Climate: 4th-driest year on record at Lake Powell

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High flow experiment planned for early November to restore aquatic and riparian Colorado River ecosystems downstream of Glen Canyon Dam

By Summit Voice

FRISCO — Even with some bonus inflow in September, the past water year Oct 1, 2012 – Sept. 30, 2013) ended up as the fourth-driest on record for the Colorado River Basin as measured at Lake Powell — the key reservoir on the river that helps balance supply and demand between the upper and lower basins.
Overall water storage in the Colorado River Basin in the last 14 years has ranged from a high of 94 percent of capacity in 2000 to the present low of 50 percent at the start of the 2014 water year.

In a recent update, the U.S. Bureau of Reclamation (http://www.usbr.gov) reported that total inflow for the water year was just 5.12 million acre-feet, just 47 percent of average. Water years 2002, 1977, and 2012 were drier, receiving 2.64 maf, 3.53 maf, and 4.91 maf, respectively.

Lake Powell has only seen above-average inflows in three of the past 14 years. According to BuRec, the span between 2000 and 2014 is the driest 14-year period on record since the reservoir started filling in 1963, with an average annual inflow of about 8.25 million acre feet, or about 76 percent of the 30-year average between 1981 and 2010.

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).

But monsoon moisture definitely gave the reservoir a boost, raising the water level by 2 feet during an 11-day stretch in September. For the month, the inflow was 857,000 acre-feet, about 210 percent of average. At the end of September, Lake Powell’s water level was more than 108 feet below full, at 45 percent of capacity.

When global warming is factored into the big-picture water equation, some studies have suggested Lake Powell may continue dropping for years to come. Research published by the U.S. Forest Service Rocky Mountain Research Station (http://summitcountyvoice.com/2013/02/24/water-lake-powell-may-dry-up-within-a-few-decades/) this year found that “Lakes Powell and Mead are projected to drop to zero and only occasionally thereafter add rather small amounts of storage before emptying again.”

Last summer, the Bureau of Reclamation announced it will probably have to cut deliveries (http://summitcountyvoice.com/2013/08/16/is-the-colorado-river-tapped-out/) to the Lower Basin states in the next couple years. This year, Lake Powell’s water level peaked June 18 at a level 35 feet lower than 2012. Storage in the reservoir dropped by 3 million acre feet from the previous year.

BuRec released about 8.2 million acre feet from the reservoir. Under a cooperative program, the agency plans a high flow experimental release Nov. 11 to Nov. 16, ramping up flows from Lake Powell as high as 37,200 cubic feet per second, lasting for four days to try and mimic beneficial high natural flows downstream of the reservoir.

The releases will drop the reservoir level by about 2.5 feet but won’t change the overall annual of water to be delivered downstream. More information is online at the BuRec Lake Powell website (http://www.usbr.gov/uc/water/crsp/cs/gcd.html).
Related Information and graphics (courtesy BuRec):

Filed under: climate and weather, Colorado, Colorado River, drought, Environment, global warming, rivers, water
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High Flow Experiment - November 11-16, 2013

On November 11-16, 2013, the Department of Interior will conduct a high flow experimental (HFE) release from Glen Canyon Dam in accordance with the High-Flow Protocol. Under this Protocol, high flow releases are linked to sediment input and other resource conditions below Glen Canyon Dam. This HFE will be the second conducted under the HFE Protocol.

Beginning on the morning of November 11th, releases from Glen Canyon Dam will begin ramping up to full power plant capacity (approximately 22,200 cfs). At midday on November 11th, bypass tubes at Glen Canyon Dam will be opened and releases will continue to increase up to full power plant and bypass capacity (approximately 37,200 cfs) by the evening of November 11th. Releases will be maintained at peak release for 4 days (96 hours) and then begin ramping back down. Releases will return to normal operations in the afternoon of November 16th. The entire experiment, including ramping is expected to last 5 and a half days, with 4 day (96 hours) at peak release. 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 and a half day experiment. The annual release volume from Lake Powell remains 7.48 maf and will not change as a result of the HFE. For additional information about High Flow Experiments at Glen Canyon Dam, please check back for links to the soon-to-be-updated High Flow Experiment webpages.

Related Information and graphics:
* Glen Canyon Dam November 2013 HFE Release Hydrograph
* 2013 HFE Downstream Flow Arrival Time Map
* Lake Powell 2013 HFE Projected Elevation Graphs
* Lake Mead Projected Elevation Graphs

Current Status

The unregulated inflow volume to Lake Powell in September was 857 thousand acre-feet (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 million acre-feet (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.

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

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 year 2013 on June 18th 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 10.93 maf (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.

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.

Releases from Glen Canyon Dam in October are currently averaging approximately 8,000 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 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 11 – 19, 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 5,000 cfs and 8,000 cfs.

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 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 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 (89% 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 17.5 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).

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Katrina Grantz