be 7.48 maf under all inflow scenarios.

Consistent with Section 6.C.1 of the Interim Guidelines, the Lake Powell operational tier for water year 2014 is the Mid-Elevation Release Tier with an annual release volume of 7.48 maf. This was determined in the August 2013 24-Month study tier determination run which projected that, with an 8.23 maf annual release pattern in water year 2014, the January 1, 2014, Lake Powell elevation would be below 3,575.0 feet and the Lake Mead elevation would be above 1,025.0 feet. This determination will be documented in the 2014 AOP, which is currently in the final stages of development.

Upper Colorado River Basin Hydrology

The Upper Colorado River Basin regularly experiences significant year to year hydrologic variability. During the 14-year period 2000 to 2013, however, the unregulated inflow to Lake Powell, which is a good measure of hydrologic conditions in the Colorado River Basin, was above average in only 3 out of the past 14 years. The period 2000-2014 is the lowest 14-year period since the closure of Glen Canyon Dam in 1963, with an average unregulated inflow of 8.25 maf, or 76% of the 30-year average (1981-2010). (For comparison, the 1981-2010 average is 10.83maf.) The unregulated inflow during the 2000-2013 period has ranged from a low of 2.64 maf (24% of average) in water year 2002 to a high of 15.97 maf (147% of average) in water year 2011. One wet year can significantly increase total system reservoir storage, just as persistent dry years can draw down the system storage.

At the beginning of water year 2014, total system storage in the Colorado River Basin was 29.9 maf (50% of 59.6 maf total system capacity). This is about 4 maf less than the total storage at the beginning of water year 2013 which began at 34.0 maf (57% of capacity). Since the beginning of water year 2000, total Colorado Basin storage has experienced year to year increases and decreases in response to wet and dry hydrology, ranging from a high of 94% of capacity at the beginning of 2000 to a low of 50% of capacity at the beginning of water year 2014. Based on current forecasts, the current projected end of water year 2014 total Colorado Basin reservoir storage is approximately 29.6 maf (50% of capacity).

This update courtesy of Katrina Grantz, Bureau of Reclamation

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From: **RRFW Riverwire** riverwire@rrfw.org
Subject: Glen Canyon Dam Update November 2013
Date: November 17, 2013 at 3:15 PM
To: john@livingrivers.org

RR

RRFW Riverwire
Glen Canyon Dam Update November 2013

Current Status

The unregulated inflow volume to Lake Powell in October was 549 thousand acre-feet (kaf) (107% of average). The release volume from Glen Canyon Dam in October was 481 kaf. The end of October elevation and storage of Lake Powell were 3590.9 feet (109.1 feet from full pool) and 10.90 million acre-feet (maf) (45% of full capacity), respectively. The reservoir elevation is now declining and will continue to decline through the fall and winter until spring runoff in 2014.

Current Operations

From November 11-16, 2013, the Department of Interior is conducting a High Flow Experiment (HFE). Under the HFE Protocol, high flow releases are linked to sediment input and other resource conditions below Glen Canyon Dam. During the HFE, total releases from Glen Canyon Dam at full powerplant capacity and bypass may reach approximately 34,100 cubic feet per second (cfs). Releases will be maintained at peak release for 4 days (96 hours). The total experiment, including ramping, is expected to last just over five days. November releases from Glen Canyon Dam prior to and after the HFE are expected to fluctuate between 5,000cfs and 8,000cfs. The elevation of Lake Powell is expected to decrease approximately 2 ½ feet during the 5 day experiment. The total release volume in November, including the HFE, will be approximately 670 kaf. The annual release volume from Lake Powell remains 7.48 maf and will not change as a result of the HFE.

In December, the release volume will likely be about 600 kaf, with fluctuations from about 6,000 cfs in the daytime to about 12,000 cfs in the nighttime and consistent with the Glen Canyon Operating Criteria (Federal Register, Volume 62, No. 41, March 3, 1997).

In January, the release volume will likely be about 800 kaf with daily fluctuations for hydropower.

The operating tier for water year 2014 is the Mid-Elevation Release Tier with an annual release volume of 7.48 maf, as established in August 2013 and pursuant to the Interim Guidelines, Section 6.C.1. Reclamation will schedule operations at Glen Canyon Dam to achieve as practicably as possible a 7.48 maf annual release volume by September 30, 2014.

In addition to daily scheduled fluctuations for power generation, the instantaneous releases from Glen Canyon Dam may also fluctuate to provide 40 MW of system regulation. These instantaneous release adjustments stabilize the electrical generation and transmission system and translate to a range of about 1,200 cfs above or below the hourly scheduled release rate. Under system normal conditions, fluctuations for regulation are typically short lived and generally balance out over the hour with minimal or no noticeable impacts on downstream river flow conditions.

Releases from Glen Canyon Dam can also fluctuate beyond scheduled fluctuations for power generation when called upon as a partner that shares reserve requirements within the electrical generator community (i.e. balancing area). Reserves provide system reliability in the event of an unscheduled outage. Glen Canyon Dam typically maintains 41 MW of reserves (approximately 1,200 cfs). Reserve calls can be maintained for a maximum of 2 hours after which time the generation rate should be returned to the original schedule. If reserves from Glen Canyon Dam are called upon, releases from the dam can exceed scheduled levels and can have a noticeable impact on the river downstream from Glen Canyon Dam. Calls for reserves are fairly infrequent and typically are for much less than 41 MW.

Inflow Forecasts and Model Projections

The hydrologic forecast for water year 2014 for Lake Powell, issued by the Colorado Basin River Forecast Center, projects that the most probable (median) unregulated inflow volume will be 9.75 maf (90% of average based on the period 1981-2010). The water year 2014 forecast increased slightly (100 kaf) since last month. At this early point in the season, there is significant uncertainty regarding next year's water supply. The forecast

ranges from a minimum probable of 6.5 maf (60% of average) to a maximum probable of 16.5 maf (162% of average). There is a 10 percent chance that inflows could be higher than the maximum probable and a 10 percent chance they could be lower than the minimum probable.

Based on the current forecast, the November 24-Month study projects Lake Powell elevation will peak near approximately 3,605 ft next summer and end the water year near 3,599 feet with approximately 11.68 maf in storage (48% capacity). Note that projections of elevation and storage have significant uncertainty at this point in the season, primarily due to uncertainty regarding next season's snowpack and resulting inflow to Lake Powell. Under the minimum probable inflow scenario, last run in October, the projected summer peak is 3,586 ft and end of water year storage is 9.3 maf (38% capacity). Under the maximum probable inflow scenario, last run in October, the projected summer peak is 3,661 ft and end of water year storage is 18.4 maf (76% capacity). There is a 10 percent chance that inflows will be higher, resulting in higher elevation and storage, and 10 percent chance that inflows will be lower, resulting in lower elevation and storage. The annual release volume from Lake Powell during water year 2014 is projected to be 7.48 maf under all inflow scenarios.

Consistent with Section 6.C.1 of the Interim Guidelines, the Lake Powell operational tier for water year 2014 is the Mid-Elevation Release Tier with an annual release volume of 7.48 maf. This was determined in the August 2013 24-Month study tier determination run which projected that, with an 8.23 maf annual release pattern in water year 2014, the January 1, 2014, Lake Powell elevation would be below 3,575.0 feet and the Lake Mead elevation would be above 1,025.0 feet. This determination will be documented in the 2014 AOP, which is currently in the final stages of development.

Upper Colorado River Basin Hydrology

The Upper Colorado River Basin regularly experiences significant year to year hydrologic variability. During the 14-year period 2000 to 2013, however, the unregulated inflow to Lake Powell, which is a good measure of hydrologic conditions in the Colorado River Basin, was above average in only 3 out of the past 14 years. The period 2000-2014 is the lowest 14-year period since the closure of Glen Canyon Dam in 1963, with an average unregulated inflow of 8.25 maf, or 76% of the 30-year average (1981-2010). (For comparison, the 1981-2010 average is 10.83maf.) The unregulated inflow during the 2000-2013 period has ranged from a low of 2.64 maf (24% of average) in water year 2002 to a high of 15.97 maf (147% of average) in water year 2011. Under the current forecast, water year 2014 inflows to Lake Powell are expected to range between a minimum probable of 6.5 maf (60% of average) and a maximum probable of 16.5 maf (162% of average) with a most probable projection of 9.75 maf (90% of average).

At the beginning of water year 2014, total system storage in the Colorado River Basin was 29.9 maf (50% of 59.6 maf total system capacity). This is about 4 maf less than the total storage at the beginning of water year 2013 which began at 34.0 maf (57% of capacity). Since the beginning of water year 2000, total Colorado Basin storage has experienced year to year increases and decreases in response to wet and dry hydrology, ranging from a high of 94% of capacity at the beginning of 2000 to a low of 50% of capacity at the beginning of water year 2014. One wet year can significantly increase total system reservoir storage, just as persistent dry years can draw down the system storage. Based on current inflow forecasts, the current projected end of water year 2014 total Colorado Basin reservoir storage is approximately 29.6 maf (50% of capacity). The actual end of water year storage may vary significantly from this projection, primarily due to uncertainty regarding next season's snowpack and resulting runoff.

This update courtesy of Katrina Grantz, Bureau of Reclamation

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From: **RRFW Riverwire** riverwire@rrfw.org
Subject: Glen Canyon Dam Update December 2013
Date: December 12, 2013 at 5:50 PM
To: john@livingrivers.org

RR

RRFW Riverwire

Glen Canyon Dam Update December 2013

Current Operations

In December, the release volume will likely be about 600 kaf, with fluctuations from about 6,000 cubic feet per second (cfs) in the nighttime to about 12,000 cfs in the daytime, consistent with the Glen Canyon Operating Criteria (Federal Register, Volume 62, No. 41, March 3, 1997). In January, the release volume will likely be about 800 kaf with daily fluctuations for hydropower between 8,500 cfs and 16,500 cfs. The anticipated release volume for February is 600 kaf with daily flows close to December 2013 releases

Rough estimates at this time project that in March the expected release may be something close to 505 kaf (maybe up to 510 kaf, or so) with fluctuations between 6,000 cfs and 10,500 cfs or 11,000 cfs.

In April and May, releases are also expected to be very close to 500 kaf, with daily fluctuations similar to March releases. June is forecasted to be close to 600 kaf.

The operating tier for water year 2014 is the Mid-Elevation Release Tier with an annual release volume of 7.48 maf, as established in August 2013 and pursuant to the Interim Guidelines, Section 6.C.1. Reclamation will schedule operations at Glen Canyon Dam to achieve as practicably as possible a 7.48 maf annual release volume by September 30, 2014.

Releasing 7.48 maf this year instead of 8.23 means river runners will see lower monthly release volumes than they may have seen in the past.

In addition to daily scheduled fluctuations for power generation, the instantaneous releases from Glen Canyon Dam may also fluctuate to provide 40 MW of system regulation. These instantaneous release adjustments stabilize the electrical generation and transmission system and translate to a range of about 1,200 cfs above or below the hourly scheduled release rate. Under system normal conditions, fluctuations for regulation are typically short lived and generally balance out over the hour with minimal or no noticeable impacts on downstream river flow conditions.

Releases from Glen Canyon Dam can also fluctuate beyond scheduled fluctuations for power generation when called upon as a partner that shares reserve requirements within the electrical generator community (i.e. balancing area). Reserves provide system reliability in the event of an unscheduled outage. Glen Canyon Dam typically maintains 41 MW of reserves (approximately 1,200 cfs). Reserve calls can be maintained for a maximum of 2 hours after which time the generation rate should be returned to the original schedule. If reserves from Glen Canyon Dam are called upon, releases from the dam can exceed scheduled levels and can have a noticeable impact on the river downstream from Glen

Canyon Dam. Calls for reserves are fairly infrequent and typically are for much less than 41 MW.

Current Status

The unregulated inflow volume to Lake Powell in November was 460 thousand acre-feet (kaf) (97% of average). The release volume from Glen Canyon Dam in November was 680 kaf. On November 11-16 a high flow experimental release was conducted from Glen Canyon Dam in accordance with the High Flow Protocol. Reclamation released the maximum available capacity (35,000 cfs) during the 5-day experiment. The end of November elevation and storage of Lake Powell were 3587.9 feet (112.1 feet from full pool) and 10.63 million acre-feet (maf) (44% of full capacity), respectively. The annual release volume from Lake Powell remains 7.48 maf and will not change as a result of the HFE. The reservoir elevation is now declining and will continue to decline through the fall and winter until spring runoff in 2014.

Inflow Forecasts and Model Projections
The hydrologic forecast for water year 2014 for Lake Powell, issued by the Colorado Basin River Forecast Center, projects that the most probable (median) unregulated inflow volume will be 10.21 maf (94% of average based on the period 1981-2010). The water year 2014 forecast increased by 560 kaf since last month. At this early point in the season, there is still significant uncertainty regarding next year's water supply. The forecast ranges from a minimum probable of 6.5 maf (60% of average) to a maximum probable of 16.5 maf (162% of average). There is a 10 percent chance that inflows could be higher than the maximum probable and a 10 percent chance they could be lower than the minimum probable.

Based on the current forecast, the December 24-Month study projects Lake Powell elevation will peak near approximately 3,608 ft next summer and end the water year near 3,603 feet with approximately 12.08 maf in storage (50% capacity). Note that projections of elevation and storage have significant uncertainty at this point in the season, primarily due to uncertainty regarding the upcoming winter's total snowfall and the resulting inflow to Lake Powell. Under the minimum probable inflow scenario, last run in October, the projected summer peak is 3,586 ft and end of water year storage is 9.3 maf (38% capacity). Under the maximum probable inflow scenario, last run in October, the projected summer peak is 3,661 ft and end of water year storage is 18.4 maf (76% capacity). There is a 10 percent chance that inflows will be higher, resulting in higher elevation and storage, and 10 percent chance that inflows will be lower, resulting in lower elevation and storage. The minimum and maximum probable model runs will be updated in January. The annual release volume from Lake Powell during water year 2014 is projected to be 7.48 maf under all inflow scenarios.

Consistent with Section 6.C.1 of the Interim Guidelines, the Lake Powell operational tier for water year 2014 is the Mid-Elevation Release Tier with an annual release volume of 7.48 maf. This was determined in the August 2013 24-Month study tier determination run which projected that, with an 8.23 maf annual release pattern in water year 2014, the January 1, 2014, Lake Powell elevation would be below 3,575.0 feet and the Lake Mead elevation would be above 1,025.0 feet. This determination will be documented in the 2014

AOP, which is currently in the final stages of development.

Upper Colorado River Basin Hydrology

The Upper Colorado River Basin regularly experiences significant year to year hydrologic variability. During the 14-year period 2000 to 2013, however, the unregulated inflow to Lake Powell, which is a good measure of hydrologic conditions in the Colorado River Basin, was above average in only 3 out of the past 14 years. The period 2000-2014 is the lowest 14-year period since the closure of Glen Canyon Dam in 1963, with an average unregulated inflow of 8.25 maf, or 76% of the 30-year average (1981-2010). (For comparison, the 1981-2010 average is 10.83maf.) The unregulated inflow during the 2000-2013 period has ranged from a low of 2.64 maf (24% of average) in water year 2002 to a high of 15.97 maf (147% of average) in water year 2011. Under the current forecast, water year 2014 inflows to Lake Powell are expected to range between a minimum probable of 6.5 maf (60% of average) and a maximum probable of 16.5 maf (162% of average) with a most probable projection of 10.21 maf (94% of average).

At the beginning of water year 2014, total system storage in the Colorado River Basin was 29.9 maf (50% of 59.6 maf total system capacity). This is about 4 maf less than the total storage at the beginning of water year 2013 which began at 34.0 maf (57% of capacity). Since the beginning of water year 2000, total Colorado Basin storage has experienced year to year increases and decreases in response to wet and dry hydrology, ranging from a high of 94% of capacity at the beginning of 2000 to a low of 50% of capacity at the beginning of water year 2014. One wet year can significantly increase total system reservoir storage, just as persistent dry years can draw down the system storage. Based on current inflow forecasts, the current projected end of water year 2014 total Colorado Basin reservoir storage is approximately 31.1 maf (51% of capacity). The actual end of water year storage may vary significantly from this projection, primarily due to uncertainty regarding next season's snowpack and resulting runoff.

This update courtesy of Katrina Grantz, Bureau of Reclamation

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Forward email

From: **RRFW Riverwire** riverwire@rrfw.org
Subject: Glen Canyon Dam Update January 2014
Date: January 14, 2014 at 4:02 PM
To: john@livingrivers.org

RR

RRFW Riverwire
Glen Canyon Dam Update January 2014

January 14, 2014

Current Status

The unregulated inflow volume to Lake Powell in December was 294 thousand acre-feet (kaf) (81% of average). The release volume from Glen Canyon Dam in December was 601 kaf. The end of December elevation and storage of Lake Powell were 3584.4 feet (115.6 feet from full pool) and 10.16 million acre-feet (maf) (42% of full capacity), respectively. The reservoir elevation is now declining and will continue to decline through the winter until spring runoff. Snowpack is currently about 96% of median for this time of year.

Current Operations

The operating tier for water year 2014 is the Mid-Elevation Release Tier with an annual release volume of 7.48 maf, as established in August 2013 and pursuant to the Interim Guidelines, Section 6.C.1. Reclamation will schedule operations at Glen Canyon Dam to achieve as practicably as possible a 7.48 maf annual release volume by September 30, 2014.

In January, the release volume will likely be about 800 kaf, with fluctuations from about 8,500 cubic feet per second (cfs) in the nighttime to about 16,500 cfs in the daytime and consistent with the Glen Canyon Operating Criteria (Federal Register, Volume 62, No. 41, March 3, 1997). In February, the release volume will likely be about 600 kaf with daily fluctuations for hydropower.

In addition to daily scheduled fluctuations for power generation, the instantaneous releases from Glen Canyon Dam may also fluctuate to provide 40 Megawatts (MW) of system regulation. These instantaneous release adjustments stabilize the electrical generation and transmission system and translate to a range of about 1,200 cfs above or below the hourly scheduled release rate. Under system normal conditions, fluctuations for regulation are typically short lived and generally balance out over the hour with minimal or no noticeable impacts on downstream river flow conditions.

Releases from Glen Canyon Dam can also fluctuate beyond scheduled fluctuations for power generation when called upon as a partner that shares reserve requirements within the electrical generator community (i.e. balancing area). Reserves provide system reliability in the event of an unscheduled outage. Glen Canyon Dam typically maintains 41 MW of reserves (approximately 1,200 cfs). Reserve calls can be maintained for a maximum of 2 hours after which time the generation rate should be returned to the original schedule. If reserves from Glen Canyon Dam are called upon, releases from the dam can exceed scheduled levels and can have a noticeable impact on the river downstream from Glen Canyon Dam. Calls for reserves are fairly infrequent and typically are for much less than 41 MW.

Inflow Forecasts and Model Projections

The forecast for the 2014 April to July water supply season for Lake Powell, issued by the Colorado Basin River Forecast Center, projects that the most probable (median) unregulated inflow volume will be 6.81 maf (95% of average based on the period 1981-2010). The winter snow accumulation season has started off near average (currently 96% of median), however, at this early point in the season, there is still significant uncertainty regarding the final snowpack and resulting runoff. The April-July forecast ranges from a minimum probable of 4.0 maf (56% of average) to a maximum probable of 10.2 maf (142% of average). (For reference, the 30-year April-Juny average is 7.16 maf.) There is a 10 percent chance that inflows could be higher than the maximum probable and a 10 percent chance they could be lower than the minimum probable.

Based on the current forecast, the January 24-Month study projects Lake Powell elevation will peak near approximately 3,608 ft next summer and end the water year near 3,603 feet with approximately 12.04 maf in storage (50% capacity). Note that projections of elevation and storage have significant uncertainty at this point in the season, primarily due to uncertainty regarding the season's total snowpack and the resulting inflow to

Lake Powell. Under the minimum probable inflow scenario, updated in January, the projected summer peak is 3,592 ft and end of water year storage is 9.7 maf (40% capacity). Under the maximum probable inflow scenario, updated in January, the projected summer peak is 3,631 ft and end of water year storage is 15.0 maf (62% capacity). There is a 10 percent chance that inflows will be higher, resulting in higher elevation and storage, and 10 percent chance that inflows will be lower, resulting in lower elevation and storage. The minimum and maximum probable model runs will be updated again in April. The annual release volume from Lake Powell during water year 2014 is projected to be 7.48 maf under all inflow scenarios.

Consistent with Section 6.C.1 of the Interim Guidelines, the Lake Powell operational tier for water year 2014 is the Mid-Elevation Release Tier with an annual release volume of 7.48 maf. This was determined in the August 2013 24-Month study tier determination run and documented in the 2014 Annual Operating Plan signed by Secretary Jewell in December 2013.

Upper Colorado River Basin Hydrology

The Upper Colorado River Basin regularly experiences significant year to year hydrologic variability. During the 14-year period 2000 to 2013, however, the unregulated inflow to Lake Powell, which is a good measure of hydrologic conditions in the Colorado River Basin, was above average in only 3 out of the past 14 years. The period 2000-2014 is the lowest 14-year period since the closure of Glen Canyon Dam in 1963, with an average unregulated inflow of 8.25 maf, or 76% of the 30-year average (1981-2010). (For comparison, the 1981-2010 total water year average is 10.83maf.) The unregulated inflow during the 2000-2013 period has ranged from a low of 2.64 maf (24% of average) in water year 2002 to a high of 15.97 maf (147% of average) in water year 2011. Under the current forecast, total water year 2014 inflows to Lake Powell are expected to range between a minimum probable of 6.9 maf (64% of average) and a maximum probable of 14.1 maf (130% of average) with a most probable projection of 10.09 maf (93% of average).

At the beginning of water year 2014, total system storage in the Colorado River Basin was 29.9 maf (50% of 59.6 maf total system capacity). This is about 4 maf less than the total storage at the beginning of water year 2013 which began at 34.0 maf (57% of capacity). Since the beginning of water year 2000, total Colorado Basin storage has experienced year to year increases and decreases in response to wet and dry hydrology, ranging from a high of 94% of capacity at the beginning of 2000 to a low of 50% of capacity at the beginning of water year 2014. One wet year can significantly increase total system reservoir storage, just as persistent dry years can draw down the system storage. Based on current inflow forecasts, the current projected end of water year 2014 total Colorado Basin reservoir storage is approximately 29.9 maf (50% of capacity). The actual end of water year storage may vary significantly from this projection, primarily due to uncertainty regarding next season's snowpack and resulting runoff.

Based on January minimum and maximum probable inflow forecasts and modeling the range is approximately 26.9 maf (45%) to 33.6 maf (56%), respectively.

This update courtesy of Katrina Grantz, Bureau of Reclamation

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RRFW is a non-profit project of Living Rivers.

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From: **RRFW Riverwire** riverwire@rrfw.org
Subject: Glen Canyon Dam Update
Date: February 24, 2014 at 8:44 PM
To: john@livingrivers.org

RR

RRFW Riverwire
Glen Canyon Dam Update

February 24, 2014

Current Status

The unregulated inflow volume to Lake Powell in January was 270 thousand acre-feet (kaf) (75% of average). The release volume from Glen Canyon Dam in January was 800 kaf. The end of January elevation and storage of Lake Powell were 3578.7 feet (121 feet from full pool) and 9.83 million acre-feet (maf) (40% of full capacity), respectively. The reservoir elevation is now declining and will continue to decline until spring runoff. Snowpack is currently about 111% of median for this time of year.

Current Operations

In February, the release volume was about 600 kaf, with fluctuations from about 8,000 cubic feet per second (cfs) in the nighttime to about 14,000 cfs in the daytime and consistent with the Glen Canyon Operating Criteria (Federal Register, Volume 62, No. 41, March 3, 1997).

Hourly releases during March 2014 are anticipated to fluctuate between approximately 6,000 cfs in the nighttime and approximately 11,000 cfs in the daytime. The Bureau of Reclamation anticipates the release volume for April 2014 will be approximately 500,000 acre-feet with fluctuations between approximately 6,000 cfs and 11,000 cfs. The anticipated release volume for May 2014 is about 510,000 acre feet with fluctuations between approximately 6,000 cfs and 11,000 cfs. This will be confirmed in a subsequent notification toward the end of March.

In addition to daily scheduled fluctuations for power generation, the instantaneous releases from Glen Canyon Dam may also fluctuate to provide 40 Megawats (MW) of system regulation. These instantaneous release adjustments stabilize the electrical generation and transmission system and translate to a range of about 1,200 cfs above or below the hourly scheduled release rate. Under system normal conditions, fluctuations for regulation are typically short lived and generally balance out over the hour with minimal or no noticeable impacts on downstream river flow conditions.

Releases from Glen Canyon Dam can also fluctuate beyond scheduled fluctuations for power generation when called upon as a partner that shares reserve requirements within the electrical generator community (i.e. balancing area). Reserves provide system reliability in the event of an unscheduled outage. Glen Canyon Dam typically maintains 41 MW of reserves (approximately 1,200 cfs). Reserve calls can be maintained for a maximum of 2 hours after which time the generation rate should be returned to the original schedule. If reserves from Glen Canyon Dam are called upon, releases from the dam can exceed

scheduled levels and can have a noticeable impact on the river downstream from Glen Canyon Dam. Calls for reserves are fairly infrequent and typically are for much less than 41 MW.

The operating tier for water year 2014 is the Mid-Elevation Release Tier with an annual release volume of 7.48 maf, as established in August 2013 and pursuant to the Interim Guidelines, Section 6.C.1. Reclamation will schedule operations at Glen Canyon Dam to achieve as practicably as possible a 7.48 maf annual release by September 30, 2014.

Inflow Forecasts and Model Projections

The forecast for the 2014 April to July water supply season for Lake Powell, issued on Feb 4th by the Colorado Basin River Forecast Center, projects that the most probable (median) unregulated inflow volume will be 7.25 maf (101% of average based on the period 1981-2010). The April-July forecast increased by 440 kaf since last month. The winter snow accumulation season has tracked near average so far (currently 111% of median), however we are currently roughly two-thirds of the way through the snow accumulation season and there is still uncertainty regarding the final snowpack and resulting runoff. The April-July forecast ranges from a minimum probable of 4.75 maf (66% of average) to a maximum probable of 10.3 maf (144% of average). (For reference, the 30-year April-Juny average is 7.16 maf.) There is a 10 percent chance that inflows could be higher than the maximum probable and a 10 percent chance they could be lower than the minimum probable.

Based on the current forecast, the February 24-Month study projects Lake Powell elevation will peak near approximately 3,611 ft next summer and end the water year near 3,604 feet with approximately 12.16 maf in storage (50% capacity). Note that projections of elevation and storage have significant uncertainty at this point in the season, primarily due to uncertainty regarding the season's total snowpack and the resulting inflow to Lake Powell. Under the minimum probable inflow scenario, updated in January, the projected summer peak is 3,592 ft and end of water year storage is 9.7 maf (40% capacity). Under the maximum probable inflow scenario, updated in January, the projected summer peak is 3,631 ft and end of water year storage is 15.0 maf (62% capacity). There is a 10 percent chance that inflows will be higher, resulting in higher elevation and storage, and 10 percent chance that inflows will be lower, resulting in lower elevation and storage. The minimum and maximum probable model runs will be updated again in April. The annual release volume from Lake Powell during water year 2014 is projected to be 7.48 maf under all inflow scenarios.

Consistent with Section 6.C.1 of the Interim Guidelines, the Lake Powell operational tier for water year 2014 is the Mid-Elevation Release Tier with an annual release volume of 7.48 maf. This was determined in the August 2013 24-Month Study and documented in the 2014 Annual Operating Plan signed by Secretary Jewell in December 2013.

Upper Colorado River Basin Hydrology

The Upper Colorado River Basin regularly experiences significant year to year hydrologic variability. During the 14-year period 2000 to 2013, however, the unregulated inflow to Lake Powell, which is a good measure of hydrologic conditions in the Colorado River Basin, was above average in only 3 out of the past 14 years. The period 2000-2014 is the

Basin, was above average in only 3 out of the past 14 years. The period 2000-2014 is the lowest 14-year period since the closure of Glen Canyon Dam in 1963, with an average unregulated inflow of 8.25 maf, or 76% of the 30-year average (1981-2010). (For comparison, the 1981-2010 total water year average is 10.83maf.) The unregulated inflow during the 2000-2013 period has ranged from a low of 2.64 maf (24% of average) in water year 2002 to a high of 15.97 maf (147% of average) in water year 2011. Under the current forecast, total water year 2014 inflows to Lake Powell are expected to range between a minimum probable of 7.92 maf (73% of average) and a maximum probable of 13.47 maf (124% of average) with a most probable projection of 10.42 maf (96% of average).

At the beginning of water year 2014, total system storage in the Colorado River Basin was 29.9 maf (50% of 59.6 maf total system capacity). This is about 4 maf less than the total storage at the beginning of water year 2013 which began at 34.0 maf (57% of capacity). Since the beginning of water year 2000, total Colorado Basin storage has experienced year to year increases and decreases in response to wet and dry hydrology, ranging from a high of 94% of capacity at the beginning of 2000 to a low of 50% of capacity at the beginning of water year 2014. One wet year can significantly increase total system reservoir storage, just as persistent dry years can draw down the system storage. Based on current inflow forecasts, the current projected end of water year 2014 total Colorado Basin reservoir storage is approximately 30.1 maf (51% of capacity). The actual end of water year storage may vary significantly from this projection, primarily due to uncertainty regarding this season's snowpack and resulting runoff. Based on January minimum and maximum probable inflow forecasts and modeling the range is approximately 26.9 maf (45%) to 33.6 maf (56%), respectively

This update courtesy of Katrina Grantz, Bureau of Reclamation

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From: **RRFW Riverwire** riverwire@rrfw.org
Subject: Glen Canyon Dam Update April 2014
Date: April 17, 2014 at 5:08 PM
To: john@livingrivers.org

RR

RRFW Riverwire
Glen Canyon Dam Update

April 17, 2014

Current Status

The unregulated inflow volume to Lake Powell in March was 509 thousand acre-feet (kaf) (76% of average). The release volume from Glen Canyon Dam in March was 504 kaf. The end of March elevation and storage of Lake Powell were 3,574.8 feet (125 feet from full pool) and 9.50 million acre-feet (maf) (39% of full capacity), respectively. The reservoir elevation is nearing the anticipated seasonal low and will likely remain near the current elevation until increasing when runoff begins in late spring. Snowpack is currently about 112% of median for this time of year and is likely nearing the seasonal peak.

Current Operations

The operating tier for water year 2014 is the Mid-Elevation Release Tier with an annual release volume of 7.48 maf, as established in August 2013 and pursuant to the Interim Guidelines, Section 6.C.1. Reclamation will schedule operations at Glen Canyon Dam to achieve as practicably as possible a 7.48 maf annual release by September 30, 2014.

In April, the release volume will likely be approximately 500 kaf, with fluctuations between about 6,000 cubic feet per second (cfs) in the nighttime to about 11,000 cfs in the daytime and consistent with the Glen Canyon Operating Criteria (Federal Register, Volume 62, No. 41, March 3, 1997). In May, the release volume will likely be approximately 510 kaf with daily fluctuations between about 6,000 cfs and 11,000 cfs. The anticipated release volume for June is about 600 kaf with fluctuations between approximately 7,000 cfs and 13,000 cfs.

In addition to daily scheduled fluctuations for power generation, the instantaneous releases from Glen Canyon Dam may also fluctuate to provide 40 Megawatts (MW) of system regulation. These instantaneous release adjustments stabilize the electrical generation and transmission system and translate to a range of about 1,200 cfs above or below the hourly scheduled release rate. Under system normal conditions, fluctuations for regulation are typically short lived and generally balance out over the hour with minimal or no noticeable impacts on downstream river flow conditions.

Releases from Glen Canyon Dam can also fluctuate beyond scheduled fluctuations for power generation when called upon as a partner that shares reserve requirements within the electrical generator community (i.e. balancing authority). Reserves provide system reliability in the event of an unscheduled outage. Glen Canyon Dam typically maintains 41 MW of reserves (approximately 1,200 cfs). Reserve calls can be maintained for a maximum of 2 hours after which time the generation rate should be returned to the original schedule. If reserves from Glen Canyon Dam are called upon, releases from the dam can exceed scheduled levels and can have a noticeable impact on the river downstream from Glen Canyon Dam. Calls for reserves are fairly infrequent and typically are for much less than 41 MW.

Inflow Forecasts and Model Projections

The forecast for the 2014 April to July water supply season for Lake Powell, issued on April 2, 2014 by the Colorado Basin River Forecast Center, projects that the most probable (median) unregulated inflow volume will be 7.85 maf (110% of average based on the period 1981-2010). The April-July forecast decreased by 0.45 million acre-feet since last month. The winter snow accumulation season has tracked slightly above average over the past month (currently 112% of median). We are nearing the end of the typical snow accumulation season and spring runoff is expected to begin in many subbasins over the next month. However, the timing and final volume of spring runoff is still uncertain. The April-July forecast ranges from a minimum probable of 5.80 maf (81% of average) to a maximum probable of 10.3 maf (144% of average). (For reference, the 30-year April-July average is 7.16 maf.) There is a 10 percent chance that inflows could be higher than the maximum probable and a 10 percent chance they could be lower than the minimum probable.

Based on the current forecast, the April 24-Month study projects Lake Powell elevation will peak near approximately 3,614 feet near the end of June and end the water year near 3,610 feet with approximately 12.71 maf in storage (52% capacity). Note that projections of elevation and storage have uncertainty at this point in the season, primarily due to uncertainty regarding the spring runoff and resulting inflow to Lake Powell. Under the minimum probable inflow scenario, updated in April, the projected summer peak is 3,599 ft and end of water year storage is 10.98 maf (45% capacity). Under the maximum probable inflow scenario, updated in April, the projected summer peak is 3,632 ft and end of water year storage is 14.93 maf (61% capacity). There is a 10 percent chance that inflows will be higher, resulting in higher elevation and storage, and 10 percent chance that inflows will be lower, resulting in lower elevation and storage. The annual release volume from Lake Powell during water year 2014 is projected to be 7.48 maf under all inflow scenarios.

Consistent with Section 6.C.1 of the Interim Guidelines, the Lake Powell operational tier for water year 2014 is the Mid-Elevation Release Tier with an annual release volume of 7.48 maf. This was determined in the August 2013 24-Month Study and documented in the 2014 Annual Operating Plan signed by Secretary Jewell in December 2013.

Upper Colorado River Basin Hydrology

The Upper Colorado River Basin regularly experiences significant year to year hydrologic variability. During the 14-year period 2000 to 2013, however, the unregulated inflow to Lake Powell, which is a good measure of hydrologic conditions in the Colorado River Basin, was above average in only 3 out of the past 14 years. The period 2000-2013 is the lowest 14-year period since the closure of Glen Canyon Dam in 1963, with an average unregulated inflow of 8.25 maf, or 76% of the 30-year average (1981-2010). (For comparison, the 1981-2010 total water year average is 10.83maf.) The unregulated inflow during the 2000-2013 period has ranged from a low of 2.64 maf (24% of average) in water year 2002 to a high of 15.97 maf (147% of average) in water year 2011. Under the current forecast, total water year 2014 unregulated inflows to Lake Powell are expected to range between a minimum probable of 8.8 maf (82% of average) and a maximum probable of 13.8 maf (128% of average) with a most probable projection of 11.11 maf (103% of average).

At the beginning of water year 2014, total system storage in the Colorado River Basin was 29.9 maf (50% of 59.6 maf total system capacity). This is about 4 maf less than the total storage at the beginning of water year 2013 which began at 34.0 maf (57% of capacity). Since the beginning of water year 2000, total Colorado Basin storage has experienced year to year increases and decreases in response to wet and dry hydrology, ranging from a high of 94% of capacity at the beginning of 2000 to a low of 50% of capacity at the beginning of water year 2014. One wet year can significantly increase total system reservoir storage, just as persistent dry years can draw down the system storage. Based on current inflow forecasts, the current projected end of water year 2014 total Colorado Basin reservoir storage is approximately 30.6 maf (51% of capacity). The actual end of water year storage may vary significantly from this projection, primarily due to uncertainty regarding this season's runoff. Based on April minimum and maximum probable inflow forecasts and modeling the range is approximately 28.4 maf (48%) to 33.2 maf (56%), respectively.

This update courtesy of Katrina Grantz, Bureau of Reclamation

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Forward email
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From: **RRFW Riverwire** riverwire@rrfw.org
Subject: Glen Canyon Dam Update June 2014
Date: June 14, 2014 at 12:55 PM
To: john@livingrivers.org

RR

RRFW Riverwire
Glen Canyon Dam Update

June 14, 2014

Current Status

The unregulated inflow volume to Lake Powell in May was 2,082 thousand acre-feet (kaf) (89% of average). The release volume from Glen Canyon Dam in May was 493 kaf. The end of May elevation and storage of Lake Powell were 3,589.4 feet (111 feet from full pool) and 10.76 million acre-feet (maf) (44% of full capacity), respectively. The reservoir elevation is increasing as spring runoff begins to enter the reservoir. Basin-wide snowpack peaked at 111% of median on April 7th and runoff is well underway with less than 10% of the measurable snowpack remaining.

Current Operations

In June, the release volume will be approximately 600 kaf, with fluctuations between about 7,000 cubic feet per second (CFS) in the nighttime to about 13,000 cfs in the daytime and consistent with the Glen Canyon Operating Criteria (Federal Register, Volume 62, No. 41, March 3, 1997). In July, the release volume will likely be approximately 800 kaf with daily fluctuations between about 10,000 cfs and 18,000 cfs. The anticipated release volume for August is about 800 kaf with fluctuations between approximately 9,000 cfs and 17,000 cfs.

In addition to daily scheduled fluctuations for power generation, the instantaneous releases from Glen Canyon Dam may also fluctuate to provide 40 MW of system regulation. These instantaneous release adjustments stabilize the electrical generation and transmission system and translate to a range of about 1,200 cfs above or below the hourly scheduled release rate. Under system normal conditions, fluctuations for regulation are typically short lived and generally balance out over the hour with minimal or no noticeable impacts on downstream river flow conditions.

The operating tier for water year 2014 is the Mid-Elevation Release Tier with an annual release volume of 7.48 maf, as established in August 2013 and pursuant to the Interim Guidelines, Section 6.C.1. Reclamation will schedule operations at Glen Canyon Dam to achieve as practicably as possible a 7.48 maf annual release by September 30, 2014.

Releases from Glen Canyon Dam can also fluctuate beyond scheduled releases when called upon to respond to unscheduled power outages or power system emergencies. Depending on the severity of the system emergency, the response from Glen Canyon Dam can be significant, within the full range of the operating capacity of the power plant for as long as is necessary to maintain balance in the transmission system. Glen Canyon Dam typically maintains 41MW (approximately 1,200 cfs) of generation capacity in reserve in order to respond to a system emergency even when generation rates are already high. System emergencies occur fairly infrequently and typically require small responses from Glen Canyon Dam. However, these responses can have a noticeable impact on the river downstream of Glen Canyon Dam.

Inflow Forecasts and Model Projections

The forecast for the 2014 April to July water supply season for Lake Powell, issued on June 2, 2014 by the Colorado Basin River Forecast Center, projects that the most probable (median) unregulated inflow volume will be 7.55 maf (105% of average based on the period 1981-2010). The April-July most probable forecast remained the same as last month. The seasonal snowpack peaked on April 7, 2014 at 111% of median and nearly all of the measurable snowpack has now melted. The April-July forecast ranges from a minimum probable of 6.60 maf (92% of average) to a maximum probable of 8.45 maf (118% of average). (For reference, the 30-year April-July average is 7.16 maf.) There is a 10 percent chance that inflows could be higher than the maximum probable and a 10 percent chance they could be lower than the minimum probable.

Based on the current forecast, the June 24-Month study projects Lake Powell elevation will peak near

Based on the current forecast, the June 24-Month study projects Lake Powell elevation will peak near approximately 3,614 feet near the end of July and end the water year near 3,610 feet with approximately 12.7 maf in storage (52% capacity). Note that projections of elevation and storage have uncertainty, primarily due to uncertainty regarding the spring runoff and resulting inflow to Lake Powell. Under the minimum probable inflow scenario, last updated in April, the projected summer peak is 3,599 ft and end of water year storage is 11.0 maf (45% capacity). Under the maximum probable inflow scenario, updated in April, the projected summer peak is 3,632 ft and end of water year storage is 14.9 maf (61% capacity). There is a 10 percent chance that inflows will be higher, resulting in higher elevation and storage, and 10 percent chance that inflows will be lower, resulting in lower elevation and storage. The annual release volume from Lake Powell during water year 2014 is projected to be 7.48 maf under all inflow scenarios.

Consistent with Section 6.C.1 of the Interim Guidelines, the Lake Powell operational tier for water year 2014 is the Mid-Elevation Release Tier with an annual release volume of 7.48 maf. This was determined in the August 2013 24-Month Study and documented in the 2014 Annual Operating Plan signed by Secretary Jewell in December 2013.

Upper Colorado River Basin Hydrology

The Upper Colorado River Basin regularly experiences significant year to year hydrologic variability. During the 14-year period 2000 to 2013, however, the unregulated inflow to Lake Powell, which is a good measure of hydrologic conditions in the Colorado River Basin, was above average in only 3 out of the past 14 years. The period 2000-2013 is the lowest 14-year period since the closure of Glen Canyon Dam in 1963, with an average unregulated inflow of 8.25 maf, or 76% of the 30-year average (1981-2010). (For comparison, the 1981-2010 total water year average is 10.83 maf.) The unregulated inflow during the 2000-2013 period has ranged from a low of 2.64 maf (24% of average) in water year 2002 to a high of 15.97 maf (147% of average) in water year 2011. Under the current forecast, total water year 2014 unregulated inflows to Lake Powell are expected to range between a minimum probable of 9.8 maf (91% of average) and a maximum probable of 11.7 maf (108% of average) with a most probable projection of 10.78 maf (100% of average).

At the beginning of water year 2014, total system storage in the Colorado River Basin was 29.9 maf (50% of 59.6 maf total system capacity). This is about 4 maf less than the total storage at the beginning of water year 2013 which began at 34.0 maf (57% of capacity). Since the beginning of water year 2000, total Colorado Basin storage has experienced year to year increases and decreases in response to wet and dry hydrology, ranging from a high of 94% of capacity at the beginning of 2000 to a low of 50% of capacity at the beginning of water year 2014. One wet year can significantly increase total system reservoir storage, just as persistent dry years can draw down the system storage. Based on current inflow forecasts, the current projected end of water year 2014 total Colorado Basin reservoir storage is approximately 30.4 maf (51% of capacity). The actual end of water year storage may vary significantly from this projection, primarily due to uncertainty regarding this season's runoff. Based on April minimum and maximum probable inflow forecasts and modeling the range is approximately 28.4 maf (48%) to 33.2 maf (56%), respectively.

This update courtesy of Katrina Grantz, Bureau of Reclamation

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From: **RRFW Riverwire** riverwire@rrfw.org
Subject: Glen Canyon Dam Update August 2014
Date: August 20, 2014 at 8:30 PM
To: john@livingrivers.org

RR

RRFW Riverwire
Glen Canyon Dam Update

August 20, 2013

Current Status

The unregulated inflow volume to Lake Powell in July was 838 thousand acre-feet (kaf) (77% of average). The release volume from Glen Canyon Dam in July was 800 kaf. The end of July elevation and storage of Lake Powell were 3,608.1 feet (92 feet from full pool) and 12.54 million acre-feet (maf) (52% of full capacity), respectively. The reservoir elevation reached it seasonal peak of 3,609.7 feet on July 7, 2014 and is now declining. The reservoir elevation is expected to continue to decline until spring 2015. The April to July unregulated inflow volume to Lake Powell was 6,923 kaf (97% of average).

Current Operations
The operating tier for water year 2014 is the Mid-Elevation Release Tier with an annual release volume of 7.48 maf, as established in August 2013 and pursuant to the Interim Guidelines, Section 6.C.1. Reclamation will schedule operations at Glen Canyon Dam to achieve as practicably as possible a 7.48 maf annual release by September 30, 2014.

In August, the release volume will be approximately 800 kaf, with fluctuations between about 9,000 cubic Feet per second (cfs) in the nighttime to about 17,000 cfs in the daytime and consistent with the Glen Canyon Operating Criteria (Federal Register, Volume 62, No. 41, March 3, 1997). In September, the release volume will likely be approximately 600 kaf with daily fluctuations between about 7,000 cfs and 13,000 cfs. The anticipated release volume for October is about 600 kaf with fluctuations between approximately 7,000 cfs and 13,000 cfs.

In addition to daily scheduled fluctuations for power generation, the instantaneous releases from Glen Canyon Dam may also fluctuate to provide 40 MW of system regulation. These instantaneous release adjustments stabilize the electrical generation and transmission system and translate to a range of about 1,200 cfs above or below the hourly scheduled release rate. Under system normal conditions, fluctuations for regulation are typically short lived and generally balance out over the hour with minimal or no noticeable impacts on downstream river flow conditions.

Releases from Glen Canyon Dam can also fluctuate beyond scheduled releases when called upon to respond to unscheduled power outages or power system emergencies. Depending on the severity of the system emergency, the response from Glen Canyon Dam can be significant, within the full range of the operating capacity of the power plant for as long as is necessary to maintain balance in the transmission system. Glen Canyon Dam typically maintains 41MW (approximately 1,200 cfs) of generation capacity in reserve in order to respond to a system emergency even when generation rates are already high. System emergencies occur fairly infrequently and typically require small responses from Glen Canyon Dam. However, these responses can have a noticeable impact on the river downstream of Glen Canyon Dam.

Inflow Forecasts and Model Projections

The forecast for water year 2014 unregulated inflow to Lake Powell, issued on August 1, 2014, by the Colorado Basin River Forecast Center, projects that the most probable (median) unregulated inflow volume will be 10.15 maf (94% of average based on the period 1981-2010). The April to July unregulated inflow volume was 6,923 kaf (97% of average).

Based on the current forecast, the August 24-Month study projects Lake Powell elevation will end the water year near 3,604 feet with approximately 12.11 maf in storage (50% capacity). Note that projections of elevation and storage have uncertainty, primarily due to uncertainty regarding the inflow to Lake Powell. Under these scenarios, there is a 10 percent chance that inflows will be higher, resulting in higher elevation and storage,

and 10 percent chance that inflows will be lower, resulting in lower elevation and storage. The annual release volume from Lake Powell during water year 2014 is projected to be 7.48 maf under all inflow scenarios.

Consistent with Section 6.C.1 of the Interim Guidelines, the Lake Powell operational tier for water year 2014 is the Mid-Elevation Release Tier with an annual release volume of 7.48 maf. This was determined in the August 2013 24-Month Study and documented in the 2014 Annual Operating Plan signed by Secretary Jewell in December 2013.

This August 24-Month study projects the January 1, 2015 Lake Powell elevation will be 3,596.62 feet, which is below the 2015 Equalization Elevation of 3,649 feet and above elevation 3,575 feet. Consistent with Section 6.B of the Interim Guidelines, Lake Powell's operations in water year 2015 will be governed by the Upper Elevation Balancing Tier, with an initial water year release volume of 8.23 maf and the potential for an April adjustment to equalization or balancing releases in April 2015. Consistent with Section 6.B.4 of the Interim Guidelines, an April adjustment to balancing releases is projected to occur and Lake Powell is currently projected to release 9.0 maf in water year 2015. This determination will be documented in the 2015 AOP, which is currently in the final stages of development.

Upper Colorado River Basin Hydrology

The Upper Colorado River Basin regularly experiences significant year to year hydrologic variability. During the 14-year period 2000 to 2013, however, the unregulated inflow to Lake Powell, which is a good measure of hydrologic conditions in the Colorado River Basin, was above average in only 3 out of the past 14 years. The period 2000-2013 is the lowest 14-year period since the closure of Glen Canyon Dam in 1963, with an average unregulated inflow of 8.25 maf, or 76% of the 30-year average (1981-2010). (For comparison, the 1981-2010 total water year average is 10.83 maf.) The unregulated inflow during the 2000-2013 period has ranged from a low of 2.64 maf (24% of average) in water year 2002 to a high of 15.97 maf (147% of average) in water year 2011. Under the current most probable forecast, total water year 2014 unregulated inflows to Lake Powell is projected to be 10.15 maf (94% of average).

At the beginning of water year 2014, total system storage in the Colorado River Basin was 29.9 maf (50% of 59.6 maf total system capacity). This is about 4 maf less than the total storage at the beginning of water year 2013 which began at 34.0 maf (57% of capacity). Since the beginning of water year 2000, total Colorado Basin storage has experienced year to year increases and decreases in response to wet and dry hydrology, ranging from a high of 94% of capacity at the beginning of 2000 to a low of 50% of capacity at the beginning of water year 2014. One wet year can significantly increase total system reservoir storage, just as persistent dry years can draw down the system storage. Based on current inflow forecasts, the current projected end of water year 2014 total Colorado Basin reservoir storage is approximately 29.7 maf (50% of capacity). The actual end of water year storage may vary from this projection, primarily due to uncertainty regarding inflow to Lake Powell.

This update courtesy of Katrina Grantz, Bureau of Reclamation

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From: **RRFW Riverwire** riverwire@rrfw.org
Subject: Glen Canyon Dam Update September 2014
Date: September 13, 2014 at 10:56 PM
To: john@livingrivers.org

RR

RRFW Riverwire
Glen Canyon Dam Update

September 13, 2014

Current Status

The unregulated inflow volume to Lake Powell in August was 517 thousand acre-feet (kaf) (103% of average). The release volume from Glen Canyon Dam in August was 801 kaf. The end of August elevation and storage of Lake Powell were 3,605.8 feet (94 feet from full pool) and 12.31 million acre-feet (maf) (51% of full capacity), respectively. The reservoir elevation reached it seasonal peak of 3,609.7 feet on July 7, 2014 and is now declining. The reservoir elevation is expected to continue to decline until spring 2015. The April to July unregulated inflow volume to Lake Powell was 6,923 kaf (97% of average).

Current Operations

The operating tier for water year 2014 is the Mid-Elevation Release Tier with an annual release volume of 7.48 maf, as established in August 2013 and pursuant to the Interim Guidelines, Section 6.C.1. Reclamation will schedule operations at Glen Canyon Dam to achieve as practicably as possible a 7.48 maf annual release by September 30, 2014.

In September, the release volume will be approximately 600 kaf, with fluctuations between about 6,500 cubic feet per second (cfs) in the nighttime to about 12,500 cfs in the daytime and consistent with the Glen Canyon Operating Criteria (Federal Register, Volume 62, No. 41, March 3, 1997). In October, the release volume will likely be approximately 600 kaf with daily fluctuations between about 7,000 cfs and 13,000 cfs. The anticipated release volume for November is about 600 kaf with fluctuations between approximately 7,000 cfs and 13,000 cfs.

In addition to daily scheduled fluctuations for power generation, the instantaneous releases from Glen Canyon Dam may also fluctuate to provide 40 MW of system regulation. These instantaneous release adjustments stabilize the electrical generation and transmission system and translate to a range of about 1,200 cfs above or below the hourly scheduled release rate. Under system normal conditions, fluctuations for regulation are typically short lived and generally balance out over the hour with minimal or no noticeable impacts on downstream river flow conditions.

Releases from Glen Canyon Dam can also fluctuate beyond scheduled releases when called upon to respond to unscheduled power outages or power system emergencies. Depending on the severity of the system emergency, the response from Glen Canyon Dam can be significant, within the full range of the operating capacity of the power plant for as long as is necessary to maintain balance in the transmission system. Glen Canyon Dam typically maintains 41MW (approximately 1,200 cfs) of generation capacity in reserve in order to respond to a system emergency even when generation rates are already high. System emergencies occur fairly infrequently and typically require small responses from Glen Canyon Dam. However, these responses can have a noticeable impact on the river downstream of Glen Canyon Dam.

Inflow Forecasts and Model Projections

The forecast for water year 2014 unregulated inflow to Lake Powell, issued on September 1, 2014, by the Colorado Basin River Forecast Center, projects that the most probable (median) unregulated inflow volume will be 10.27 maf (95% of average based on the period 1981-2010). The April to July unregulated inflow volume was 6,923 kaf (97% of average).

Based on the current forecast, the September 24-Month study projects Lake Powell elevation will end the water year near 3,605 feet with approximately 12.19 maf in storage (50% capacity). Note that projections of elevation and storage have uncertainty, primarily due to uncertainty regarding the inflow to Lake Powell. The

annual release volume from Lake Powell during water year 2014 is projected to be 7.48 maf under all inflow scenarios.

Consistent with Section 6.C.1 of the Interim Guidelines, the Lake Powell operational tier for water year 2014 is the Mid-Elevation Release Tier with an annual release volume of 7.48 maf. This was determined in the August 2013 24-Month Study and documented in the 2014 Annual Operating Plan signed by Secretary Jewell in December 2013.

The August 2014 24-Month study projected the January 1, 2015 Lake Powell elevation will be below the 2015 Equalization Elevation feet and above elevation 3,575 feet. Therefore, consistent with Section 6.B of the Interim Guidelines, Lake Powell's operations in water year 2015 will be governed by the Upper Elevation Balancing Tier, with an initial water year release volume of 8.23 maf and the potential for an April adjustment to equalization or balancing releases in April 2015. An April adjustment to balancing releases is projected to occur and Lake Powell is currently projected to release 9.0 maf in water year 2015. This determination will be documented in the 2015 AOP, which is currently in the final stages of development.

Upper Colorado River Basin Hydrology

The Upper Colorado River Basin regularly experiences significant year to year hydrologic variability. During the 14-year period 2000 to 2013, however, the unregulated inflow to Lake Powell, which is a good measure of hydrologic conditions in the Colorado River Basin, was above average in only 3 out of the past 14 years. The period 2000-2013 is the lowest 14-year period since the closure of Glen Canyon Dam in 1963, with an average unregulated inflow of 8.25 maf, or 76% of the 30-year average (1981-2010). (For comparison, the 1981-2010 total water year average is 10.83 maf.) The unregulated inflow during the 2000-2013 period has ranged from a low of 2.64 maf (24% of average) in water year 2002 to a high of 15.97 maf (147% of average) in water year 2011. Under the current most probable forecast, total water year 2014 unregulated inflows to Lake Powell is projected to be 10.27 maf (95% of average).

At the beginning of water year 2014, total system storage in the Colorado River Basin was 29.9 maf (50% of 59.6 maf total system capacity). This is about 4 maf less than the total storage at the beginning of water year 2013 which began at 34.0 maf (57% of capacity). Since the beginning of water year 2000, total Colorado Basin storage has experienced year to year increases and decreases in response to wet and dry hydrology, ranging from a high of 94% of capacity at the beginning of 2000 to a low of 50% of capacity at the beginning of water year 2014. One wet year can significantly increase total system reservoir storage, just as persistent dry years can draw down the system storage. Based on current inflow forecasts, the current projected end of water year 2014 total Colorado Basin reservoir storage is approximately 29.8 maf (50% of capacity). The actual end of water year storage may vary from this projection, primarily due to uncertainty regarding inflow to Lake Powell.

This update courtesy of Katrina Grantz, Bureau of Reclamation

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From: **RRFW Riverwire** riverwire@rrfw.org
Subject: Glen Canyon Dam Update October 2014
Date: October 10, 2014 at 9:38 PM
To: john@livingrivers.org

RR

RRFW Riverwire
Glen Canyon Dam Update

October 10, 2014

Current Operations

In October, the release volume will be approximately 600 thousand acre feet (kaf), with fluctuations between about 7,000 cfs in the nighttime to about 13,000 cfs in the daytime and consistent with the Glen Canyon Operating Criteria (Federal Register, Volume 62, No. 41, March 3, 1997).

The anticipated release volume for November is 600 kaf with fluctuations for power generation throughout the day consistent with the Glen Canyon Operating Criteria (Federal Register, Volume 62, No. 41, March 3, 1997). However, the release volume may be adjusted in the event of a High Flow Experiment (HFE). Under the High-Flow Protocol, high flow releases are linked to sediment input and other resource conditions below Glen Canyon Dam. Preliminary analysis appears favorable for a high flow experimental release to occur during the week of November 9th, 2014. During the High Flow Experiment, total releases from Glen Canyon Dam at full bypass may reach approximately 37,500 cfs for up to 96 hours. The total experiment, including ramping, could last up to about five and a half days. In the event of a high flow experiment, releases from Glen Canyon Dam prior to and after the high flow experiment are anticipated to fluctuate between about 7,000cfs and 9,000cfs. Further data collection, modeling, and analysis prior to the end of October may modify the expected duration and/or magnitude of the HFE. A final determination on the timing, magnitude and duration of a potential fall 2014 HFE will likely be made near the end of October.

In addition to daily scheduled fluctuations for power generation, the instantaneous releases from Glen Canyon Dam may also fluctuate to provide 40 MW of system regulation. These instantaneous release adjustments stabilize the electrical generation and transmission system and translate to a range of about 1,200 cfs above or below the hourly scheduled release rate. Under system normal conditions, fluctuations for regulation are typically short lived and generally balance out over the hour with minimal or no noticeable impacts on downstream river flow conditions.

Releases from Glen Canyon Dam can also fluctuate beyond scheduled releases when called upon to respond to unscheduled power outages or power system emergencies. Depending on the severity of the system emergency, the response from Glen Canyon Dam can be significant, within the full range of the operating capacity of the power plant for as long as is necessary to maintain balance in the transmission system. Glen Canyon Dam typically maintains 41Megawatts (MW) (approximately 1,200 cfs) of generation capacity in reserve in order to respond to a system emergency even when generation rates are already high. System emergencies occur fairly infrequently and typically require small responses from Glen Canyon Dam. However, these responses can have a noticeable impact on the river downstream of Glen Canyon Dam.

The operating tier for water year 2015 was established in August 2014 as the Upper Elevation Balancing Tier, with an initial water year release volume of 8.23 million acre feet (maf) and the potential for an April adjustment to equalization or balancing releases in April 2015. An April adjustment to balancing releases is projected to occur and Lake Powell is currently projected to release 9.0 maf in water year 2015. Reclamation will schedule operations at Glen Canyon Dam to achieve as practicably as possible the appropriate total annual release volume by September 30, 2015.

Current Status

The unregulated inflow volume to Lake Powell in September was 511 kaf (125% of average). The release volume from Glen Canyon Dam in September was 604 kaf. The end of September elevation and storage of Lake Powell were 3,605.5 feet (94 feet from full pool) and 12.29 maf (51% of full capacity), respectively. The reservoir elevation is now declining and is expected to continue to decline until spring 2015.

The water year 2014 unregulated inflow volume to Lake Powell was 10.381 maf (96% of average), which was significantly higher than inflows observed in 2012 and 2013 (45% and 47% of average, respectively). The end of water year 2014 elevation and storage of Lake Powell were 3,605.5 feet (94 feet from full pool) and 12.29 maf (51% of full capacity), respectively. This is 1.4 maf more than the 2013 end of water year storage which was 10.93 maf (45% of capacity), and 14.2 feet higher than the end of 2013 elevation, which was 3591.3 feet.

Releases for water year 2014 totaled 7.480 maf. Pursuant to the Interim Guidelines, Lake Powell operated under the Mid-Elevation Release Tier in 2014. Throughout water year 2014, Reclamation adjusted operations of Glen Canyon Dam to release the appropriate annual volume during 2014 to achieve Mid-Elevation Release Tier objectives as practicably as possible by September 30, 2014.

Inflow Forecasts and Model Projections

The forecast for water year 2015 unregulated inflow to Lake Powell, issued on October 1, 2014, by the Colorado Basin River Forecast Center, projects that the most probable (median) unregulated inflow volume will be 10.63 maf (98% of average based on the period 1981-2010). At this early point in the season, there is significant uncertainty regarding next year's water supply. The forecast ranges from a minimum probable of 7.4 maf (68% of average) to a maximum probable of 18.6 maf (172% of average). There is 10% chance that inflows could be higher than the maximum probable and a 10% chance they could be lower than the minimum probable.

As determined in the August 2014 24-Month Study, Lake Powell's operations in water year 2015 will be governed by the Upper Elevation Balancing Tier, with an initial water year release volume of 8.23 maf and the potential for an April adjustment to equalization or balancing releases in April 2015. An April adjustment to balancing releases is projected to occur and Lake Powell is currently projected to release 9.0 maf in water year 2015. This determination will be documented in the 2015 Annual Operating Plan, which is currently in the final stages of development.

Based on the current forecast, the October 24-Month Study projects Lake Powell elevation will end water year 2015 near 3,614 feet with approximately 13.12 maf in storage (54% capacity). Note that projections of elevation and storage have significant uncertainty at this early point in the season, primarily due to uncertainty regarding next season's snowpack and the resulting inflow to Lake Powell. Under the minimum probable inflow scenario, which was updated in October, the projected end of water year elevation and storage are 3589 feet and 10.71 maf (44% capacity), respectively. Under the maximum probable inflow scenario, which was updated in October, the projected end of water year elevation and storage are 3649 feet and 17.09 maf (70% capacity), respectively. The annual release volume from Lake Powell during water year 2015 is projected to be 9.0 maf under the minimum and most probable inflow scenarios and 12.1 maf under the maximum probable inflow scenario. There is a 10% chance that inflows will be higher, potentially resulting in higher releases; and 10% chance that inflows will be lower, potentially resulting in lower releases. If inflows are less than the current forecasted minimum probable inflow, the water year 2015 annual release could be as low as 8.23 maf. If inflows are greater than the current forecasted maximum probable inflow, the annual release could be greater than 12.1 maf.

Upper Colorado River Basin Hydrology

The Upper Colorado River Basin regularly experiences significant year to year hydrologic variability. During the 15-year period 2000 to 2014, however, the unregulated inflow to Lake Powell, which is a good measure of hydrologic conditions in the Colorado River Basin, was above average in only 3 out of the past 15 years. The period 2000-2014 is the lowest 15-year period since the closure of Glen Canyon Dam in 1963, with an average unregulated inflow of 8.20 maf, or 76% of the 30-year average (1981-2010). (For comparison, the 1981-2010 total water year average is 10.83 maf.) The unregulated inflow during the 2000-2014 period has ranged from a low of 2.64 maf (24% of average) in water year 2002 to a high of 15.97 maf (147% of average) in water year 2011. Under the current most probable forecast, total water year 2015 unregulated inflows to Lake Powell is projected to be 10.63 maf (98% of average).

At the beginning of water year 2015, total system storage in the Colorado River Basin was 30.0 maf (50% of 59.6 maf total system capacity). This is nearly the same as the total storage at the beginning of water year 2014 which began at 29.9 maf (50% of capacity). Since the beginning of water year 2000, total Colorado Basin storage has experienced year to year increases and decreases in response to wet and dry hydrology, ranging from a high of 94% of capacity at the beginning of 2000 to a low of 50% of capacity at the beginning of water year 2014. One wet year can significantly increase total system reservoir storage, just as persistent dry years

can draw down the system storage. Based on current inflow forecasts, the current projected end of water year 2015 total Colorado Basin reservoir storage is approximately 30.6 maf (51% of capacity). The actual end of water year storage may vary from this projection, primarily due to uncertainty regarding next season's snowpack and resulting runoff. Based on October minimum and maximum probable inflow forecasts and modeling the range is approximately 27.4 maf (46%) to 38.1 maf (64%), respectively.

This update courtesy of Katrina Grantz, Bureau of Reclamation

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Check out RRFW's Rafting Grand Canyon Wiki for free information on Do-It-Yourself Grand Canyon rafting info http://www.rrfw.org/RaftingGrandCanyon/Main_Page.

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River Runners for Wilderness | PO Box 17301 | Boulder | CO | 80308

From: **RRFW Riverwire** riverwire@rrfw.org
Subject: Glen Canyon Dam Update November 2014
Date: November 19, 2014 at 9:27 AM
To: john@livingrivers.org

RR

RRFW Riverwire
Glen Canyon Dam Update

November 19, 2014

Current Status

The unregulated inflow volume to Lake Powell in October was 716 thousand acre-feet (kaf) (140% of average). The release volume from Glen Canyon Dam in October was 598 kaf. The end of October elevation and storage of Lake Powell were 3,605.6 feet (94 feet from full pool) and 12.29 million acre-feet (maf) (51% of full capacity), respectively. The reservoir elevation is now declining and is expected to continue to decline until spring 2015.

Current Operations

On November 10-15, 2014, the Department of Interior conducted a high flow experimental (HFE) release from Glen Canyon Dam in accordance with the High Flow Protocol (Protocol). Under this Protocol, high flow releases are linked to sediment input and other resource conditions below Glen Canyon Dam. This HFE is the third conducted under the Protocol. Beginning on the morning of November 10th, releases from Glen Canyon Dam were increased up to full power plant capacity (approximately 22,500 cfs). At midday on November 10th, bypass tubes at Glen Canyon Dam were opened and releases continued to increase up to full power plant and bypass capacity (approximately 37,500 cfs) by the evening of November 10th. Releases were maintained at peak release for 4 days (96 hours) and then began ramping back down. Releases returned to normal operations in the afternoon of November 15th. The entire experiment, including ramping lasted 5 and a half days. November releases from Glen Canyon Dam prior to and after the HFE are expected to fluctuate between 6,500cfs and 9,000cfs. The elevation of Lake Powell decreased 2.9 feet during the 5 and a half day experiment. The total release in November, including the HFE, is anticipated to be approximately 770 kaf. The annual release volume from Lake Powell will not change as a result of the HFE.

In December, the release volume will be approximately 866 kaf, with fluctuations anticipated between about 9,500 cfs in the nighttime to about 17,500 cfs in the daytime and consistent with the Glen Canyon Operating Criteria (Federal Register, Volume 62, No. 41, March 3, 1997). The anticipated release volume for January is 866 kaf.

The operating tier for water year 2015 was established in August 2014 as the Upper Elevation Balancing Tier, with an initial water year release volume of 8.23 maf and the potential for an April adjustment to equalization or balancing releases in April 2015. An April adjustment to balancing releases is projected to occur and Lake Powell is currently projected to release 9.0 maf in water year 2015. Reclamation will schedule operations at Glen Canyon Dam to achieve as practicably as possible the appropriate total annual release volume by September 30, 2015.

In addition to daily scheduled fluctuations for power generation, the instantaneous releases from Glen Canyon Dam may also fluctuate to provide 40 MW of system regulation. These instantaneous release adjustments stabilize the electrical generation and transmission system and translate to a range of about 1,200 cfs above or below the hourly scheduled release rate. Under system normal conditions, fluctuations for regulation are typically short lived and generally balance out over the hour with minimal or no noticeable impacts on downstream river flow conditions.

Releases from Glen Canyon Dam can also fluctuate beyond scheduled releases when called upon to respond to unscheduled power outages or power system emergencies. Depending on the severity of the system emergency, the response from Glen Canyon Dam can be significant, within the full range of the operating capacity of the power plant for as long as is necessary to maintain balance in the transmission system. Glen Canyon Dam typically maintains 41MW (approximately 1,200 cfs) of generation capacity in reserve in order to respond to a system emergency even when generation rates are already high. System emergencies occur

fairly infrequently and typically require small responses from Glen Canyon Dam. However, these responses can have a noticeable impact on the river downstream of Glen Canyon Dam.

Inflow Forecasts and Model Projections

The forecast for water year 2015 unregulated inflow to Lake Powell, issued on November 1, 2014, by the Colorado Basin River Forecast Center, projects that the most probable (median) unregulated inflow volume will be 9.55 maf (88% of average based on the period 1981-2010). This is about a 1 maf decrease from the forecast issued last month. At this early point in the season, there is significant uncertainty regarding next year's water supply. The forecast ranges from a minimum probable of 7.4 maf (68% of average) to a maximum probable of 18.6 maf (172% of average). There is 10% chance that inflows could be higher than the maximum probable and a 10% chance they could be lower than the minimum probable.

As determined in the August 2014 24-Month Study, Lake Powell's operations in water year 2015 will be governed by the Upper Elevation Balancing Tier, with an initial water year release volume of 8.23 maf and the potential for an April adjustment to equalization or balancing releases in April 2015. An April adjustment to balancing releases is projected to occur and Lake Powell is currently projected to release 9.0 maf in water year 2015. This determination will be documented in the 2015 Annual Operating Plan, which is currently in the final stages of development.

Based on the current forecast, the November 24-Month Study projects Lake Powell elevation will end water year 2015 near 3,603 feet with approximately 12.08 maf in storage (50% capacity). Note that projections of elevation and storage have significant uncertainty at this early point in the season, primarily due to uncertainty regarding next season's snowpack and the resulting inflow to Lake Powell. Under the minimum probable inflow scenario, which was updated in October, the projected end of water year elevation and storage are 3589 feet and 10.71 maf (44% capacity), respectively. Under the maximum probable inflow scenario, which was updated in October, the projected end of water year elevation and storage are 3649 feet and 17.09 maf (70% capacity), respectively. The annual release volume from Lake Powell during water year 2015 is projected to be 9.0 maf under the minimum and most probable inflow scenarios and 12.1 maf under the maximum probable inflow scenario. There is a 10% chance that inflows will be higher, potentially resulting in higher releases; and 10% chance that inflows will be lower, potentially resulting in lower releases. If inflows are less than the current forecasted minimum probable inflow, the water year 2015 annual release could be as low as 8.23 maf. If inflows are greater than the current forecasted maximum probable inflow, the annual release could be greater than 12.1 maf.

Upper Colorado River Basin Hydrology

The Upper Colorado River Basin regularly experiences significant year to year hydrologic variability. During the 15-year period 2000 to 2014, however, the unregulated inflow to Lake Powell, which is a good measure of hydrologic conditions in the Colorado River Basin, was above average in only 3 out of the past 15 years. The period 2000-2014 is the lowest 15-year period since the closure of Glen Canyon Dam in 1963, with an average unregulated inflow of 8.39 maf, or 78% of the 30-year average (1981-2010). (For comparison, the 1981-2010 total water year average is 10.83 maf.) The unregulated inflow during the 2000-2014 period has ranged from a low of 2.64 maf (24% of average) in water year 2002 to a high of 15.97 maf (147% of average) in water year 2011. The water year 2014 unregulated inflow volume to Lake Powell was 10.381 maf (96% of average), which was significantly higher than inflows observed in 2012 and 2013 (45% and 47% of average, respectively). Under the current most probable forecast, total water year 2015 unregulated inflows to Lake Powell is projected to be 9.55 maf (88% of average).

At the beginning of water year 2015, total system storage in the Colorado River Basin was 30.0 maf (50% of 59.6 maf total system capacity). This is nearly the same as the total storage at the beginning of water year 2014 which began at 29.9 maf (50% of capacity). Since the beginning of water year 2000, total Colorado Basin storage has experienced year to year increases and decreases in response to wet and dry hydrology, ranging from a high of 94% of capacity at the beginning of 2000 to a low of 50% of capacity at the beginning of water year 2014. One wet year can significantly increase total system reservoir storage, just as persistent dry years can draw down the system storage. Based on current inflow forecasts, the current projected end of water year 2015 total Colorado Basin reservoir storage is approximately 29.5 maf (50% of capacity). The actual end of water year storage may vary from this projection, primarily due to uncertainty regarding next season's snowpack and resulting runoff. Based on October minimum and maximum probable inflow forecasts and modeling the range is approximately 27.4 maf (46%) to 38.1 maf (64%), respectively.

This update courtesy of Katrina Grantz, Bureau of Reclamation

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Check out RRFW's Rafting Grand Canyon Wiki for free information on Do-It-Yourself Grand Canyon rafting info http://www.rrfw.org/RaftingGrandCanyon/Main_Page.

See our store offerings and donate at the RRFW Store!

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River Runners for Wilderness | PO Box 17301 | Boulder | CO | 80308

From: **RRFW Riverwire** riverwire@rrfw.org
Subject: Glen Canyon Dam Update December 2014
Date: December 20, 2014 at 5:13 PM
To: john@livingrivers.org

RR

RRFW Riverwire
Glen Canyon Dam Update

December 20, 2014

Current Status

The unregulated inflow volume to Lake Powell in November was 418 thousand acre-feet (kaf) (88% of average). The release volume from Glen Canyon Dam in November was 776 kaf. The end of November elevation and storage of Lake Powell were 3,601.9 feet (98 feet from full pool) and 11.93 million acre-feet (maf) (49% of full capacity), respectively. The reservoir elevation is now declining and is expected to continue to decline until spring 2015.

Current Operations

In December, the release volume will be approximately 866 kaf, with fluctuations anticipated between about 9,500 cubic feet per second (cfs) in the nighttime to about 17,500 cfs in the daytime and consistent with the Glen Canyon Operating Criteria (Federal Register, Volume 62, No. 41, March 3, 1997). The anticipated release volume for January is 860 kaf.

The operating tier for water year 2015 was established in August 2014 as the Upper Elevation Balancing Tier. In the Upper Elevation Balancing Tier the initial water year release volume is 8.23 maf; however, there is the possibility for an April adjustment to equalization or balancing operations to govern for the remainder of the water year. Under the most probable inflow scenario, an April adjustment to balancing releases is projected to occur and Lake Powell is currently projected to release 9.0 maf in water year 2015. Reclamation will schedule operations at Glen Canyon Dam to achieve as practicably as possible the appropriate total annual release volume by September 30, 2015.

In addition to daily scheduled fluctuations for power generation, the instantaneous releases from Glen Canyon Dam may also fluctuate to provide 40 MW of system regulation. These instantaneous release adjustments stabilize the electrical generation and transmission system and translate to a range of about 1,200 cfs above or below the hourly scheduled release rate. Under system normal conditions, fluctuations for regulation are typically short lived and generally balance out over the hour with minimal or no noticeable impacts on downstream river flow conditions.

Releases from Glen Canyon Dam can also fluctuate beyond scheduled releases when called upon to respond to unscheduled power outages or power system emergencies. Depending on the severity of the system emergency, the response from Glen Canyon Dam can be significant, within the full range of the operating capacity of the power plant for as long as is necessary to maintain balance in the transmission system. Glen Canyon Dam typically maintains 27 MW (approximately 800 cfs) of generation capacity in reserve in order to respond to a system emergency even when generation rates are already high. System emergencies occur fairly infrequently and typically require small responses from Glen Canyon Dam. However, these responses can have a noticeable impact on the river downstream of Glen Canyon Dam.

Inflow Forecasts and Model Projections

The forecast for water year 2015 unregulated inflow to Lake Powell, issued on December 1, 2014, by the Colorado Basin River Forecast Center, projects that the most probable (median) unregulated inflow volume will be 9.79 maf (90% of average based on the period 1981-2010). This is about a 200 kaf increase from the forecast issued last month. At this early point in the season, there is significant uncertainty regarding next year's water supply. The forecast ranges from a minimum probable of 7.4 maf (68% of average) to a maximum probable of 18.6 maf (172% of average). There is 10% chance that inflows could be higher than the maximum probable and a 10% chance they could be lower than the minimum probable.

As determined in the August 2014 24-Month Study, Lake Powell's operations in water year 2015 will be governed by the Upper Elevation Balancing Tier. In this tier, the initial water year release volume is 8.23 maf, however, there is the potential for an April adjustment to equalization or balancing releases in April 2015. An April adjustment to balancing releases is projected to occur and Lake Powell is currently projected to release 9.0 maf in water year 2015. This determination will be documented in the 2015 Annual Operating Plan, which is currently in the final stages of development.

Based on the current forecast, the December 24-Month Study projects Lake Powell elevation will end water year 2015 near 3,606 feet with approximately 12.35 maf in storage (51% capacity). Note that projections of elevation and storage have significant uncertainty at this early point in the season, primarily due to uncertainty regarding next season's snowpack and the resulting inflow to Lake Powell. Under the minimum probable inflow scenario, which was updated in October, the projected end of water year elevation and storage are 3589 feet and 10.71 maf (44% capacity), respectively. Under the maximum probable inflow scenario, which was updated in October, the projected end of water year elevation and storage are 3649 feet and 17.09 maf (70% capacity), respectively.

The annual release volume from Lake Powell during water year 2015 is projected to be 9.0 maf under the minimum and most probable inflow scenarios and 12.1 maf under the maximum probable inflow scenario. There is a 10% chance that inflows will be higher, potentially resulting in higher releases; and 10% chance that inflows will be lower, potentially resulting in lower releases. If inflows are less than the current forecasted minimum probable inflow, the water year 2015 annual release could be as low as 8.23 maf. If inflows are greater than the current forecasted maximum probable inflow, the annual release could be greater than 12.1 maf.

Upper Colorado River Basin Hydrology

The Upper Colorado River Basin regularly experiences significant year to year hydrologic variability. During the 15-year period 2000 to 2014, however, the unregulated inflow to Lake Powell, which is a good measure of hydrologic conditions in the Colorado River Basin, was above average in only 3 out of the past 15 years. The period 2000-2014 is the lowest 15-year period since the closure of Glen Canyon Dam in 1963, with an average unregulated inflow of 8.39 maf, or 78% of the 30-year average (1981-2010). (For comparison, the 1981-2010 total water year average is 10.83 maf.) The unregulated inflow during the 2000-2014 period has ranged from a low of 2.64 maf (24% of average) in water year 2002 to a high of 15.97 maf (147% of average) in water year 2011. The water year 2014 unregulated inflow volume to Lake Powell was 10.381 maf (96% of average), which was significantly higher than inflows observed in 2012 and 2013 (45% and 47% of average, respectively). Under the current most probable forecast, total water year 2015 unregulated inflows to Lake Powell is projected to be 9.79 maf (90% of average).

At the beginning of water year 2015, total system storage in the Colorado River Basin was 30.0 maf (50% of 59.6 maf total system capacity). This is nearly the same as the total storage at the beginning of water year 2014 which began at 29.9 maf (50% of capacity). Since the beginning of water year 2000, total Colorado Basin storage has experienced year to year increases and decreases in response to wet and dry hydrology, ranging from a high of 94% of capacity at the beginning of 2000 to a low of 50% of capacity at the beginning of water year 2014. One wet year can significantly increase total system reservoir storage, just as persistent dry years can draw down the system storage. Based on current inflow forecasts, the current projected end of water year 2015 total Colorado Basin reservoir storage is approximately 29.8 maf (50% of capacity). The actual end of water year storage may vary from this projection, primarily due to uncertainty regarding next season's snowpack and resulting runoff. Based on October minimum and maximum probable inflow forecasts and modeling the range is approximately 27.4 maf (46%) to 38.1 maf (64%), respectively.

This update courtesy of Katrina Grantz, Bureau of Reclamation

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From: **RRFW Riverwire** riverwire@rrfw.org
Subject: Glen Canyon Dam Update January 2015
Date: January 16, 2015 at 4:11 PM
To: john@livingrivers.org

RR

RRFW Riverwire
Glen Canyon Dam Update

January 16, 2015

Current Status

The unregulated inflow volume to Lake Powell in December was 409 thousand acre-feet (kaf) (113% of average). The release volume from Glen Canyon Dam in December was 864 kaf. The end of December elevation and storage of Lake Powell were 3,597.8 feet (102 feet from full pool) and 11.54 million acre-feet (maf) (47% of full capacity), respectively. The reservoir elevation is now declining and is expected to continue to decline until spring 2015.

Current Operations

The operating tier for water year 2015 was established in August 2014 as the Upper Elevation Balancing Tier. In the Upper Elevation Balancing Tier the initial water year release volume is 8.23 maf; however, there is the possibility for an April adjustment to equalization or balancing operations to govern for the remainder of the water year. Under the minimum, most, and maximum probable inflow scenarios, an April adjustment to balancing releases is projected to occur and Lake Powell is currently projected to release 9.0 maf in water year 2015. Reclamation will schedule operations at Glen Canyon Dam to achieve as practicably as possible the appropriate total annual release volume by September 30, 2015.

In January, the release volume will be approximately 860 kaf, with fluctuations anticipated between about 10,000 cubic Feet per second (cfs) in the nighttime to about 18,000 cfs in the daytime and consistent with the Glen Canyon Operating Criteria (Federal Register, Volume 62, No. 41, March 3, 1997). The anticipated release volume for February and March are 600 kaf and 650 kaf, respectively.

In addition to daily scheduled fluctuations for power generation, the instantaneous releases from Glen Canyon Dam may also fluctuate to provide 40 Megawatts (MW) of system regulation. These instantaneous release adjustments stabilize the electrical generation and transmission system and translate to a range of about 1,200 cfs above or below the hourly scheduled release rate. Under system normal conditions, fluctuations for regulation are typically short lived and generally balance out over the hour with minimal or no noticeable impacts on downstream river flow conditions.

Releases from Glen Canyon Dam can also fluctuate beyond scheduled releases when called upon to respond to unscheduled power outages or power system emergencies. Depending on the severity of the system emergency, the response from Glen Canyon Dam can be significant, within the full range of the operating capacity of the power plant for as long as is necessary to maintain balance in the transmission system. Glen Canyon Dam typically maintains 27MW (approximately 800 cfs) of generation capacity in reserve in order to respond to a system emergency even when generation rates are already high. System emergencies occur fairly infrequently and typically require small responses from Glen Canyon Dam. However, these responses can have a noticeable impact on the river downstream of Glen Canyon Dam.

Inflow Forecasts and Model Projections

The April to July 2015 water supply forecast for unregulated inflow to Lake Powell, issued on January 5, 2015, by the Colorado Basin River Forecast Center, projects that the most probable (median) unregulated inflow volume will be 6.5 maf (91% of average based on the period 1981-2010). At this early point in the season, there is still significant uncertainty regarding this year's water supply. The forecast ranges from a minimum probable of 4.4 maf (61% of average) to a maximum probable of 9.8 maf (137% of average). There is 10% chance that inflows could be higher than the maximum probable and a 10% chance they could be lower than the minimum probable.

As determined in the August 2014 24-Month Study, and documented in the 2015 Annual Operating Plan, Lake Powell's operations in water year 2015 will be governed by the Upper Elevation Balancing Tier. In this tier, the initial water year release volume is 8.23 maf, however, there is the potential for an April adjustment to equalization or balancing releases. If the April 2015 24-Month Study projects Lake Powell's September 30, 2015, elevation to be greater than 3,649 feet, the Equalization Tier would govern Lake Powell's operations for the remainder of water year 2015 and releases could be approximately 10.8 maf or greater. Based on analysis of a range of forecasted inflow scenarios, the current probability of realizing an inflow volume that would trigger equalization in 2015 is approximately 5 percent. If the April 2015 24-Month Study projects Lake Powell's September 30, 2015, elevation to be equal to or greater than 3,575 feet and equal to or less than 3,649 feet, and Lake Mead's elevation to be less than 1,075 feet, Lake Powell's annual release volume would be increased to balance the contents of Lake Mead and Lake Powell up to 9.0 maf. Based on analysis of a range of forecasted inflow scenarios, the current probability of realizing an inflow volume that would trigger balancing releases of up to 9.0 maf in 2015 is approximately 90 percent. The January 2015 24-Month Study projects that an April 2015 adjustment to balancing releases is likely to occur and Lake Powell is currently projected to release 9.0 maf in water year 2015.

Based on the current forecast, the January 24-Month Study projects Lake Powell elevation will end water year 2015 near 3,609 feet with approximately 12.63 maf in storage (52% capacity). Note that projections of elevation and storage have significant uncertainty at this early point in the season, primarily due to uncertainty regarding this season's final snowpack and the resulting inflow to Lake Powell. Under the minimum probable inflow scenario, last updated in January, the projected end of water year elevation and storage are 3589 feet and 10.73 maf (44% capacity), respectively. Under the maximum probable inflow scenario, last updated in January, the projected end of water year elevation and storage are 3639 feet and 15.94 maf (66% capacity), respectively. The annual release volume from Lake Powell during water year 2015 is projected to be 9.0 maf under all three inflow scenarios. However, there is a 10% chance that inflows will be higher, potentially resulting in higher releases; and 10% chance that inflows will be lower, potentially resulting in lower releases. If inflows are less than the current forecasted minimum probable inflow, the water year 2015 annual release could be as low as 8.23 maf. If inflows are greater than the current forecasted maximum probable inflow, the annual release could be 10.8 maf or greater.

Upper Colorado River Basin Hydrology

The Upper Colorado River Basin regularly experiences significant year to year hydrologic variability. During the 15-year period 2000 to 2014, however, the unregulated inflow to Lake Powell, which is a good measure of hydrologic conditions in the Colorado River Basin, was above average in only 3 out of the past 15 years. The period 2000-2014 is the lowest 15-year period since the closure of Glen Canyon Dam in 1963, with an average unregulated inflow of 8.39 maf, or 78% of the 30-year average (1981-2010). (For comparison, the 1981-2010 total water year average is 10.83 maf.) The unregulated inflow during the 2000-2014 period has ranged from a low of 2.64 maf (24% of average) in water year 2002 to a high of 15.97 maf (147% of average) in water year 2011. The water year 2014 unregulated inflow volume to Lake Powell was 10.381 maf (96% of average), which, though still below average, was significantly higher than inflows observed in 2012 and 2013 (45% and 47% of average, respectively). Under the current most probable forecast, total water year 2015 unregulated inflows to Lake Powell is projected to be 10.08 maf (93% of average).

At the beginning of water year 2015, total system storage in the Colorado River Basin was 30.0 maf (50% of 59.6 maf total system capacity). This is nearly the same as the total storage at the beginning of water year 2014 which began at 29.9 maf (50% of capacity). Since the beginning of water year 2000, total Colorado Basin storage has experienced year to year increases and decreases in response to wet and dry hydrology, ranging from a high of 94% of capacity at the beginning of 2000 to a low of 50% of capacity at the beginning of water year 2014. One wet year can significantly increase total system reservoir storage, just as persistent dry years can draw down the system storage. Based on current inflow forecasts, the current projected end of water year 2015 total Colorado Basin reservoir storage is approximately 29.9 maf (50% of capacity). The actual end of water year storage may vary from this projection, primarily due to uncertainty regarding next season's snowpack and resulting runoff. Based on January minimum and maximum probable inflow forecasts and modeling the range is approximately 27.5 maf (46%) to 33.6 maf (56%), respectively.

This update courtesy of Katrina Grantz, Bureau of Reclamation

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From: **RRFW Riverwire** riverwire@rrfw.org
Subject: Glen Canyon Dam Update February 2015
Date: February 15, 2015 at 2:55 PM
To: john@livingrivers.org

RR

RRFW Riverwire
Glen Canyon Dam Update

February 15, 2015

Current Status

The unregulated inflow volume to Lake Powell in January was 348 thousand acre-feet (kaf) (96% of average). The release volume from Glen Canyon Dam in January was 862 kaf. The end of January elevation and storage of Lake Powell were 3,593.6 feet (106 feet from full pool) and 11.15 million acre-feet (maf) (46% of full capacity), respectively. The reservoir elevation is now declining and is expected to continue to decline until spring 2015.

Current Operations

The operating tier for water year 2015 was established in August 2014 as the Upper Elevation Balancing Tier. In the Upper Elevation Balancing Tier the initial water year release volume is 8.23 maf; however, there is the possibility for an April adjustment to equalization or balancing operations to govern for the remainder of the water year. Under the minimum, most, and maximum probable inflow scenarios an April adjustment to balancing releases is projected to occur and Lake Powell is currently projected to release 9.0 maf in water year 2015. The minimum and maximum release projections, last updated in January, will be updated again in April. Reclamation will schedule operations at Glen Canyon Dam to achieve as practicably as possible the appropriate total annual release volume by September 30, 2015.

In February, the release volume will be approximately 600 kaf, with fluctuations anticipated between about 6,500 cfs in the nighttime to about 12,500 cfs in the daytime and consistent with the Glen Canyon Operating Criteria (Federal Register, Volume 62, No. 41, March 3, 1997). The anticipated release volume for March and April are 650 kaf and 600 kaf, respectively.

In addition to daily scheduled fluctuations for power generation, the instantaneous releases from Glen Canyon Dam may also fluctuate to provide 40 MW of system regulation. These instantaneous release adjustments stabilize the electrical generation and transmission system and translate to a range of about 1,200 cfs above or below the hourly scheduled release rate. Under system normal conditions, fluctuations for regulation are typically short lived and generally balance out over the hour with minimal or no noticeable impacts on downstream river flow conditions.

Releases from Glen Canyon Dam can also fluctuate beyond scheduled releases when called upon to respond to unscheduled power outages or power system emergencies. Depending on the severity of the system emergency, the response from Glen Canyon Dam can be significant, within the full range of the operating capacity of the power plant for as long as is necessary to maintain balance in the transmission system. Glen Canyon Dam typically maintains 27MW (approximately 800 cfs) of generation capacity in reserve in order to respond to a system emergency even when generation rates are already high. System emergencies occur fairly infrequently and typically require small responses from Glen Canyon Dam. However, these responses can have a noticeable impact on the river downstream of Glen Canyon Dam.

Inflow Forecasts and Model Projections

The April to July 2015 water supply forecast for unregulated inflow to Lake Powell, issued on February 3, 2015, by the Colorado Basin River Forecast Center, projects that the most probable (median) unregulated inflow volume will be 5.2 maf (73% of average based on the period 1981- 2010). The forecast decreased by 1.3 maf over the past month. At this early point in the season, there is still significant uncertainty regarding this year's water supply. The forecast ranges from a minimum probable of 3.4 maf (47% of average) to a maximum probable of 8.35 maf (117% of average). There is 10% chance that inflows could be higher than the maximum probable and a 10% chance they could be lower than the minimum probable.

As determined in the August 2014 24-Month Study, and documented in the 2015 Annual Operating Plan, Lake Powell's operations in water year 2015 will be governed by the Upper Elevation Balancing Tier. In this tier, the initial water year release volume is 8.23 maf, however, there is the potential for an April adjustment to equalization or balancing releases in April 2015. If the April 2015 24-Month Study projects Lake Powell's September 30, 2015, elevation to be greater than 3,649 feet, the Equalization Tier would govern Lake Powell's operations for the remainder of water year 2015 and releases could be approximately 10.8 maf or greater. Based on analysis of a range of forecasted inflow scenarios, the current probability of realizing an inflow volume that would trigger equalization in 2015 is approximately 5 percent. If the April 2015 24- Month Study projects Lake Powell's September 30, 2015, elevation to be between 3,575 feet and 3,649 feet, and Lake Mead's elevation to be less than 1,075 feet, Lake Powell's annual release volume would be increased to balance the contents of Lake Mead and Lake Powell up to 9.0 maf. Based on analysis of a range of forecasted inflow scenarios, the current probability of realizing an inflow volume that would trigger balancing releases of up to 9.0 maf in 2015 is approximately 90 percent. The February 2015 24-Month Study projects that an April adjustment to balancing releases is likely to occur and Lake Powell is currently projected to release 9.0 maf in water year 2015.

Based on the current forecast, the February 24-Month Study projects Lake Powell elevation will end water year 2015 near 3,597 feet with approximately 11.47 maf in storage (47% capacity).

Note that projections of elevation and storage have significant uncertainty at this early point in the season, primarily due to uncertainty regarding this season's final snowpack and the resulting inflow to Lake Powell. Under the minimum probable inflow scenario, last updated in January, the projected end of water year elevation and storage are 3589 feet and 10.73 maf (44% capacity), respectively. Under the maximum probable inflow scenario, last updated in January, the projected end of water year elevation and storage are 3639 feet and 15.94 maf (66% capacity), respectively. The annual release volume from Lake Powell during water year 2015 is projected to be 9.0 maf under all three inflow scenarios.

However, there is a 10% chance that inflows will be higher, potentially resulting in higher releases; and 10% chance that inflows will be lower, potentially resulting in lower releases. If inflows are less than the current forecasted minimum probable inflow, the water year 2015 annual release could be as low as 8.23 maf. If inflows are greater than the current forecasted maximum probable inflow, the annual release could be 10.8 maf or greater. Modeling of projected reservoir operations based on the minimum and maximum scenarios will be updated again in April.

Upper Colorado River Basin Hydrology

The Upper Colorado River Basin regularly experiences significant year to year hydrologic variability. During the 15-year period 2000 to 2014, however, the unregulated inflow to Lake Powell, which is a good measure of hydrologic conditions in the Colorado River Basin, was above average in only 3 out of the past 15 years. The period 2000-2014 is the lowest 15-year period since the closure of Glen Canyon Dam in 1963, with an average unregulated inflow of 8.39 maf, or 78% of the 30-year average (1981-2010). (For comparison, the 1981-2010 total water year average is 10.83 maf.) The unregulated inflow during the 2000-2014 period has ranged from a low of 2.64 maf (24% of average) in water year 2002 to a high of 15.97 maf (147% of average) in water year 2011. The water year 2014 unregulated inflow volume to Lake Powell was 10.381 maf (96% of average), which, though still below average, was significantly higher than inflows observed in 2012 and 2013 (45% and 47% of average, respectively). Under the current most probable forecast, total water year 2015 unregulated inflows to Lake Powell is projected to be 10.08 maf (93% of average).

At the beginning of water year 2015, total system storage in the Colorado River Basin was 30.0 maf (50% of 59.6 maf total system capacity). This is nearly the same as the total storage at the beginning of water year 2014 which began at 29.9 maf (50% of capacity). Since the beginning of water year 2000, total Colorado Basin storage has experienced year to year increases and decreases in response to wet and dry hydrology, ranging from a high of 94% of capacity at the beginning of 2000 to a low of 50% of capacity at the beginning of water year 2014. One wet year can significantly increase total system reservoir storage, just as persistent dry years can draw down the system storage. Based on current inflow forecasts, the current projected end of water year 2015 total Colorado Basin reservoir storage is approximately 28.7 maf (48% of capacity). The actual end of water year storage may vary from this projection, primarily due to uncertainty regarding next season's snowpack and resulting runoff. Based on January minimum and maximum probable inflow forecasts and modeling the range is approximately 27.5 maf (46%) to 33.6 maf (56%), respectively.

Update courtesy of Katrina Grantz, United States Bureau of Reclamation

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From: **RRFW Riverwire** riverwire@rrfw.org
Subject: Glen Canyon Dam Update April 2015
Date: April 17, 2015 at 10:36 PM
To: john@livingrivers.org

RR

RRFW Riverwire
Glen Canyon Dam Update

April 17, 2015

Current Status

The unregulated inflow volume to Lake Powell in March was 552 thousand acre-feet (kaf) (83% of average). The release volume from Glen Canyon Dam in March was 649 kaf. The end of March elevation and storage of Lake Powell were 3,591.0 feet (109 feet from full pool) and 10.91 million acre-feet (maf) (45% of full capacity), respectively. The reservoir elevation is near the anticipated seasonal low and will soon begin increasing as spring runoff enters the reservoir.

Current Operations

In April, the release volume will be approximately 600 kaf, with fluctuations anticipated between about 7,500 cfs in the nighttime to about 13,000 cubic feet per second (cfs) in the daytime and consistent with the Glen Canyon Operating Criteria (Federal Register, Volume 62, No. 41, March 3, 1997). The anticipated release volume for May is 700 kaf with daily fluctuations between approximately 8,500 cfs and 14,500 cfs . The expected release for June is 800 kaf with daily fluctuations between approximately 10,000 cfs and 18,000 cfs.

The operating tier for water year 2015 was established in August 2014 as the Upper Elevation Balancing Tier. In the Upper Elevation Balancing Tier the initial water year release volume is 8.23 maf; however, there is the possibility for an April adjustment to equalization or balancing operations to govern for the remainder of the water year. This April 2015 24-Month Study establishes that Lake Powell operations will shift to "balancing releases" for the remainder of water year 2015. Under Balancing, the contents of Lake Powell and Lake Mead will be balanced by the end of the water year, but not more than 9.0 maf and not less than 8.23 maf shall be released from Lake Powell. Based on the most probable inflow forecast, this April 24-Month Study projects a balancing release of 9.0 maf in water year 2015; the actual release in water year 2015, however, will depend on hydrology in the remainder of water year and will range from 8.23 to 9.0 maf. The projected release from Lake Powell in water year 2015 will be updated each month throughout the remainder of the water year. Reclamation will schedule operations at Glen Canyon Dam to achieve as practicably as possible the appropriate total annual release volume by September 30, 2015.

In addition to daily scheduled fluctuations for power generation, the instantaneous releases from Glen Canyon Dam may also fluctuate to provide 40 MW of system regulation. These instantaneous release adjustments stabilize the electrical generation and transmission system and translate to a range of about 1,200 cfs above or below the hourly scheduled release rate. Under system normal conditions, fluctuations for regulation are typically short lived and generally balance out over the hour with minimal or no noticeable impacts on downstream river flow conditions.

Releases from Glen Canyon Dam can also fluctuate beyond scheduled releases when called upon to respond to unscheduled power outages or power system emergencies. Depending on the severity of the system emergency, the response from Glen Canyon Dam can be significant, within the full range of the operating capacity of the power plant for as long as is necessary to maintain balance in the transmission system. Glen Canyon Dam typically maintains 27 MW (approximately 800 cfs) of generation capacity in reserve in order to respond to a system emergency even when generation rates are already high. System emergencies occur fairly infrequently and typically require small responses from Glen Canyon Dam. However, these responses can have a noticeable impact on the river downstream of Glen Canyon Dam.

Inflow Forecasts and Model Projections

The April to July 2015 water supply forecast for unregulated inflow to Lake Powell, issued on April 2, 2015, by the Colorado Basin River Forecast Center, projects that the most probable (median) unregulated inflow volume

will be 3.75 maf (52% of average based on the period 1981-2010). The forecast decreased by 135 kaf since last month. At this point in the season, there is still uncertainty regarding this year's water supply and the total inflow to Lake Powell. The spring runoff forecast ranges from a minimum probable of 2.60 maf (36% of average) to a maximum probable of 5.70 maf (80% of average). There is 10% chance that inflows could be higher than the maximum probable and a 10% chance they could be lower than the minimum probable.

As determined in the August 2014 24-Month Study, and documented in the 2015 Annual Operating Plan, Lake Powell's operations in water year 2015 will be governed by the Upper Elevation Balancing Tier. In this tier, the initial water year release volume is 8.23 maf, however, there is the potential for an April adjustment to equalization or balancing releases in April 2015. This April 2015 24-Month Study projects the end of water year elevation at Lake Powell to be above 3,575 feet and the end of water year elevation at Lake Mead to be below elevation 1,075.0 feet. Therefore, in accordance with Section 6.B.4 of the 2007 Interim Guidelines, Lake Powell operations will shift to "balancing releases" for the remainder of water year 2015. Under Section 6.B.4, the contents of Lake Powell and Lake Mead will be balanced by the end of the water year, but not more than 9.0 maf and not less than 8.23 maf shall be released from Lake Powell.

Based on the April most probable inflow forecast, the annual release volume from Lake Powell during water year 2015 is projected to be 9.0 maf. Under the minimum probable inflow scenario, the water year release is projected to be 8.9 maf. Under the maximum probable inflow scenario, the release is projected to be 9.0 maf. There 10% chance that inflows will be lower than the current minimum probable forecast, potentially resulting in lower releases. If inflows are less than the minimum probable forecast, the water year 2015 annual release could be as low as 8.23 maf. If inflows are greater than the current forecasted maximum probable inflow, the annual release will be 9.0 maf. The projected release from Lake Powell in water year 2015 will be updated each month throughout the remainder of the water year.

Based on the current forecast, the April 24-Month Study projects Lake Powell elevation will end water year 2015 near 3,583 feet with approximately 10.24 maf in storage (42% capacity). Projections of elevation and storage still have significant uncertainty at this point in the season, primarily due to uncertainty regarding spring runoff and the resulting inflow to Lake Powell. Under the minimum probable inflow scenario, updated in April, the projected end of water year elevation and storage are 3574 feet and 9.45 maf (39% capacity), respectively. Under the maximum probable inflow scenario, updated in April, the projected end of water year elevation and storage are 3603 feet and 12.02 maf (49% capacity), respectively. Modeling of projected reservoir operations based on the minimum and maximum scenarios will be updated again in August.

Upper Colorado River Basin Hydrology

The Upper Colorado River Basin regularly experiences significant year to year hydrologic variability. During the 15-year period 2000 to 2014, however, the unregulated inflow to Lake Powell, which is a good measure of hydrologic conditions in the Colorado River Basin, was above average in only 3 out of the past 15 years. The period 2000-2014 is the lowest 15-year period since the closure of Glen Canyon Dam in 1963, with an average unregulated inflow of 8.39 maf, or 78% of the 30-year average (1981-2010). (For comparison, the 1981-2010 total water year average is 10.83 maf.) The unregulated inflow during the 2000-2014 period has ranged from a low of 2.64 maf (24% of average) in water year 2002 to a high of 15.97 maf (147% of average) in water year 2011. The water year 2014 unregulated inflow volume to Lake Powell was 10.381 maf (96% of average), which, though still below average, was significantly higher than inflows observed in 2012 and 2013 (45% and 47% of average, respectively). Under the current most probable forecast, total water year 2015 unregulated inflows to Lake Powell is projected to be 7.18 maf (66% of average), and ranges from a minimum probable inflow of 5.9 maf (55%) and maximum probable inflow of 9.4 maf (87%).

At the beginning of water year 2015, total system storage in the Colorado River Basin was 30.0 maf (50% of 59.6 maf total system capacity). This is nearly the same as the total storage at the beginning of water year 2014 which began at 29.9 maf (50% of capacity). Since the beginning of water year 2000, total Colorado Basin storage has experienced year to year increases and decreases in response to wet and dry hydrology, ranging from a high of 94% of capacity at the beginning of 2000 to a low of 50% of capacity at the beginning of water year 2014. One wet year can significantly increase total system reservoir storage, just as persistent dry years can draw down the system storage. Based on current inflow forecasts, the current projected end of water year 2015 total Colorado Basin reservoir storage is approximately 27.4 maf (46% of capacity). The actual end of water year storage may vary from this projection, primarily due to uncertainty regarding this season's runoff and resulting reservoir inflow. Based on the April minimum and maximum probable inflow forecasts and modeling the range is approximately 26.1 maf (44%) to 29.5 maf (50%), respectively.

This update courtesy of Katrina Grantz, Bureau of Reclamation

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From: **RRFW Riverwire** riverwire@rrfw.org
Subject: Glen Canyon Dam Update September 2015
Date: September 1, 2015 at 12:04 PM
To: john@livingrivers.org

RR

RRFW Riverwire
Glen Canyon Dam Update

September 1, 2015

Current Status

The April to July 2015 unregulated inflow to Lake Powell was 6.71 million acre-feet (maf) (94% of average). The unregulated inflow in July was 1.072 maf (98% of average). The release volume from Glen Canyon Dam in July was 1.048 maf. The end of July elevation and storage of Lake Powell were 3,612.6 feet (87 feet from full pool) and 13.00 maf (53% of full capacity), respectively. The reservoir elevation peaked at 3,614 feet on July 14 and is now in its seasonal decline through the fall and winter months.

Current Operations

In August 2015, the release volume was approximately 800 thousand acre-feet (kaf), with fluctuations between approximately 9,000 cubic feet per second (cfs) and 17,000 cfs and consistent with the Glen Canyon Operating Criteria (Federal Register, Volume 62, No. 41, March 3, 1997). The anticipated release volume for September is approximately 710 kaf with daily fluctuations between approximately 9,000 cfs and 15,000 cfs. The expected release for October is 600 kaf with daily fluctuations between approximately 7,000 cfs and 13,500 cfs. The anticipated release volume for November 2015 is 600,000 acre-feet with daily fluctuations between approximately 7,000 cfs and 13,000 cfs.

The operating tier for water year 2015, established in August 2014, is the Upper Elevation Balancing Tier. The April 2015 24-Month Study established that Lake Powell operations will be governed by balancing for the remainder of water year 2015. Based on the most probable inflow forecast, this August 24-Month Study projects a balancing release of 9.0 maf in water year 2015. Reclamation will schedule operations at Glen Canyon Dam to achieve as practicably as possible the appropriate total annual release volume by September 30, 2015.

The operating tier for water year 2016, established this August 2015, is the Upper Elevation Balancing Tier, with an initial water year release volume of 8.23 maf and the potential for an April 2016 adjustment to equalization or balancing releases. Based on the current forecast, an April adjustment to balancing releases is projected to occur and Lake Powell is currently projected to release 9.0 maf in water year 2016. This projection will be updated each month throughout the water year.

In addition to daily scheduled fluctuations for power generation, the instantaneous releases from Glen Canyon Dam may also fluctuate to provide 40 MW of system regulation. These instantaneous release adjustments stabilize the electrical generation and transmission system and translate to a range of about 1,200 cfs above or below the hourly scheduled release rate. Under system normal conditions, fluctuations for regulation are typically short lived and generally balance out over the hour with minimal or no noticeable impacts on downstream river flow conditions.

Releases from Glen Canyon Dam can also fluctuate beyond scheduled releases when called upon to respond to unscheduled power outages or power system emergencies. Depending on the severity of the system emergency, the response from Glen Canyon Dam can be significant, within the full range of the operating capacity of the power plant for as long as is necessary to maintain balance in the transmission system. Glen Canyon Dam currently maintains 27 MW (approximately 800 cfs) of generation capacity in reserve in order to respond to a system emergency even when generation rates are already high. System emergencies occur fairly infrequently and typically require small responses from Glen Canyon Dam. However, these responses can have a noticeable impact on the river downstream of Glen Canyon Dam.

Inflow Forecasts and Model Projections

The forecast for water year 2016 unregulated inflow to Lake Powell, issued on August 3, 2015, by the Colorado Basin River Forecast Center, projects that the most probable (median) unregulated inflow volume next year will be 9.54 maf (88% of average). There is significant uncertainty regarding next season's snow pack development and resulting runoff into Lake Powell. The forecast ranges from a minimum probable of 6.4 maf (59%) to a maximum probable of 16.9 maf (156%). There is a 10% chance that inflows could be higher than the current maximum probable forecast and a 10% chance that inflows could be lower than the minimum probable forecast.

Based on the current forecast, the August 24-Month study projects Lake Powell elevation will end water year 2015 near 3,608 feet with approximately 12.51 maf in storage (51% capacity) and water year 2016 near 3,610 feet with approximately 12.71 maf in storage (52% capacity). Note that projections of elevation and storage for water year 2016 have significant uncertainty at this point in the season. Projections of elevation and storage using the minimum and maximum probable inflow forecast are 3,585 feet (10.4 maf, 43% capacity) and 3,648 feet (17.0 maf, 70% capacity), respectively. Under these scenarios, there is a 10 percent chance that inflows will be higher, resulting in higher elevation and storage, and 10 percent chance that inflows will be lower, resulting in lower elevation and storage. The annual release volume from Lake Powell during water year 2016 is projected to be 9.0 maf under the minimum and most probable inflow scenarios and 11.4 maf under the maximum probable inflow scenario. There is a chance that inflows could be higher or lower, potentially resulting in releases greater than 11.4 maf or as low as 8.23 maf in water year 2016.

Upper Colorado River Basin Hydrology

The Upper Colorado River Basin regularly experiences significant year to year hydrologic variability. During the 15-year period 2000 to 2014, however, the unregulated inflow to Lake Powell, which is a good measure of hydrologic conditions in the Colorado River Basin, was above average in only 3 out of the past 15 years. The period 2000-2014 is the lowest 15-year period since the closure of Glen Canyon Dam in 1963, with an average unregulated inflow of 8.39 maf, or 78% of the 30-year average (1981-2010). (For comparison, the 1981-2010 total water year average is 10.83 maf.) The unregulated inflow during the 2000-2014 period has ranged from a low of 2.64 maf (24% of average) in water year 2002 to a high of 15.97 maf (147% of average) in water year 2011. The water year 2014 unregulated inflow volume to Lake Powell was 10.381 maf (96% of average), which, though still below average, was significantly higher than inflows observed in 2012 and 2013 (45% and 47% of average, respectively). Under the current most probable forecast, total water year 2015 unregulated inflows to Lake Powell is projected to be 10.33 maf (95% of average).

At the beginning of water year 2015, total system storage in the Colorado River Basin was 30.0 maf (50% of 59.6 maf total system capacity). This is nearly the same as the total storage at the beginning of water year 2014 which began at 29.9 maf (50% of capacity). Since the beginning of water year 2000, total Colorado Basin storage has experienced year to year increases and decreases in response to wet and dry hydrology, ranging from a high of 94% of capacity at the beginning of 2000 to a low of 50% of capacity at the beginning of water year 2015. One wet year can significantly increase total system reservoir storage, just as persistent dry years can draw-down the system storage. Based on current inflow forecasts, the current projected end of water year total Colorado Basin reservoir storage for water year 2015 is approximately 30.55 maf (51% of total system capacity) and for water year 2016 is approximately 30.24 maf (51% of total system capacity). The actual end of water year 2016 system storage may vary from this projection, primarily due to uncertainty regarding next season's snowpack and resulting runoff and reservoir inflow. Based on the August minimum and maximum probable inflow forecasts and modeling, the range of end of water year 2016 total system capacity is approximately 27.2 maf (46%) to 37.3 maf (63%), respectively.

This update courtesy of Katrina Grantz, Bureau of Reclamation

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From: **RRFW Riverwire** riverwire@rrfw.org
Subject: Glen Canyon Dam And High Flow Update October 2015
Date: October 19, 2015 at 5:00 PM
To: john@livingrivers.org

RR

RRFW Riverwire

Glen Canyon Dam And High Flow Update

October 19, 2015

Fall 2015 High Flow Experiment Canceled

Due to resource concerns, the Department of Interior will not conduct a High-Flow Experiment (HFE) at Glen Canyon Dam this fall. Although sediment conditions in the Canyon support a HFE, a concentrated grouping of green sunfish-invasive to the area-was recently discovered in a backwater slough downstream of Glen Canyon Dam. There is concern that an HFE could disperse this harmful nonnative downstream into the Colorado River, posing a threat to native endangered species in the Canyon. While response actions are underway to effectively address the green sunfish problem, the timeline for doing so is not conducive to conducting an HFE in November 2015.

Current Status

The unregulated inflow to Lake Powell in September was 276 thousand acre feet (kaf) (68% of average). The release volume from Glen Canyon Dam in August was 714 kaf. The end of September elevation and storage of Lake Powell were 3,606.1 feet (94 feet from full pool) and 12.3 million acre feet (maf) (51% of full capacity), respectively. The water year 2015 unregulated inflow to Lake Powell was 10.17 maf (94% of average). The water year 2015 release from Lake Powell was 9.0 maf. The reservoir elevation peaked at 3,614 feet on July 14, 2015 and is now in its seasonal decline through the fall and winter months.

Current Operations

In October 2015, the release volume will be approximately 600 kaf, with fluctuations anticipated between approximately 7,000 cubic feet per second (cfs) and 13,000 cfs and consistent with the Glen Canyon Operating Criteria (Federal Register, Volume 62, No. 41, March 3, 1997). The anticipated release volume for November is approximately 600 kaf with daily fluctuations between approximately 7,000 cfs and 13,000 cfs. The expected release for December is 800 kaf with daily fluctuations between approximately 9,000 cfs and 17,000 cfs.

In addition to daily scheduled fluctuations for power generation, the instantaneous releases from Glen Canyon Dam may also fluctuate to provide 40 Megawatts (MW) of system regulation. These instantaneous release adjustments stabilize the electrical generation and transmission system and translate to a range of about 1,200 cfs above or below the hourly scheduled release rate. Under system normal conditions, fluctuations for regulation are typically short lived and generally balance out over the hour with minimal or no noticeable impacts on downstream river flow conditions.

Releases from Glen Canyon Dam can also fluctuate beyond scheduled releases when called upon to respond to unscheduled power outages or power system emergencies. Depending on the severity of the system emergency, the response from Glen Canyon Dam can be significant, within the full range of the operating capacity of the power plant for as long as is necessary to maintain balance in the transmission system. Glen Canyon Dam currently maintains 27 MW (approximately 800 cfs) of generation capacity in reserve in order to respond to a system emergency even when generation rates are already high. System emergencies occur fairly infrequently and typically require small responses from Glen Canyon Dam. However, these responses can have a noticeable impact on the river downstream of Glen Canyon Dam.

The operating tier for water year 2016, established in August 2015, is the Upper Elevation Balancing Tier, with an initial water year release volume of 8.23 maf and the potential for an April 2016 adjustment to equalization or balancing releases. Based on the current forecast, an April adjustment to balancing releases is projected to occur and Lake Powell is currently projected to release 9.0 maf in water year 2016. This projection will be updated each month throughout the water year.

Inflow Forecasts and Model Projections

The forecast for water year 2016 unregulated inflow to Lake Powell, issued on October 1, 2015, by the Colorado Basin River Forecast Center, projects that the most probable (median) unregulated inflow volume next year will be 8.45 maf (78% of average). This is a decrease of 840 kaf since the September forecast for water year 2016. There is significant uncertainty regarding next season's snow pack development and resulting runoff into Lake Powell. The forecast ranges from a minimum probable of 6.2 maf (57%) to a maximum probable of 16.0 maf (148%). There is a 10% chance that inflows could be higher than the current maximum probable forecast and a 10% chance that inflows could be lower than the minimum probable forecast.

Based on the current forecast, the October 24-Month Study projects Lake Powell elevation will end water year 2016 near 3,600 feet with approximately 11.8 maf in storage (48% capacity). Note that projections of elevation and storage for water year 2016 have significant uncertainty at this point in the season. Projections of elevation and storage using the minimum and maximum probable inflow forecast, updated in October, are 3,581 feet (10.0 maf, 43% capacity) and 3,639 feet (15.9 maf, 65% capacity), respectively. Under these scenarios, there is a 10 percent chance that inflows will be higher, resulting in higher elevation and storage, and 10 percent chance that inflows will be lower, resulting in lower elevation and storage. The annual release volume from Lake Powell during water year 2016 is projected to be 9.0 maf under the minimum and most probable inflow scenarios and 11.4 maf under the maximum probable inflow scenario. There is a chance that inflows could be higher or lower, potentially resulting in releases greater than 11.4 maf or as low as 8.23 maf in water year 2016. The minimum and maximum probable scenarios will be updated again in January.

Upper Colorado River Basin Hydrology

The Upper Colorado River Basin regularly experiences significant year to year hydrologic variability. During the 16-year period 2000 to 2015, however, the unregulated inflow to Lake Powell, which is a good measure of hydrologic conditions in the Colorado River Basin, was above average in only 3 out of the past 16 years. The period 2000-2015 is the lowest 16-year period since the closure of Glen Canyon Dam in 1963, with an average unregulated inflow of 8.51 maf, or 79% of the 30-year average (1981-2010). (For comparison, the 1981-2010 total water year average is 10.83 maf.) The unregulated inflow during the 2000-2015 period has ranged from a low of 2.64 maf (24% of average) in water year 2002 to a high of 15.97 maf (147% of average) in water year 2011. The water year 2015 unregulated inflow volume to Lake Powell was 10.17 maf (94% of average), which, though still below average, was significantly higher than inflows observed in 2012 and 2013 (45% and 47% of average, respectively). Under the current most probable forecast, total water year 2016 unregulated inflows to Lake Powell is projected to be 8.45 maf (78% of average).

At the beginning of water year 2016, total system storage in the Colorado River Basin was 30.3 maf (51% of 59.6 maf total system capacity). This is nearly the same as the total storage at the beginning of water years 2014 and 2015 which began at 29.9 maf and 30.0 maf, respectively, both of which were 50% of capacity. Since the beginning of water year 2000, total Colorado Basin storage has experienced year to year increases and decreases in response to wet and dry hydrology, ranging from a high of 94% of capacity at the beginning of 2000 to a low of 50% of capacity at the beginning of water year 2005. One wet year can significantly increase total system reservoir storage, just as persistent dry years can draw down the system storage. Based on current inflow forecasts, the current projected end of water year total Colorado Basin reservoir storage for water year 2016 is approximately 28.9 maf (49% of total system capacity).The actual end of water year 2016 system storage may vary from this projection, primarily due to uncertainty regarding next season's snowpack and resulting runoff and reservoir inflow. Based on the October minimum and maximum probable inflow forecasts and modeling, the range of end of water year 2016 total system capacity is approximately 26.8 maf (45%) to 36.4 maf (61%), respectively.

This update courtesy of Katrina Grantz, Bureau of Reclamation

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From: **RRFW Riverwire** riverwire@rrfw.org
Subject: Glen Canyon Dam Update April 2016
Date: April 27, 2016 at 9:48 AM
To: john@livingrivers.org

RR

RRFW Riverwire
Glen Canyon Dam Update

April 27, 2016

Current Status

The unregulated inflow volume to Lake Powell in March was 553 thousand acre-feet (kaf) (83 percent of average). The release volume from Glen Canyon Dam in March was 694 kaf. The end of March elevation and storage of Lake Powell were 3,592 ft (108 feet from full pool) and 11.02 maf (45% of full capacity), respectively. The reservoir elevation is near the anticipated seasonal low and will soon begin increasing as spring runoff enters the reservoir.

Current Operations

In April, the release volume will be approximately 664 kaf, with fluctuations anticipated between about 8,000 cfs in the nighttime to about 14,000 cfs in the daytime and consistent with the Glen Canyon Operating Criteria (Federal Register, Volume 62, No. 41, March 3, 1997). The anticipated release volume for May is 700 kaf with daily fluctuations between approximately 8,000 cfs and 14,000 cfs. The expected release for June is 800 kaf with daily fluctuations between approximately 9,000 cfs and 17,000cfs. The anticipated release volume for July 2016 is 950,000 kaf. This will be confirmed in a subsequent directive toward the end of May.

The operating tier for water year 2016 was established in August 2015 as the Upper Elevation Balancing Tier. In the Upper Elevation Balancing Tier the initial water year release volume is 8.23 maf; however, there is the possibility for an April adjustment to equalization or balancing operations to govern for the remainder of the water year. This April 2016 24-Month Study establishes that Lake Powell operations will shift to "balancing releases" for the remainder of water year 2016. Under Balancing, the contents of Lake Powell and Lake Mead will be balanced by the end of the water year, but not more than 9.0 maf and not less than 8.23 maf shall be released from Lake Powell. Based on the most probable inflow forecast, this April 24-Month Study projects a balancing release of 9.0 maf in water year 2016; the actual release in water year 2016, however, will depend on hydrology in the remainder of water year and will range from8.23 to 9.0 maf. The projected release from Lake Powell in water year 2016 will be updated each month throughout the remainder of the water year. Reclamation will schedule operations at Glen Canyon Dam to achieve as practicably as possible the appropriate total annual release volume by September 30,2016.

In addition to daily scheduled fluctuations for power generation, the instantaneous releases from Glen Canyon Dam may also fluctuate to provide 40 megawatts (mw) of system regulation. These instantaneous release adjustments stabilize the electrical generation and transmission system and translate to a range of about 1,200 cfs above or below the hourly scheduled release rate. Under system normal conditions, fluctuations for regulation are typically short lived and generally balance out over the hour with minimal or no noticeable impacts on downstream river flow conditions.

Releases from Glen Canyon Dam can also fluctuate beyond scheduled releases when called upon to respond to unscheduled power outages or power system emergencies. Depending on the severity of the system emergency, the response from Glen Canyon Dam can be significant,within the full range of the operating capacity of the power plant for as long as is necessary to maintain balance in the transmission system. Glen Canyon Dam typically maintains 30 mw (approximately 880 cfs) of generation capacity in reserve in order to respond to a system emergency even when generation rates are already high. System emergencies occur fairly infrequently and typically require small responses from Glen Canyon Dam. However, these responses can have a noticeable impact on the river downstream of Glen Canyon Dam.

Inflow Forecasts and Model Projections

The April to July 2016 water supply forecast for unregulated inflow to Lake Powell, issued on April 4, 2016, by

the Colorado Basin River Forecast Center, projects that the most probable (median) unregulated inflow volume will be 5.3 maf (74 percent of average based on the period 1981-2010). The forecast decreased by 400 kaf since last month. At this point in the season, there is still uncertainty regarding this year's water supply and the total inflow to Lake Powell. The spring runoff forecast ranges from a minimum probable of 3.85 maf (54 percent of average) to a maximum probable of 7.65 maf (107 percent of average). There is 10% chance that inflows could be higher than the maximum probable and a 10% chance they could be lower than the minimum probable.

As determined in the August 2015 24-Month Study, and documented in the 2016 Annual Operating Plan, Lake Powell's operations in water year 2016 will be governed by the Upper Elevation Balancing Tier. In this tier, the initial water year release volume is 8.23 maf, however, there is the potential for an April adjustment to equalization or balancing releases in April 2016. This April 2016 24-Month Study projects the end of water year elevation at Lake Powell to be above 3,575 ft and the end of water year elevation at Lake Mead to be below elevation 1,075.0ft. Therefore, in accordance with Section 6.B.4 of the 2007 Interim Guidelines, Lake Powell operations will shift to "balancing releases" for the remainder of water year 2016. Under Section 6.B.4, the contents of Lake Powell and Lake Mead will be balanced by the end of the water year, but not more than 9.0 maf and not less than 8.23 maf shall be released from Lake Powell.

Based on the April most probable inflow forecast, the annual release volume from Lake Powell during water year 2016 is projected to be 9.0 maf. Under the minimum probable inflow scenario, the water year release is projected to be 9.0 maf. Under the maximum probable inflow scenario, the release is projected to be 9.0 maf. There is 10% chance that inflows will be lower than the current minimum probable forecast, potentially resulting in lower releases. If inflows are less than the minimum probable forecast, the water year 2016 annual release could be as low as 8.23 maf. If inflows are greater than the current forecasted maximum probable inflow, the annual release will be 9.0 maf. The projected release from Lake Powell in water year 2016 will be updated each month throughout the remainder of the water year.

Based on the current forecast, the April 24-Month Study projects Lake Powell elevation will end water year 2016 near 3,600 ft with approximately 11.75 maf in storage (48%capacity). Projections of elevation and storage still have significant uncertainty at this point in the season, primarily due to uncertainty regarding spring runoff and the resulting inflow to Lake Powell. Under the minimum probable inflow scenario, updated in April, the projected end of water year elevation and storage are 3585 ft and 10.35 maf (43% capacity), respectively. Under the maximum probable inflow scenario, updated in April, the projected end of water year elevation and storage are 3622 ft and 14.01 maf (58% capacity), respectively. Modeling of projected reservoir operations based on the minimum and maximum scenarios will be updated again in August.

Upper Colorado River Basin Hydrology

The Upper Colorado River Basin regularly experiences significant year to year hydrologic variability. During the 16-year period 2000 to 2015, however, the unregulated inflow to Lake Powell, which is a good measure of hydrologic conditions in the Colorado River Basin, was above average in only 3 out of the past 16 years. The period 2000-2015 is the lowest 16-year period since the closure of Glen Canyon Dam in 1963, with an average unregulated inflow of8.39 maf, or 78% of the 30-year average (1981-2010). (For comparison, the 1981-2010 total water year average is 10.83 maf.) The unregulated inflow during the 2000-2015 period has ranged from a low of 2.64 maf (24 percent of average) in water year 2002 to a high of 15.97 maf (147 percent of average) in water year 2011. The water year 2015 unregulated inflow volume to Lake Powell was 10.174 maf (94 percent of average), which, though still below average, was significantly higher than inflows observed in 2012 and 2013 (45% and 47 percent of average,respectively).

Under the current most probable forecast, total water year 2016 unregulated inflows to Lake Powell is projected to be 8.44 maf (78 percent of average), and ranges from a minimum probable inflow of 6.86 maf (63%) and maximum probable inflow of 11.13 maf (103%).

At the beginning of water year 2016, total system storage in the Colorado River Basin was 30.3 maf (51% of 59.6 maf total system capacity). This is nearly the same as the total storage at the beginning of water year 2015 which began at 30.1 maf (50% of capacity). Since the beginning of water year 2000, total Colorado Basin storage has experienced year to year increases and decreases in response to wet and dry hydrology, ranging from a high of 94% of capacity at the beginning of 2000 to a low of 50% of capacity at the beginning of water year 2014. One wet year can significantly increase total system reservoir storage, just as persistent dry years can draw down the system storage. Based on current inflow forecasts, the current projected end of water year 2016 total Colorado Basin reservoir storage is approximately 29.0 maf (49% of capacity).

The actual end of water year storage may vary from this projection, primarily due to uncertainty regarding this season's runoff and resulting reservoir inflow. Based on the April minimum and maximum probable inflow forecasts and modeling the range is approximately 27.6 maf (46%) to 31.4 maf (53%),respectively.
This update courtesy of Paul Davidson, Bureau of Reclamation

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From: **RRFW Riverwire** riverwire@rrfw.org
Subject: Glen Canyon Dam Update May 2016
Date: May 22, 2016 at 4:27 PM
To: john@livingrivers.org

RR

RRFW Riverwire
Glen Canyon Dam Update

May 22, 2016

Current Operations

In May, the release volume will be approximately 700 thousand acre feet (kaf), with fluctuations anticipated between about 8,000 cubic feet per second (cfs) in the nighttime to about 14,000 cfs in the daytime and consistent with the Glen Canyon Operating Criteria (Federal Register, Volume 62, No. 41, March 3, 1997). The anticipated release volume for June is 800 kaf with daily fluctuations between approximately 9,000 cfs and 17,000 cfs. The expected release for July is 950 kaf with daily fluctuations between approximately 11,500 cfs and 19,500 cfs. The anticipated release volume for August 2016 is 900,000 kaf.

The operating tier for water year 2016 was established in August 2015 as the Upper Elevation Balancing Tier. The April 2016 24-Month Study established that Lake Powell operations will be governed by balancing for the remainder of water year 2016. Under balancing, the contents of Lake Powell and Lake Mead will be balanced by the end of the water year, but not more than 9.0 million acre feet (maf) and not less than 8.23 maf shall be released from Lake Powell. Based on the most probable inflow forecast, this May 24-Month Study projects a balancing release of 9.0 maf in water year 2016; the actual release in water year 2016, however, will depend on hydrology in the remainder of water year and will range from 8.23 to 9.0 maf. The projected release from Lake Powell in water year 2016 will be updated each month throughout the remainder of the water year. Reclamation will schedule operations at Glen Canyon Dam to achieve as practicably as possible the appropriate total annual release volume by September 30, 2016.

In addition to daily scheduled fluctuations for power generation, the instantaneous releases from Glen Canyon Dam may also fluctuate to provide 40 megawatts (mw) of system regulation. These instantaneous release adjustments stabilize the electrical generation and transmission system and translate to a range of about 1,200 cfs above or below the hourly scheduled release rate. Under system normal conditions, fluctuations for regulation are typically short lived and generally balance out over the hour with minimal or no noticeable impacts on downstream river flow conditions.

Releases from Glen Canyon Dam can also fluctuate beyond scheduled releases when called upon to respond to unscheduled power outages or power system emergencies. Depending on the severity of the system emergency, the response from Glen Canyon Dam can be significant,within the full range of the operating capacity of the power plant for as long as is necessary to maintain balance in the transmission system. Glen Canyon Dam typically maintains 30 mw (approximately 880 cfs) of generation capacity in reserve in order to respond to a system emergency even when generation rates are already high. System emergencies occurfairly infrequently and typically require small responses from Glen Canyon Dam. However, these responses can have a noticeable impact on the river downstream of Glen Canyon Dam.

Current Status

The unregulated inflow volume to Lake Powell in April was 814 kaf (77 percent of average). The release volume from Glen Canyon Dam in April was 665 kaf. The end of April elevation and storage of Lake Powell were 3,592 ft (108 feet from full pool) and 11.01 maf (45% of full capacity), respectively. The reservoir reached a seasonal low elevation on April 15th near elevation 3591.14 feet. Since that time the reservoir has been increasing as the first of the spring runoff is now entering the reservoir.

Inflow Forecasts and Model Projections

The April to July 2016 water supply forecast for unregulated inflow to Lake Powell, issued on May 3, 2016, by the Colorado Basin River Forecast Center, projects that the most probable (median) unregulated inflow volume will be 5.5 maf (77 percent of average based on the period 1981-2010). The forecast increased by 200 kaf

since last month. At this point in the season, there is still uncertainty regarding this year's water supply and the total inflow to Lake Powell. The spring runoff forecast ranges from a minimum probable of 3.85 maf (54 percent of average) to a maximum probable of 7.65 maf (107 percent of average). There is 10% chance that inflows could be higher than the maximum probable and a 10% chance they could be lower than the minimum probable.

As determined in the August 2015 24-Month Study, and documented in the 2016 Annual Operating Plan, Lake Powell's operations in water year 2016 will be governed by the Upper Elevation Balancing Tier. Because the April 2016 24-Month Study projected the end of water year elevation at Lake Powell to be above 3,575 feet and the end of water year elevation at Lake Mead to be below elevation 1,075.0 feet, Lake Powell operations shifted to balancing (Section 6.B.4 of the 2007 Interim Guidelines) for the remainder of water year 2016. Under balancing, the contents of Lake Powell and Lake Mead will be balanced by the end of the water year, but not more than 9.0 maf and not less than 8.23 maf shall be released from Lake Powell.

Based on the May most probable inflow forecast, the annual release volume from Lake Powell during water year 2016 is projected to be 9.0 maf. Under the minimum probable inflow scenario, the water year release is projected to be 9.0 maf. Under the maximum probable inflow scenario, the release is projected to be 9.0 maf. There is 10% chance that inflows will be lower than the current minimum probable forecast, potentially resulting in lower releases. If inflows are less than the minimum probable forecast, the water year 2016 annual release could be as low as 8.23 maf. If inflows are greater than the current forecasted maximum probable inflow, the annual release will be 9.0 maf. The projected release from Lake Powell in water year 2016 will be updated each month throughout the remainder of the water year.

Based on the current forecast, the May 24-Month Study projects Lake Powell elevation will end water year 2016 near 3,603 ft with approximately 12.06 maf in storage (50% capacity). Projections of elevation and storage still have significant uncertainty at this point in the season, primarily due to uncertainty regarding spring runoff and the resulting inflow to Lake Powell. Under the minimum probable inflow scenario, updated in April, the projected end of water year elevation and storage are 3585 ft and 10.35 maf (43% capacity), respectively. Under the maximum probable inflow scenario, updated in April, the projected end of water year elevation and storage are 3622 ft and 14.01 maf (58% capacity), respectively. Modeling of projected reservoir operations based on the minimum and maximum scenarios will be updated again in August.

Upper Colorado River Basin Hydrology

The Upper Colorado River Basin regularly experiences significant year to year hydrologic variability. During the 16-year period 2000 to 2015, however, the unregulated inflow to Lake Powell, which is a good measure of hydrologic conditions in the Colorado River Basin, was above average in only 3 out of the past 16 years. The period 2000-2015 is the lowest 16-year period since the closure of Glen Canyon Dam in 1963, with an average unregulated inflow of8.51 maf, or 79% of the 30-year average (1981-2010). (For comparison, the 1981-2010 total water year average is 10.83 maf.) The unregulated inflow during the 2000-2015 period has ranged from a low of 2.64 maf (24 percent of average) in water year 2002 to a high of 15.97 maf (147 percent of average) in water year 2011. The water year 2015 unregulated inflow volume to Lake Powell was 10.174 maf (94 percent of average), which, though still below average, was significantly higher than inflows observed in 2012 and 2013 (45% and 47 percent of average,respectively). Under the current most probable forecast, total water year 2016 unregulated inflows to Lake Powell is projected to be 8.71 maf (80 percent of average), and ranges from a minimum probable inflow of 6.86 maf (63%) and maximum probable inflow of 11.13 maf (103%).

At the beginning of water year 2016, total system storage in the Colorado River Basin was 30.3 maf (51% of 59.6 maf total system capacity). This is nearly the same as the total storage at the beginning of water year 2015 which began at 30.1 maf (50% of capacity). Since the beginning of water year 2000, total Colorado Basin storage has experienced year to year increases and decreases in response to wet and dry hydrology, ranging from a high of 94% of capacity at the beginning of 2000 to a low of 50% of capacity at the beginning of water year 2014. One wet year can significantly increase total system reservoir storage, just as persistent dry years can draw down the system storage. Based on current inflow forecasts, the current projected end of water year 2016 total Colorado Basin reservoir storage is approximately 29.3 maf (49% of capacity). The actual end of water year storage may vary from this projection, primarily due to uncertainty regarding this season's runoff and resulting reservoir inflow. Based on the April minimum and maximum probable inflow forecasts and modeling the range is approximately 27.6 maf (46%) to 31.4 maf (53%), respectively.

This update courtesy of Paul Davidson, Bureau of Reclamation

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RRFW is a non-profit project of Living Rivers.

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From: **RRFW Riverwire** riverwire@rrfw.org
Subject: Glen Canyon Dam Update June 2016
Date: June 25, 2016 at 10:30 AM
To: john@livingrivers.org

RR

RRFW Riverwire
Glen Canyon Dam Update

June 25, 2016

Current Operations

In June, the release volume will be approximately 800 thousand acre feet (kaf), with fluctuations anticipated between about 9,000 cubic feet per second (cfs) in the nighttime to about 17,000 cfs in the daytime and consistent with the Glen Canyon Operating Criteria (Federal Register, Volume 62, No. 41, March 3, 1997). The anticipated release volume for July is 950 kaf with daily fluctuations between approximately 11,500 cfs and 19,500 cfs. The expected release for August is 900 kaf with daily fluctuations between approximately 10,000 cfs and 18,000 cfs.

The operating tier for water year 2016 was established in August 2015 as the Upper Elevation Balancing Tier. The April 2016 24-Month Study established that Lake Powell operations will be governed by balancing for the remainder of water year 2016. Under balancing, the contents of Lake Powell and Lake Mead will be balanced by the end of the water year, but not more than 9.0 maf and not less than 8.23 maf shall be released from Lake Powell. Based on the most probable inflow forecast, this June 24-Month Study projects a balancing release of 9.0 maf in water year 2016; the actual release in water year 2016, however, will depend on hydrology in the remainder of water year and will range from 8.23 to 9.0 maf. The projected release from Lake Powell in water year 2016 will be updated each month throughout the remainder of the water year.

Reclamation will schedule operations at Glen Canyon Dam to achieve as practicably as possible the appropriate total annual release volume by September 30, 2016.

In addition to daily scheduled fluctuations for power generation, the instantaneous releases from Glen Canyon Dam may also fluctuate to provide 40 megawatts (mw) of system regulation. These instantaneous release adjustments stabilize the electrical generation and transmission system and translate to a range of about 1,200 cfs above or below the hourly scheduled release rate. Under system normal conditions, fluctuations for regulation are typically short lived and generally balance out over the hour with minimal or no noticeable impacts on downstream river flow conditions.

Releases from Glen Canyon Dam can also fluctuate beyond scheduled releases when called upon to respond to unscheduled power outages or power system emergencies. Depending on the severity of the system emergency, the response from Glen Canyon Dam can be significant, within the full range of the operating capacity of the power plant for as long as is necessary to maintain balance in the transmission system. Glen Canyon Dam typically maintains 30 mw (approximately 880 cfs) of generation capacity in reserve in order to respond to a system emergency even when generation rates are already high. System emergencies occur fairly infrequently and typically require small responses from Glen Canyon Dam. However, these responses can have a noticeable impact on the river downstream of Glen Canyon Dam.

Current Status

The unregulated inflow volume to Lake Powell in May was 2,294 thousand acre-feet (kaf) (98 percent of average). The release volume from Glen Canyon Dam in May was 700 kaf. The end of May elevation and storage of Lake Powell were 3,604 ft (96 feet from full pool) and 12.1 maf (50% of full capacity), respectively. The reservoir reached a seasonal low elevation on April 15th near elevation 3591.14 feet. Since that time the reservoir elevation has been increasing and will continue to increase throughout mid-summer as runoff from snowmelt and precipitation enter the reservoir.

Inflow Forecasts and Model Projections

The April to July 2016 water supply forecast for unregulated inflow to Lake Powell, issued on June 3, 2016, by the Colorado Basin River Forecast Center, projects that the most probable (median) unregulated inflow volume will be 6.5 maf (91 percent of average based on the period 1981-2010). The forecast increased by 1,000 kaf since last month. There is still uncertainty regarding this year's water supply and the total inflow to Lake Powell. The spring runoff forecast ranges from a minimum probable of 3.85 maf (54 percent of average) to a maximum probable of 7.65 maf (107 percent of average). There is 10% chance that inflows could be higher than the maximum probable and a 10% chance they could be lower than the minimum probable.

As determined in the August 2015 24-Month Study, and documented in the 2016 Annual Operating Plan, Lake Powell's operations in water year 2016 will be governed by the Upper Elevation Balancing Tier. Because the April 2016 24-Month Study projected the end of water year elevation at Lake Powell to be above 3,575 feet and the end of water year elevation at Lake Mead to be below elevation 1,075.0 feet, Lake Powell operations shifted to balancing (Section 6.B.4 of the 2007 Interim Guidelines) for the remainder of water year 2016. Under balancing, the contents of Lake Powell and Lake Mead will be balanced by the end of the water year, but not more than 9.0 maf and not less than 8.23 maf shall be released from Lake Powell.

Based on the June most probable inflow forecast, the annual release volume from Lake Powell during water year 2016 is projected to be 9.0 maf. Under the minimum probable inflow scenario, the water year release is projected to be 9.0 maf. Under the maximum probable inflow scenario, the release is projected to be 9.0 maf. There is 10% chance that inflows will be lower than the current minimum probable forecast, potentially resulting in lower releases. If inflows are less than the minimum probable forecast, the water year 2016 annual release could be as low as 8.23 maf. If inflows are greater than the current forecasted maximum probable inflow, the annual release will be 9.0 maf. The projected release from Lake Powell in water year 2016 will be updated each month throughout the remainder of the water year.

Based on the current forecast, the June 24-Month Study projects Lake Powell elevation will end water year 2016 near 3,611 ft with approximately 12.82 maf in storage (53% capacity). Projections of elevation and storage still have significant uncertainty at this point in the season, primarily due to uncertainty regarding runoff and the resulting inflow to Lake Powell. Under the minimum probable inflow scenario, updated in April, the projected end of water year elevation and storage are 3585 ft and 10.35 maf (43% capacity), respectively. Under the maximum probable inflow scenario, updated in April, the projected end of water year elevation and storage are 3622 ft and 14.01 maf (58% capacity), respectively. Modeling of projected reservoir operations based on the minimum and maximum scenarios will be updated again in August.

Upper Colorado River Basin Hydrology

The Upper Colorado River Basin regularly experiences significant year to year hydrologic variability. During the 16-year period 2000 to 2015, however, the unregulated inflow to Lake Powell, which is a good measure of hydrologic conditions in the Colorado River Basin, was above average in only 3 out of the past 16 years. The period 2000-2015 is the lowest 16-year period since the closure of Glen Canyon Dam in 1963, with an average unregulated inflow of 8.51 maf, or 79% of the 30-year average (1981-2010). (For comparison, the 1981-2010 total water year average is 10.83 maf.) The unregulated inflow during the 2000-2015 period has ranged from a low of 2.64 maf (24 percent of average) in water year 2002 to a high of 15.97 maf (147 percent of average) in water year 2011. The water year 2015 unregulated inflow volume to Lake Powell was 10.174 maf (94 percent of average), which, though still below average, was significantly higher than inflows observed in 2012 and 2013 (45% and 47 percent of average, respectively).

Under the current most probable forecast, total water year 2016 unregulated inflows to Lake Powell is projected to be 9.70 maf (90 percent of average), and ranges from a minimum probable inflow of 6.86 maf (63%) and maximum probable inflow of 11.13 maf (103%).

At the beginning of water year 2016, total system storage in the Colorado River Basin was 30.3 maf (51% of 59.6 maf total system capacity). This is nearly the same as the total storage at the beginning of water year 2015 which began at 30.1 maf (50% of capacity). Since the beginning of water year 2000, total Colorado Basin storage has experienced year to year increases and decreases in response to wet and dry hydrology, ranging from a high of 94% of capacity at the beginning of 2000 to a low of 50% of capacity at the beginning of water year 2014. One wet year can significantly increase total system reservoir storage, just as persistent dry years can draw down the system storage. Based on current inflow forecasts, the current projected end of water year 2016 total Colorado Basin reservoir storage is approximately 30.3 maf (51% of capacity). The actual end of water year storage may vary from this projection, primarily due to uncertainty regarding this season's runoff and resulting reservoir inflow. Based on the April minimum and maximum probable inflow forecasts and modeling the range is approximately 27.6 maf (46%) to 31.4 maf (53%), respectively.

This update courtesy of Paul Davidson, Bureau of Reclamation

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From: **RRFW Riverwire** riverwire@rrfw.org
Subject: Glen Canyon Dam Update July 2016
Date: July 21, 2016 at 11:48 AM
To: john@livingrivers.org

RR

RRFW Riverwire
Glen Canyon Dam Update

July 21, 2016

Glen Canyon Dam Lake Powell

Current Operations

In July, the release volume will be approximately 950 thousand acre feet (kaf), with fluctuations anticipated between approximately 11,500 cubic feet per second (cfs) during the nighttime and 19,500 cfs during the daytime and consistent with the Glen Canyon Operating Criteria (Federal Register, Volume 62, No. 41, March 3, 1997). The anticipated release volume for August is 900 kaf with daily fluctuations between approximately 10,000 cfs and 18,000 cfs. The expected release for September is approximately 700 kaf with daily fluctuations between approximately 8,500 cfs and 14,500 cfs.

In addition to daily scheduled fluctuations for power generation, the instantaneous releases from Glen Canyon Dam may also fluctuate to provide 40 mega-watts (mw) of system regulation. These instantaneous release adjustments stabilize the electrical generation and transmission system and translate to a range of about 1,200 cfs above or below the hourly scheduled release rate. Under system normal conditions, fluctuations for regulation are typically short lived and generally balance out over the hour with minimal or no noticeable impacts on downstream river flow conditions.

Releases from Glen Canyon Dam can also fluctuate beyond scheduled releases when called upon to respond to unscheduled power outages or power system emergencies. Depending on the severity of the system emergency, the response from Glen Canyon Dam can be significant, within the full range of the operating capacity of the power plant for as long as is necessary to maintain balance in the transmission system. Glen Canyon Dam typically maintains 30 mw (approximately 880 cfs) of generation capacity in reserve in order to respond to a system emergency even when generation rates are already high. System emergencies occur fairly infrequently and typically require small responses from Glen Canyon Dam. However, these responses can have a noticeable impact on the river downstream of Glen Canyon Dam.

The operating tier for water year 2016 was established in August 2015 as the Upper Elevation Balancing Tier. The April 2016 24-Month Study established that Lake Powell operations will be governed by balancing for the remainder of water year 2016. Under balancing, the contents of Lake Powell and Lake Mead will be balanced by the end of the water year, but not more than 9.0 million acre feet (maf) and not less than 8.23 maf shall be released from Lake Powell. Based on the most probable inflow forecast, this July 24-Month Study projects a balancing release of 9.0 maf in water year 2016. Reclamation will schedule operations at Glen Canyon Dam to achieve as practicably as possible the appropriate total annual release volume by September 30, 2016.

Inflow Forecasts and Model Projections

The April to July 2016 water supply forecast for unregulated inflow to Lake Powell, issued on July 1, 2016, by the Colorado Basin River Forecast Center, projects that the most probable (median) unregulated inflow volume will be 6.72 maf (94 percent of average based on the period 1981-2010). The forecast increased by 2,200 kaf since last month. There is still uncertainty regarding the runoff and resulting inflow to Lake Powell through the end of the water year.

As determined in the August 2015 24-Month Study, and documented in the 2016 Annual Operating Plan, Lake Powell's operations in water year 2016 will be governed by the Upper Elevation Balancing Tier. Because the April 2016 24-Month Study projected the end of water year elevation at Lake Powell to be above 3,575 feet and the end of water year elevation at Lake Mead to be below elevation 1,075.0 feet, Lake Powell operations shifted to balancing (Section 6.B.4 of the 2007 Interim Guidelines) for the remainder of water year 2016. Under balancing, the contents of Lake Powell and Lake Mead will be balanced by the end of the water year, but not

more than 9.0 maf and not less than 8.23 maf shall be released from Lake Powell.

Based on the current forecast, the July 24-Month Study projects Lake Powell's end of water year 2016 elevation to be near 3,612 feet with approximately 12.97 maf in storage (53 percent capacity). Projections of elevation and storage still have significant uncertainty at this point in the season, primarily due to uncertainty regarding runoff and the resulting inflow to Lake Powell. Under the minimum probable inflow scenario, updated in April, the projected end of water year elevation and storage are 3585 ft and 10.35 maf (43 percent capacity), respectively. Under the maximum probable inflow scenario, updated in April, the projected end of water year elevation and storage are 3622 ft and 14.01 maf (58 percent capacity), respectively. Modeling of projected reservoir operations based on the minimum and maximum scenarios will be updated again in August.

Upper Colorado River Basin Hydrology

The Upper Colorado River Basin regularly experiences significant year to year hydrologic variability. During the 16-year period 2000 to 2015, however, the unregulated inflow to Lake Powell, which is a good measure of hydrologic conditions in the Colorado River Basin, was above average in only 3 out of the past 16 years. The period 2000-2015 is the lowest 16-year period since the closure of Glen Canyon Dam in 1963, with an average unregulated inflow of 8.51 maf, or 79 percent of the 30-year average (1981-2010). (For comparison, the 1981-2010 total water year average is 10.83 maf.) The unregulated inflow during the 2000-2015 period has ranged from a low of 2.64 maf (24 percent of average) in water year 2002 to a high of 15.97 maf (147 percent of average) in water year 2011. The water year 2015 unregulated inflow volume to Lake Powell was 10.174 maf (94 percent of average), which, though still below average, was significantly higher than inflows observed in 2012 and 2013 (45 percent and 47 percent of average, respectively). Under the current most probable forecast, total water year 2016 unregulated inflows to Lake Powell is projected to be 9.90 maf (92 percent of average), and ranges from a minimum probable inflow of 6.86 maf (63 percent of average) and maximum probable inflow of 11.13 maf (103 percent of average).

At the beginning of water year 2016, total system storage in the Colorado River Basin was 30.3 maf (51 percent of 59.6 maf total system capacity). This is nearly the same as the total storage at the beginning of water year 2015 which began at 30.1 maf (50 percent of capacity). Since the beginning of water year 2000, total Colorado Basin storage has experienced year to year increases and decreases in response to wet and dry hydrology, ranging from a high of 94 percent of capacity at the beginning of 2000 to a low of 50 percent of capacity at the beginning of water year 2014. One wet year can significantly increase total system reservoir storage, just as persistent dry years can draw down the system storage. Based on current inflow forecasts, the current projected end of water year 2016 total Colorado Basin reservoir storage is approximately 30.5 maf (51 percent of capacity). The actual end of water year storage may vary from this projection, primarily due to uncertainty regarding this season's runoff and resulting reservoir inflow. Based on the April minimum and maximum probable inflow forecasts and modeling the range is approximately 27.6 maf (46 percent of capacity) to 31.4 maf (53 percent of capacity), respectively.

This update courtesy of Paul Davidson, Bureau of Reclamation

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Grand Canyon on Facebook

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From: **RRFW Riverwire** riverwire@rrfw.org
Subject: Glen Canyon Dam Update August 2016
Date: August 27, 2016 at 6:30 PM
To: john@livingrivers.org

RR

RRFW Riverwire
Glen Canyon Dam Update

August 21, 2016

Glen Canyon Dam Lake Powell

Current Operations

In August 2016, the release volume was approximately 900 thousand acre-feet (kaf), with fluctuations between approximately 10,000 cubic feet per second (cfs) and 18,000 cfs and consistent with the Glen Canyon Operating Criteria (Federal Register, Volume 62, No. 41, March 3, 1997). The anticipated release volume for September is approximately 698 kaf with daily fluctuations between approximately 8,500 cfs and 14,500 cfs. The expected release for October is 600 kaf with daily fluctuations between approximately 7,000 cfs and 13,000 cfs. The anticipated release volume for November 2016 is 600,000 acre-feet with daily fluctuations between approximately 7,000 cfs and 13,000 cfs. This will be confirmed in a subsequent directive toward the end of September.

In addition to daily scheduled fluctuations for power generation, the instantaneous releases from Glen Canyon Dam may also fluctuate to provide 40 mega-watts (mw) of system regulation. These instantaneous release adjustments stabilize the electrical generation and transmission system and translate to a range of about 1,200 cfs above or below the hourly scheduled release rate. Under system normal conditions, fluctuations for regulation are typically short lived and generally balance out over the hour with minimal or no noticeable impacts on downstream river flow conditions.

Releases from Glen Canyon Dam can also fluctuate beyond scheduled releases when called upon to respond to unscheduled power outages or power system emergencies. Depending on the severity of the system emergency, the response from Glen Canyon Dam can be significant,within the full range of the operating capacity of the power plant for as long as is necessary to maintain balance in the transmission system. Glen Canyon Dam typically maintains 30 mw (approximately 880 cfs) of generation capacity in reserve in order to respond to a system emergency even when generation rates are already high. System emergencies occurfairly infrequently and typically require small responses from Glen Canyon Dam. However, these responses can have a noticeable impact on the river downstream of Glen Canyon Dam.

The operating tier for water year 2016 was established in August 2015 as the Upper Elevation Balancing Tier. The April 2016 24-Month Study established that Lake Powell operations will be governed by balancing for the remainder of water year 2016. Based on the most probable inflow forecast, this August 24-Month Study projects a balancing release of 9.0 maf in water year 2016. Reclamation will schedule operations at Glen Canyon Dam to achieve as practicably as possible the appropriate total annual release volume by September 30, 2016.

The operating tier for water year 2017, established this August 2016, is the Upper Elevation Balancing Tier, with an initial water year release volume of 8.23 maf and the potential for an April 2017 adjustment to equalization or balancing releases. Based on the current forecast, an April adjustment to balancing releases is projected to occur and Lake Powell is currently projected to release 9.0 maf in water year 2017. This projection will be updated each month throughout the water year.

Inflow Forecasts and Model Projections

The April to July 2016 unregulated inflow to Lake Powell was 6.61 million acre-feet (maf) (92% of average). The unregulated inflow in July was 0.595 maf (55% of average). The release
volume from Glen Canyon Dam in July was 0.950 maf. The end of July elevation and storage of Lake Powell were 3,618.22 feet (82 feet from full pool) and 13.58 maf (56% of full capacity), respectively. The reservoir elevation peaked at 3,621.5 feet on July 9th and is now in its seasonal decline through the fall and winter

months.

The forecast for water year 2017 unregulated inflow to Lake Powell, issued on August 1, 2016, by the Colorado Basin River Forecast Center, projects that the most probable (median) unregulated inflow volume next year will be 9.63 maf (89% of average). There is significant uncertainty regarding next season's snow pack development and resulting runoff into Lake Powell. The forecast ranges from a minimum probable of 6.6 maf (61%) to a maximum probable of 17.0 maf (157%). There is a 10% chance that inflows could be higher than the current maximum probable forecast and a 10% chance that inflows could be lower than the minimum probable forecast.

Based on the current forecast, the August 24-Month Study projects Lake Powell elevation will end water year 2016 near 3,612 feet with approximately 12.95 maf in storage (53% capacity) and water year 2017 near 3,613 feet with approximately 13.04 maf in storage (54% capacity). Note that projections of elevation and storage for water year 2017 have significant uncertainty at this point in the season. Projections of elevation and storage using the minimum and maximum probable inflow forecast are 3,589 feet (10.71 maf, 44% capacity) and 3,645 feet (16.64 maf, 68% capacity), respectively. Under these scenarios, there is a 10 percent chance that inflows will be higher, resulting in higher elevation and storage, and 10 percent chance that inflows will belower, resulting in lower elevation and storage. The annual release volume from Lake Powell during water year 2017 is projected to be 9.0 maf under the minimum and most probable inflow scenarios and 11.9 maf under the maximum probable inflow scenario. There is a chance that inflows could be higher or lower, potentially resulting in releases greater than 11.9 maf or as low as 8.23 maf in water year2017.

Upper Colorado River Basin Hydrology

The Upper Colorado River Basin regularly experiences significant year to year hydrologic variability. During the 16-year period 2000 to 2015, however, the unregulated inflow to Lake Powell, which is a good measure of hydrologic conditions in the Colorado River Basin, was above average in only 3 out of the past 16 years. The period 2000-2015 is the lowest 16-year period since the closure of Glen Canyon Dam in 1963, with an average unregulated inflow of8.51 maf, or 79 percent of the 30-year average (1981-2010). (For comparison, the 1981-2010 total water year average is 10.83 maf.) The unregulated inflow during the 2000-2015 period has ranged from a low of 2.64 maf (24 percent of average) in water year 2002 to a high of 15.97 maf (147 percent of average) in water year 2011. The water year 2015 unregulated inflow volume to Lake Powell was 10.174 maf (94 percent of average), which, though still below average, was significantly higher than inflows observed in 2012 and 2013 (45 percent and 47 percent of average, respectively). Under the current most probable forecast, total water year 2016 unregulated inflows to Lake Powell is projected to be 9.78 maf (90 percent ofaverage).

At the beginning of water year 2016, total system storage in the Colorado River Basin was 30.3 maf (51 percent of 59.6 maf total system capacity). This is nearly the same as the total storage at the beginning of water year 2015 which began at 30.1 maf (50 percent of capacity). Since the beginning of water year 2000, total Colorado Basin storage has experienced year to year increases and decreases in response to wet and dry hydrology, ranging from a high of 94 percent of capacity at the beginning of 2000 to a low of 50 percent of capacity at the beginning of water year 2014.

One wet year can significantly increase total system reservoir storage, just as persistent dry years can draw down the system storage. Based on current inflow forecasts, the current projected end of water year 2017 total Colorado Basin reservoir storage is approximately 30.0 maf (50 percent of capacity). The actual end of water year storage may vary from this projection, primarily due to uncertainty regarding this season's runoff and resulting reservoir inflow. Based on the August minimum and maximum probable inflow forecasts and modeling the range is approximately 27.3 maf (46 percent of capacity) to 34.1 maf (57 percent of capacity), respectively.

This update courtesy of Paul Davidson, Bureau of Reclamation

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See our store offerings and donate at the RRFW Store!

Visit us on Facebook at http://www.facebook.com/RRFW.org or chat with us at Rafting Grand Canyon on Facebook

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From: **RRFW Riverwire** riverwire@rrfw.org
Subject: Glen Canyon Dam and High-Flow Update September 2016
Date: September 29, 2016 at 10:45 PM
To: john@livingrivers.org

RR

RRFW Riverwire
Glen Canyon Dam and High-Flow Update

September 29, 2016

Current Operations

In September 2016, the release volume was approximately 699 thousand acre-feet (kaf), with fluctuations between approximately 8,500 cfs and 14,500 cfs and consistent with the Glen Canyon Operating Criteria (Federal Register, Volume 62, No. 41, March 3, 1997).

The release volume from Glen Canyon Dam for October 2016 will be 600,000 acre-feet. Hourly and daily average releases from Glen Canyon Dam for October 2016 will be scheduled through Western Area Power Administration to be consistent with the Glen Canyon Dam Operating Criteria (Federal Register, Volume 62, No. 41, March 3, 1997) and to also achieve, as nearly as is practicable, this monthly volume.

Hourly releases during October 2016 are anticipated to fluctuate between approximately 7,000 cubic feet per second (cfs) in the nighttime and 13,000 cfs in the daytime.

We anticipate the release volume for November 2016 will be approximately 600,000 acre-feet with daily fluctuations between approximately 7,000 cfs and 13,000 cfs. However, the release volume in November may be modified depending on the size and duration of a High-Flow Experiment, as described in the Environmental Assessment for Development and Implementation of a Protocol for High-Flow Experimental Releases from Glen Canyon Dam, Arizona, 2011 through 2020. The anticipated release volume for December is approximately 900,000 acre-feet. This will be confirmed in a subsequent directive toward the end of October.

At this time we do not have a set date for a fall HFE. Further data collection, modeling, and analysis prior to the end of October may modify the expected duration and/or magnitude of a HFE. A final determination on the timing, magnitude and duration of a potential fall 2016 HFE will likely be made near the end of October.

The operating tier for water year 2016, established in August 2015, is the Upper Elevation Balancing Tier. The April 2016 24-Month Study established that Lake Powell operations will be governed by balancing for the remainder of water year 2016. Based on the most probable inflow forecast, this September 24-Month Study projects a balancing release of 9.0 maf in water year 2016. Reclamation will schedule operations at Glen Canyon Dam to achieve as practicably as possible the appropriate total annual release volume by September 30, 2016.

The operating tier for water year 2017, established in August 2016, is the Upper Elevation Balancing Tier, with an initial water year release volume of 8.23 maf and the potential for an April 2017 adjustment to equalization or balancing releases. Based on the current forecast, an April adjustment to balancing releases is projected to occur and Lake Powell is currently projected to release 9.0 maf in water year 2017. This projection will be updated each month throughout the water year.

In addition to daily scheduled fluctuations for power generation, the instantaneous releases from Glen Canyon Dam may also fluctuate to provide 40 MW of system regulation. These instantaneous release adjustments stabilize the electrical generation and transmission system and translate to a range of about 1,200 cfs above or below the hourly scheduled release rate. Under system normal conditions, fluctuations for regulation are typically short lived and generally balance out over the hour with minimal or no noticeable impacts on downstream river flow conditions.

Releases from Glen Canyon Dam can also fluctuate beyond scheduled releases when called upon to respond to unscheduled power outages or power system emergencies. Depending on the severity of the system emergency, the response from Glen Canyon Dam can be significant, within the full range of the operating capacity of the power plant for as long as is necessary to maintain balance in the transmission system. Glen

Canyon Dam currently maintains 27 MW (approximately 800 cfs) of generation capacity in reserve in order to respond to a system emergency even when generation rates are already high. System emergencies occur fairly infrequently and typically require small responses from Glen Canyon Dam. However, these responses can have a noticeable impact on the river downstream of Glen Canyon Dam.

Current Status and High-Flow Experiment

High-Flow Experiments (HFE) below Glen Canyon Dam are driven by weather, sediment inputs, and other resource conditions, in accordance with the High-Flow Protocol (Protocol) http://www.usbr.gov/uc/envdocs/ea/gc/HFEProtocol/index.html.

A fall HFE can be triggered any time during October-November. Our best preliminary data and model runs indicate we now have enough sediment input from the Paria River to trigger an HFE at Glen Canyon Dam under the HFE Protocol. The HFE Technical Team will be meeting to begin planning for a possible HFE and reviewing the status of resources and potential resource impacts.

At this time we do not have a set date for a fall HFE. Further data collection, modeling, and analysis prior to the end of October may modify the expected duration and/or magnitude of a HFE. A final determination on the timing, magnitude and duration of a potential fall 2016 HFE will likely be made near the end of October.

The unregulated inflow to Lake Powell in August was 253 kaf (51% of average). The release volume from Glen Canyon Dam in August was 900 kaf. The end of August elevation and storage of Lake Powell were 3,613.55 feet (86 feet from full pool) and 13.1 maf (54% of full capacity), respectively. The April to July 2016 unregulated inflow to Lake Powell was 6.61 million acre- feet (maf) (92% of average). The reservoir elevation peaked at 3,621.5 feet on July 9 and is now in its seasonal decline through the fall and winter months.

Inflow Forecasts and Model Projections

The forecast for water year 2016 unregulated inflow to Lake Powell, issued on September 1, 2016, by the Colorado Basin River Forecast Center, projects that the most probable (median) unregulated inflow volume next year will be 9.53 maf (88% of average). There is significant uncertainty regarding next season's snow pack development and resulting runoff into Lake Powell. The forecast ranges from a minimum probable of 6.6 maf (61%) to a maximum probable of 17.0 maf (157%). There is a 10% chance that inflows could be higher than the current maximum probable forecast and a 10% chance that inflows could be lower than the minimum probable forecast.

Based on the current forecast, the September 24-Month Study projects Lake Powell elevation will end water year 2016 near 3,611.0 feet with approximately 12.83 maf in storage (53% capacity) and water year 2017 near 3,611.0 feet with approximately 12.83 maf in storage (53% capacity). Note that projections of elevation and storage for water year 2017 have significant uncertainty at this point in the season. Projections of elevation and storage using the minimum and maximum probable inflow forecast, last updated in August, are 3,589 feet (10.7 maf, 44% capacity) and 3,645 feet (16.6 maf, 68% capacity), respectively. Under these scenarios, there is a 10 percent chance that inflows will be higher, resulting in higher elevation and storage, and 10 percent chance that inflows will be lower, resulting in lower elevation and storage. The annual release volume from Lake Powell during water year 2017 is projected to be 9.0 maf under the minimum and most probable inflow scenarios and 11.9 maf under the maximum probable inflow scenario. There is a chance that inflows could be higher or lower, potentially resulting in releases greater than 11.9 maf or as low as 8.23 maf in water year 2017. The minimum and maximum probable scenarios will be updated again in October.

Upper Colorado River Basin Hydrology

The Upper Colorado River Basin regularly experiences significant year to year hydrologic variability. During the 16-year period 2000 to 2015, however, the unregulated inflow to Lake Powell, which is a good measure of hydrologic conditions in the Colorado River Basin, was above average in only 3 out of the past 16 years. The period 2000-2015 is the lowest 16-year period since the closure of Glen Canyon Dam in 1963, with an average unregulated inflow of8.51 maf, or 79 percent of the 30-year average (1981-2010). (For comparison, the 1981-2010 total water year average is 10.83 maf.) The unregulated inflow during the 2000-2015 period has ranged from a low of 2.64 maf (24 percent of average) in water year 2002 to a high of 15.97 maf (147 percent of average) in water year 2011. The water year 2015 unregulated inflow volume to Lake Powell was 10.174 maf (94 percent of average), which, though still below average, was significantly higher than inflows observed in 2012 and 2013 (45 percent and 47 percent of average, respectively). Under the current most probable

forecast, total water year 2016 unregulated inflows to Lake Powell is projected to be 9.64 maf (89 percent ofaverage).

At the beginning of water year 2016, total system storage in the Colorado River Basin was 30.3 maf (51 percent of 59.6 maf total system capacity). This is nearly the same as the total storage at the beginning of water year 2015 which began at 30.1 maf (50 percent of capacity). Since the beginning of water year 2000, total Colorado Basin storage has experienced year to year increases and decreases in response to wet and dry hydrology, ranging from a high of 94 percent of capacity at the beginning of 2000 to a low of 50 percent of capacity at the beginning of water year 2014.

One wet year can significantly increase total system reservoir storage, just as persistent dry years can draw down the system storage. Based on current inflow forecasts, the current projected end of water year 2017 total Colorado Basin reservoir storage is approximately 29.8 maf (50 percent of capacity). The actual end of water year storage may vary from this projection, primarily due to uncertainty regarding this season's runoff and resulting reservoir inflow. Based on the August minimum and maximum probable inflow forecasts and modeling the range is approximately 27.3 maf (46 percent of capacity) to 34.1 maf (57 percent of capacity), respectively.

This update courtesy of Paul Davidson, Bureau of Reclamation

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