

# Fill Lake Powell

The Path to 3588'

A Policy Proposal by

POWELLHEADZ





# Fill Lake Powell

Glen Canyon Dam created an opportunity. At the time of its construction, this opportunity was sometimes viewed in terms of water storage, power generation and flood control. Recreation on newly-formed Lake Powell, while clearly envisioned as a planned benefit, was perceived by some as a by-product of the other reasons the dam was built, rather than as a primary purpose. That perception must change to align with current realities.

Lake Powell, which was once a remote but breathtaking recreational outpost with little supporting infrastructure, had by 2019 become a \$420 million economic engine each year, and that's just from direct revenue generated, not even counting any multiplier effect in the region. Annual visitation, which in 1967 was under 500,000, had increased eight-fold by the end of the second decade of the 21st century. By 2019, recreation on Lake Powell was producing more revenue than the power generated through the dam, a trend that will likely continue as other new energy options present themselves, but only if—and this is the crucial part—Lake Powell and its supporting infrastructure continue to exist and be maintained.

Water supply issues are evolving as well. Water rights have been well-established, and the seven states in the Upper and Lower Basin, along with Mexico, work closely with the Bureau of Reclamation to manage water supply based on a series of laws and protocols first established a century ago. But the legal framework they operate under no longer works as intended, especially as long-term drought has gripped the region, especially in the 21st century. As water supply from the Colorado River has become less reliable, water managers in those states will become more creative with conservation practices while working to develop new supplies through recycled water, desalination opportunities, and engineered solutions.



# Path to 3588'

As the need to focus on water and power from the Colorado River system continues to diminish, the importance of recreational opportunities only increases. Lake Powell is a unique resource not just in the country, but in the entire world: a desert oasis providing unlikely access to some of the most beautiful canyons on the planet, while providing a haven for anglers, campers, hikers and anybody with a camera. It's an international treasure.

As times have changed, so must the focus of those who manage the lake. Priorities change. The purpose of the dam and the lake it created have evolved. While there are loud and persistent voices who see draining the lake as the only reasonable path forward, we offer an alternative vision.

The following policy proposal is our plan to raise the level of Lake Powell to 3588' - a level which allows for the full use of all major recreation amenities on the Lake. Our plan also recognizes the importance of maintaining Lake Mead at viable levels.

Recreation users are uniting to support our vision, and agency leaders in the Department of Interior are starting to take notice of our growing movement.

Our **Path to 3588'** plan was prepared by John Rickenbach. Mr. Rickenbach is an environmental and planning consultant with 30 years of experience. Mr. Rickenbach is an expert in issues related to the management of the Colorado River watershed. He has an intimate knowledge and understanding of the Colorado River Compact of 1922 and subsequent laws that guide water resource use in the seven affected states and Mexico.

With a strong a reasonable plan before us, we believe now is the time to Fill Lake Powell.



# Our Guiding

- 1. Glen Canyon National Recreational Area, established by Congress in 1972, will continue to offer unparalleled recreational land and water based recreation opportunities for the public as a premier destination.**
- 2. Establish lake recreationists (represented by Fill Lake Powell, a project associated with the Blue Ribbon Coalition, a non-profit organization whose goal is to maintain public access to public lands and waters) as an entity with a seat at the table as any components of the existing legal framework for managing the Colorado River are renegotiated. Fill Lake Powell represents the broad coalition of lake-oriented recreational interests, which go far beyond the seven states within the basin. Fill Lake Powell would be an active participant in strategic discussions and planning involving water management issues.**
- 3. Recognize non-consumptive recreational rights to use stored water in Lake Powell as a key aspect of a renegotiated agreement among the interested parties as the 1922 Compact is updated, a concept already firmly and legally established in several of states within the Colorado River watershed. Fill Lake Powell will work to ensure that non-consumptive recreational rights are protected at all levels of the law and in the execution of public policy.**
- 4. Maintain a target elevation on Lake Powell of at least 3588 feet above sea level, which would allow all existing marinas, boat ramps and related facilities to operate and maximize revenue generation. These facilities include, but are not necessarily limited to: Wahweap Marina and related boat ramps, Antelope Point Marina and related boat ramps, Castle Rock Cut, Dangling Rope Marina (or another mid-lake marina if Dangling Rope is relocated), Bullfrog Marina and related boat ramps, Halls Crossing Marina and related boat ramps, Lone Rock Beach, Stanton Canyon campground, Hite outpost, and various floating bathrooms and pumpout facilities. BOR shall plan releases through Glen Canyon Dam in such a way to achieve this target elevation by the beginning of Water Year 2025-26 (October 1, 2025), which may require incremental increases in releases up until that date.**
- 5. If the target elevation of 3588 cannot be maintained in a given year because of poor snowpack or other competing demands on the system related to water supply or power, establish protocols that meet minimum water supply and power requirements while maintaining economically viable recreational opportunities on the lake. Currently these measures are being deployed when the lake drops below 3525, which doesn't adequately take into account the impact to recreation.**



# Principles

6. When there are water shortages such that all competing management goals may not be attainable, prioritize recreational interests, water supply, and power generation related to Lake Powell as a function of the relative economic importance of these activities. Recognize and work within the confines of existing environmental laws while also exploring ways to improve these laws to balance resource utilization with environmental preservation.
7. Minimize fluctuating lake levels to the extent possible within the framework of a renegotiated agreement with BDR and other interested parties, in order to reduce maintenance and operational costs associated with established and permanent lake recreational facilities.
8. Work with the Tribal Nations, as well as state and local governments to establish and maintain appropriate lake-oriented recreational facilities to enhance the economic viability of the region, while respecting and mitigating for the environmental and cultural resources that could otherwise be affected by such facilities.
9. The NPS shall produce a 10-year management plan for GCNRA and publish it in a convenient format, updating the plan as appropriate. The plan should include revenue and use projections as well as planned improvements, identifying timing and potential revenue sources for planned facilities. The plan should emphasize ways to maximize GCNRA access for all forms of watercraft, beach users, hikers, off-road users, aircraft, anglers, commercial tour operators, campers, and any other outdoor recreation users who love GCNRA as much as we do. The plan should also include actions to facilitate access, visitation and recreation in a manner consistent with existing law, current management plans, and agency regulations – including the Department of Interior's Equity Access Plan.
10. Work collaboratively in a spirit of cooperation with competing regional interests, seeking common ground rather than confrontation in an effort to achieve common goals.

## Fill Lake Powell Mission Statement

Fill Lake Powell is committed to maintaining an economically viable Lake Powell, protecting and defending the public's recreational rights within Glen Canyon National Recreation Area, and adding the voice of recreation users to the discussion surrounding the allocation of water resources in the West.



# The Path to 3588: A Plan for Lake Powell and Lake Mead

*By John Rickenbach  
July 2022*

In June 2022, the Bureau of Reclamation (BOR) called for an immediate 2-4 million acre-foot (maf) reduction in water use among the seven states served by the Colorado River watershed in order to avert catastrophic consequences to water and power supply within the system. Based on the recent average annual water use among the states, this call to action represents a 16-32% reduction in use from this fragile water supply. If that sounds like a dramatic call to action, it is.

In an era of unprecedented drought, old assumptions and protocols for managing water supply in the Colorado River watershed no longer work. Creative, collaborative solutions are needed to ensure that the major reservoirs in the system can store sufficient water, generate power, and provide economically important recreational opportunities into the future. As recognized by the BOR, the current rate of water consumption within the system is unsustainable, at least as long as water supplies and snowpack remain generally below historic averages, a trend likely to continue into the future.

The following describes a way forward to meet this historic challenge. It involves a combination of equitably reducing water use among the affected states and Mexico, reimagining the volume and timing of water releases through the major dams, and having enough flexibility built in so that if the reservoirs begin to fill sufficiently, restrictions on water use can ease.

The key principles of this plan are these:

- 1. Power supply, water supply, and recreational opportunities associated with the major reservoirs in the system must be maintained in a sustainable manner, since those resources are crucial to the health, safety and economy of the West.**
- 2. Given the current drought and extremely low levels of Lake Powell and Lake Mead, any action under this plan needs to occur immediately for the plan to be most effective.**
- 3. Any needed water use reductions to implement this plan must be shared fairly and equitably among the states that use the water, as well as Mexico.**
- 4. Because the entire Colorado River water supply and power system does not work unless both Lake Powell and Lake Mead are viable—actions to increase storage in both reservoirs need to be addressed simultaneously. One reservoir should not be prioritized over the other.**
- 5. The plan must be flexible, and recognize changing conditions over time. The magnitude and duration of water use reductions are linked to the volume of water in Lake Powell and Lake Mead. If water volume in the reservoirs rises, water use reductions can ease.**



# Key Assumptions Under the Plan

## Inflow to Lake Powell

BOR reports that the average annual inflow to Lake Powell from 1991-2020 is 9.6 million acre feet (maf). Over time, that number has been generally decreasing, but with considerable variation up and down from year to year. In 2021, unregulated inflow to Lake Powell was only 3.5 maf, the lowest amount since the reservoir came into existence.

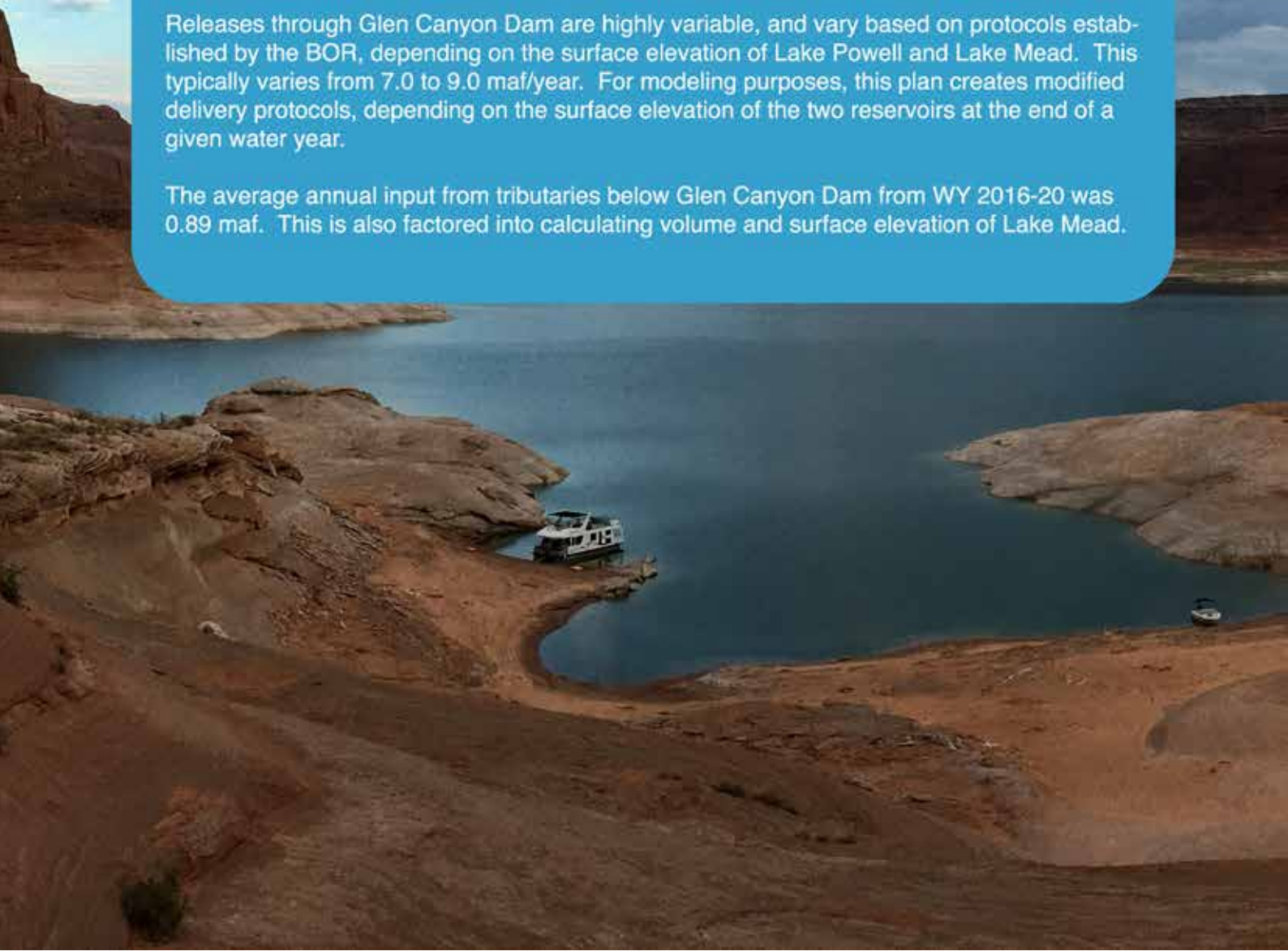
For modelling purposes underlying this plan, the 5-year period that includes water years 2016-20 (WY 2016-20) was used to calculate a more recent realistic "average" to form the baseline for future projections. This period captured Lake Powell inflows ranging from 5.4 to 11.7 maf, encompassing relatively "good" and "bad" years. The average annual inflow during that time was 8.99 maf, slightly less than the 1991-2020 average, and thus a reasonable and

## Inflow to Lake Mead

Inflow to Lake Mead is a function of three factors: releases through Glen Canyon Dam, inflow from the tributaries that feed the Colorado River below the dam (notably the Little Colorado and Virgin rivers), minus any evaporation between Glen Canyon Dam and Hoover Dam.

Releases through Glen Canyon Dam are highly variable, and vary based on protocols established by the BOR, depending on the surface elevation of Lake Powell and Lake Mead. This typically varies from 7.0 to 9.0 maf/year. For modeling purposes, this plan creates modified delivery protocols, depending on the surface elevation of the two reservoirs at the end of a given water year.

The average annual input from tributaries below Glen Canyon Dam from WY 2016-20 was 0.89 maf. This is also factored into calculating volume and surface elevation of Lake Mead.





## Water Use

For the purpose of this plan, the baseline for calculating water use is the collective average of the seven states use in the 5-year period that encompasses Water Years (WY) 2016-20.

Upper Basin Water Use is reported in the February 2022 report entitled Upper Colorado River Basin Consumptive Uses and Losses 2016-2020. Upper Basin use as reported by BOR not only includes consumptive use, but evaporation from smaller reservoirs other than the large mainstem reservoirs such as Lake Powell or Flaming Gorge, which are accounted for separately. The average annual water use in the Upper Basin from WY2016-20 was 4.15 maf.

Lower Basin Water Use is reported in the annual reports issued by BOR entitled Colorado River Accounting and Water Use Report: Arizona, California and Nevada. The reports also include data about deliveries to Mexico, as well as releases through the smaller dams downstream of Hoover Dam. The average annual water use in the Lower Basin from 2016-20 was 6.90 maf.

Each year annual deliveries to Mexico have been consistently at or very slightly above 1.5 maf in accordance with treaty requirements between that country and the USA.



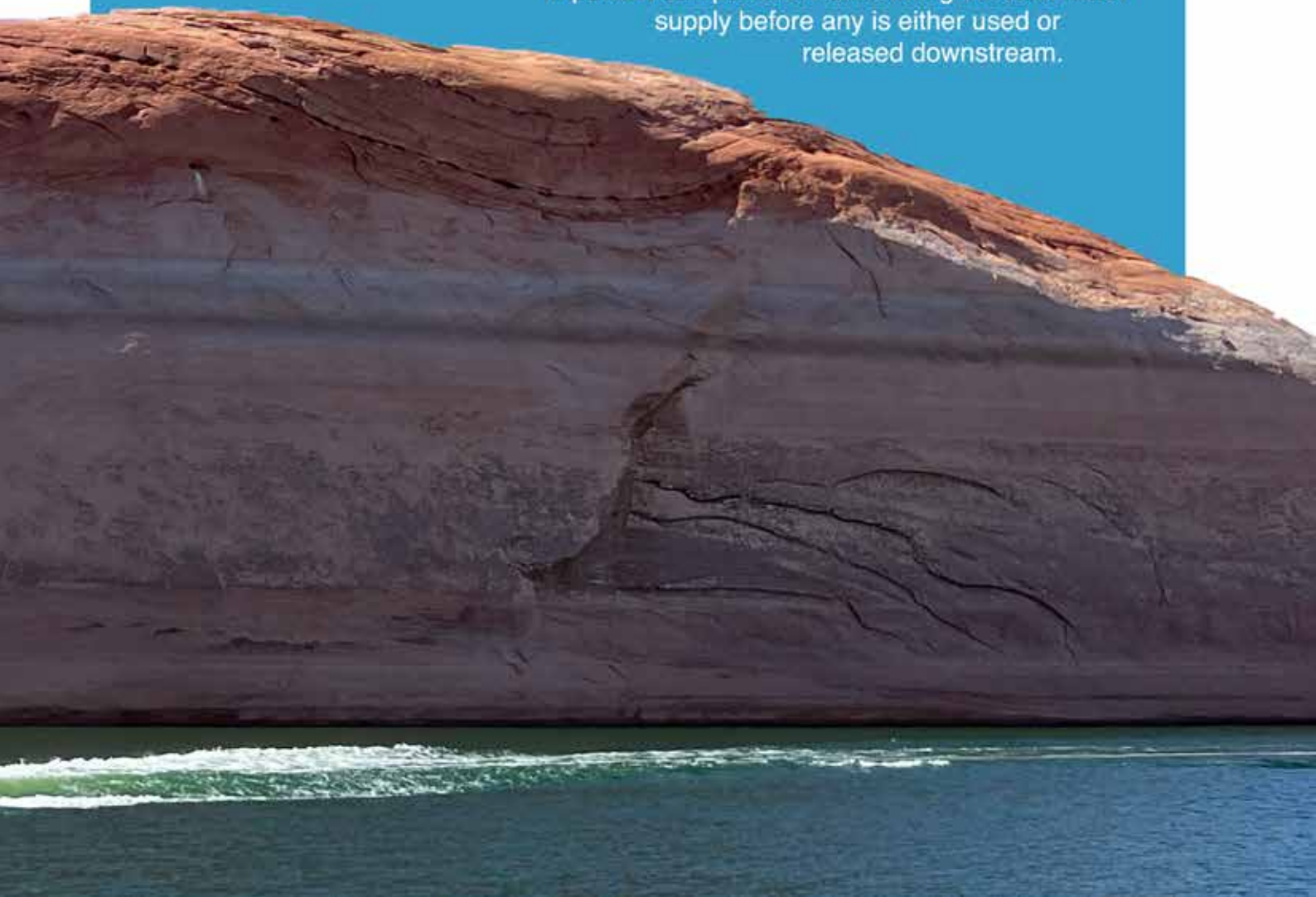


## Upper Basin Reservoir Additional Storage

There are several mainstem storage reservoirs above Lake Powell, the largest of which is Flaming Gorge Reservoir. Other significant reservoirs include Lake Navajo and Blue Mesa Reservoir. These essentially function as a “bank” for water in the Upper Basin that can be later used downstream, should the need arise. Collectively, these reservoirs have a potential capacity of about 6.4 maf, nearly 60% of which is within Flaming Gorge. The reservoir levels fluctuate as downstream need or flood control dictates, but in general, these reservoirs hold about 65-90% of their collective capacity at any given time. The 5-year average from 2016-20 is 81.4%. In May 2022, these reservoirs held only about 65% of their capacity.

## Upper Basin Reservoir Evaporation

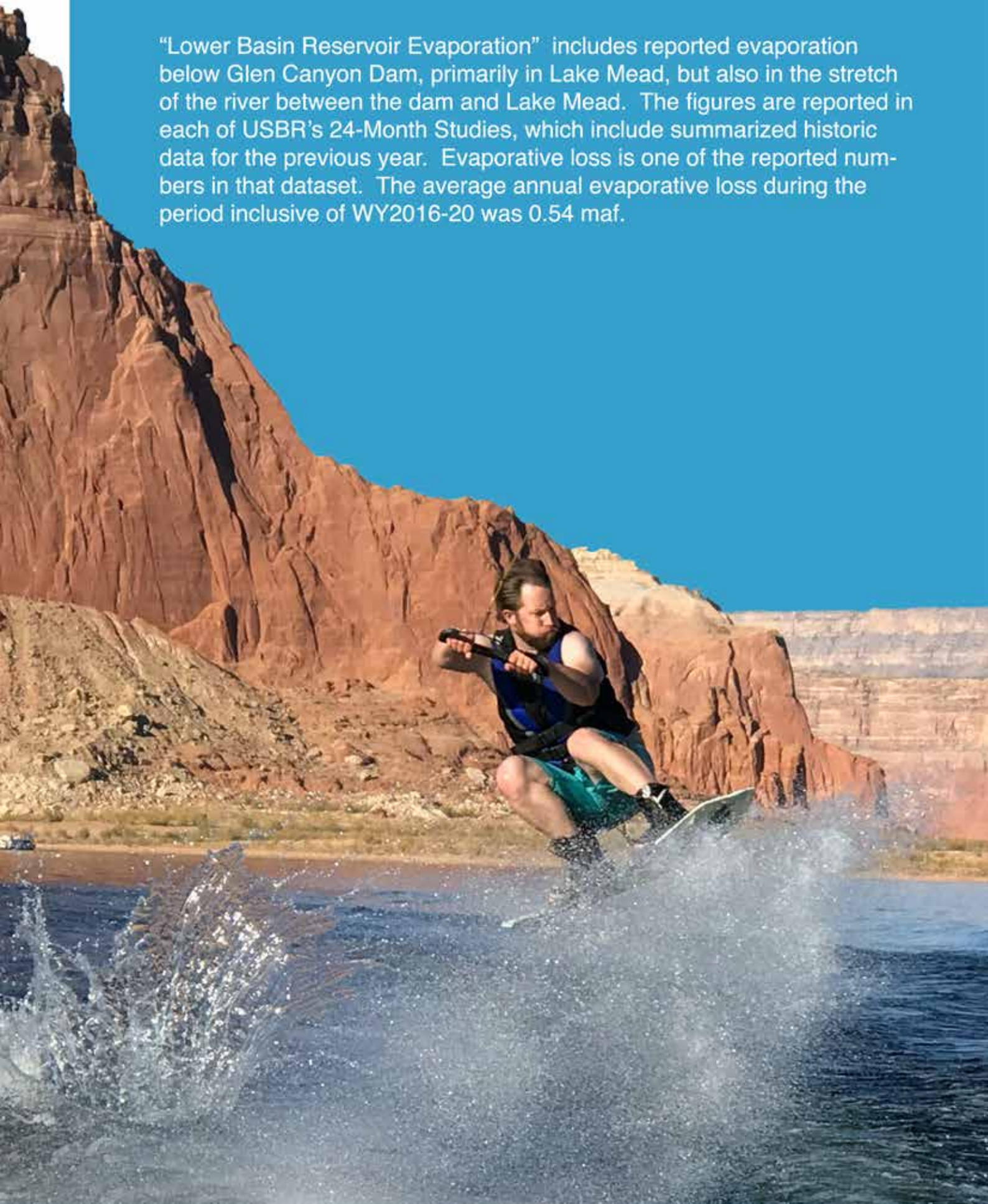
“Upper Basin Reservoir Evaporation” includes reported evaporation in the mainstem reservoirs in the Upper Basin along the Colorado or Green Rivers, most notably Lake Powell itself. Of the average annual 0.47 maf evaporative loss in those reservoirs (based on WY2016-20), about 80% comes from Lake Powell, and 17% from Flaming Gorge. The remaining 3% comes from all other smaller reservoirs such as Blue Mesa and Morrow Point. Lake Navajo evaporation is not included in this dataset in the February 2022 USBR report (see Table UC-1 of that report). Although evaporated water is not technically “available” for later use, it is an important component in calculating the total water supply before any is either used or released downstream.





## Lower Basin Reservoir Evaporation

“Lower Basin Reservoir Evaporation” includes reported evaporation below Glen Canyon Dam, primarily in Lake Mead, but also in the stretch of the river between the dam and Lake Mead. The figures are reported in each of USBR’s 24-Month Studies, which include summarized historic data for the previous year. Evaporative loss is one of the reported numbers in that dataset. The average annual evaporative loss during the period inclusive of WY2016-20 was 0.54 maf.





## Total Water Availability

In order to project future lake levels, it is first necessary to calculate the total water available in the Upper Basin watershed prior to considering any diversions, use, or evaporation. Based on existing BOR documentation, it is possible to calculate water availability in any past year using this equation:

**Total Water Availability in the Upper Basin = Inflow to Lake Powell + Upper Basin Water Use + Upper Basin Additional Storage + Upper Basin Reservoir Evaporation**

Based on the assumptions described above, the Total Water Availability in the Upper Basin on average in the period WY2016-20 was 13.59 maf annually. This forms the “baseline” for calculations for future years, and allows for modeling hypothetical reductions or increases in precipitation for future years, if “total water availability” is used as a proxy for “total precipitation”.





## Baseline Surface Elevations

In June 2022 the BOR issued its latest 24-Month Study, which forecasts inflows and outflows for all reservoirs affecting the entire Colorado River watershed. The forecast is based in part on projected long-range precipitation forecasts, historic trends, and projected releases from each reservoir. The forecast extends through June 2024, or roughly midway through Water Year 2024 (WY 2024). BOR also forecasts the projected surface elevation for Lake Powell and Lake Mead during this period. For the purpose of this plan, BOR's assumption for surface elevations at the end of WY2022 (September 30) are used as the baseline for projecting future lake levels modeled under the plan. For Lake Powell, the projected elevation is 3525.79, while Lake Mead is 1037.23.

Table 1 summarizes key baseline assumptions related to the two reservoirs, water availability, and water use in the Upper Basin, Lower Basin, and Mexico.





**Table 1. Key Baseline Assumptions Related to Water Availability and Use**

|                                                            | WY2016-20 Annual Average |
|------------------------------------------------------------|--------------------------|
| Upper Basin Water Availability (prior to diversion or use) | 13.59 maf                |
| Inflow from rivers between Glen Canyon and Hoover Dam      | 0.89 maf                 |
| Upper Basin Water Use <sup>1</sup>                         | 4.15 maf                 |
| Lower Basin Water Use                                      | 6.90 maf                 |
| Water Delivered to Mexico                                  | 1.50 maf                 |
| Upper Basin Mainstem Evaporation                           | 0.47 maf                 |
| Lower Basin Mainstem Evaporation                           | 0.54 maf                 |

Sources: USBR 24-Month Studies (2010-2022); Colorado River Accounting and Water Use Report: Arizona, California and Nevada (various years); Upper Colorado River Basin Consumptive Uses and Losses 2016-2020; <http://lakepowell.water-data.com>; <http://lakemead.water-data.com>.

1. Upper Basin Water Use also includes 0.24 maf of evaporation on non-mainstem reservoirs





# Action Plan

The following tables summarize the key aspects of the action plan for water use reductions and releases through Glen Canyon Dam to implement the key principles described at the outset of the plan, based on the previously-described assumptions. In general, required actions are based on surface elevations of Lake Powell and Lake Mead at the end of a particular water year (September 30) as reported by BOR, with water use reductions and dam releases applied to the following water year. These actions supersede any potentially conflicting protocols previously established under the 1922 Colorado River Compact and subsequent related laws, collectively known as the "Law of the River".

Table 2 shows key elevations within Lake Powell and Lake Mead that provide guidance in developing this plan, particularly regarding water use and the magnitude of releases from Glen Canyon Dam in a given year.

**Table 2. Key Elevations in Lake Powell and Lake Mead**

| Elevation Condition                                                              | Lake Powell | Lake Mead |
|----------------------------------------------------------------------------------|-------------|-----------|
| Full Pool                                                                        | 3700        | 1225      |
| Minimum elevation for all recreational facilities to be operational <sup>1</sup> | 3588        | -         |
| Buffer elevation (35 feet above minimum power pool) <sup>2</sup>                 | 3525        | 985       |
| Minimum Power Pool                                                               | 3490        | 950       |
| Dead Pool                                                                        | 3370        | 895       |

1. Includes all marinas, launch ramps, access points, campgrounds, and the Castle Rock Cut  
2. Provides a sufficient buffer to ensure continued power production, allowing for water levels to drop over the winter season.





Required water use reductions from the baseline 2016-20 average could range up to 30%, depending on the surface elevations of Lake Mead and Lake Powell at the end of the previous water year. Notably, water use reductions would be proportional, with an equal percentage applied to all seven states and deliveries to Mexico. Tables 3 and 4 show the required reductions by basin and by state for a water year, based on criteria related to the surface elevation of Lake Powell and/or Lake Mead at the end of the previous water year (September 30).

**Table 3. Required Annual Water Use Reductions**

| Annual Water Use Reduction                      |                                                                            |             |        |        | When Applicable <sup>2, 3</sup> |                   |
|-------------------------------------------------|----------------------------------------------------------------------------|-------------|--------|--------|---------------------------------|-------------------|
| Percentage Reduction from Baseline <sup>1</sup> | Total Volume that may be used annually <sup>4</sup><br>(million acre feet) |             |        |        | Lake Powell                     | Lake Mead         |
|                                                 | Upper Basin                                                                | Lower Basin | Mexico | Total  |                                 |                   |
| 30%                                             | 2.904                                                                      | 4.831       | 1.050  | 8.784  | < 3540, <b>OR</b>               | < 1025            |
| 25%                                             | 3.111                                                                      | 5.176       | 1.125  | 9.412  | > 3540 and < 3575, <b>OR</b>    | > 1025 and < 1050 |
| 20%                                             | 3.318                                                                      | 5.521       | 1.200  | 10.039 | > 3575 and < 3600, <b>OR</b>    | > 1050 and < 1075 |
| 10%                                             | 3.733                                                                      | 6.211       | 1.350  | 11.294 | > 3600 and < 3625, <b>OR</b>    | > 1075 and < 1100 |
| 0%                                              | 4.148                                                                      | 6.901       | 1.500  | 12.549 | > 3625, <b>AND</b>              | > 1100            |

1. Based on average annual water use from WY2016-20, as reported by BOR.  
2. Surface elevation at the end of a given Water Year (September 30). If no reduction is required, then pre-2022 usage protocols apply.  
3. If the condition of one reservoir is more restrictive than the other, the higher percentage reduction of the two is required to be applied to all users in the system.  
4. Reductions within each basin are allocated by State as shown in Table 4.





Table 4 shows the baseline water use for each state (average annual usage from WY2016-20), and the maximum allocation for each state depending on the percentage reduction in use required in a given year as shown in Table 3. Note that if no reduction is required in a particular year, pre-2022 water use protocols under the Law of the River would apply for that year.

**Table 4. Colorado River Annual Water Use Reductions by State**  
(based on WY2016-20 Average, in million acre feet)

| Location                         | Average Usage<br>(WY2016-20) | Percentage Reduction |        |       |       |
|----------------------------------|------------------------------|----------------------|--------|-------|-------|
|                                  |                              | 10%                  | 20%    | 25%   | 30%   |
| Lower Basin                      |                              |                      |        |       |       |
| California                       | 4.115                        | 3.703                | 3.292  | 3.086 | 2.880 |
| Arizona                          | 2.543                        | 2.289                | 2.035  | 1.907 | 1.780 |
| Nevada                           | 0.243                        | 0.219                | 0.194  | 0.182 | 0.170 |
| Subtotal                         | 6.901                        | 6.211                | 5.521  | 5.176 | 4.831 |
| Upper Basin                      |                              |                      |        |       |       |
| Arizona *                        | 0.026                        | 0.023                | 0.021  | 0.019 | 0.018 |
| Colorado                         | 2.275                        | 2.047                | 1.820  | 1.706 | 1.592 |
| Utah                             | 1.006                        | 0.905                | 0.805  | 0.754 | 0.704 |
| New Mexico                       | 0.420                        | 0.378                | 0.336  | 0.315 | 0.294 |
| Wyoming                          | 0.421                        | 0.379                | 0.337  | 0.316 | 0.295 |
| Subtotal                         | 4.148                        | 3.733                | 3.318  | 3.111 | 2.904 |
| Mexico                           | 1.500                        | 1.350                | 1.200  | 1.125 | 1.050 |
|                                  |                              |                      |        |       |       |
| Total                            | 12.549                       | 11.294               | 10.039 | 9.412 | 8.784 |
| Reduction from<br>Baseline (maf) | 0                            | 1.255                | 2.510  | 3.137 | 3.765 |

Sources: Colorado River Accounting and Water Use Report: Arizona, California and Nevada (various reports); Upper Colorado River Basin Consumptive Uses and Losses 2016-2020. Both publications by BOR.

\* A small portion of Arizona is included in the Upper Basin for the purpose of calculating water consumption under the Law of the River.

If no reduction is required, then pre-2022 usage protocols apply.



Table 5 shows the protocol for releases from Glen Canyon Dam in a given year, based on the surface elevations of both Lake Mead and Lake Powell at the end of the previous water year.

**Table 5. Protocol for Releases Through Glen Canyon Dam**

| Required Release Through Glen Canyon Dam ( <i>million acre feet</i> ) | Applicable Condition <sup>1</sup> |           |
|-----------------------------------------------------------------------|-----------------------------------|-----------|
|                                                                       | Lake Powell                       | Lake Mead |
| 5.0                                                                   | < 3540 AND                        | > 1000    |
| 5.5                                                                   | < 3540 AND                        | < 1000    |
| 6.0                                                                   | 3540-3575 AND                     | > 1025    |
| 6.5                                                                   | 3540-3575 AND                     | < 1025    |
| 7.0                                                                   | 3575-3600 AND                     | > 1050    |
| 7.5                                                                   | 3575-3600 AND                     | < 1050    |
| 8.0                                                                   | 3600-3625 AND                     | > 1075    |
| 8.23 minimum, or more as needed to balance the reservoirs             | 3600-3625 AND                     | < 1075    |
| 8.23 minimum, or more as needed to balance the reservoirs             | > 3625                            | -         |

1. Surface elevation at the end of a given Water Year (September 30).



# Possible Outcomes

## Outcomes if Action is Taken Starting in WY2023

Table 6 illustrates possible 5-year outcomes of applying this plan, depending on the water availability in a given year. These tables show a range of possibilities, from 40% less than baseline average precipitation, to 20% greater than baseline average. In all cases, power generation through each dam would continue uninterrupted through this period under this plan. With the exception of an extended drought period similar in magnitude to what was experienced from 2000-04, or perhaps an extension of the historically dry year that occurred in 2021, both reservoirs would steadily recover (Lake Powell to over 3600, Lake Mead to over 1100), and in average conditions, water use reductions could be removed by 2027. However, continued water use reductions in the range 10-30% would still be required if water availability remains below average.

Crucially, this plan assumes that the seven states (and Mexico) are able to implement a 30% reduction from their current average use starting in WY 2023, and that BDR is willing to reduce flows through Glen Canyon Dam to 5.0 maf during that year. Once the reservoirs recover above critically low levels, these restrictions could be potentially eased back consistent with proposed protocols. These are challenging but necessary steps to protect the viability of the entire system, particularly if extreme drought continues, or even if WY 2023 is similarly dry as WY 2021.



# A Range of Possibilities

**Table 6. Possible Outcomes of Plan Implementation**

| Water Availability scenarios<br>(WY 2023-27) <sup>1</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Water<br>Year | Water Use<br>Reduction <sup>2</sup> | Release<br>through Glen<br>Canyon Dam <sup>2</sup><br>(maf) | Lake Powell<br>level (Sept 30) | Lake Mead<br>level (Sept 30) |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-------------------------------------|-------------------------------------------------------------|--------------------------------|------------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 2022          | 0%                                  | 7.0                                                         | 3525                           | 1037                         |
| 40% less than average (8.1 maf/yr) <sup>3</sup><br>(similar to 2000-04)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 2023          | 30%                                 | 5.0                                                         | 3530                           | 1024                         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 2024          | 30%                                 | 5.0                                                         | 3534                           | 1010                         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 2025          | 30%                                 | 5.0                                                         | 3531                           | 996                          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 2026          | 30%                                 | 5.0                                                         | 3528                           | 989                          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 2027          | 30%                                 | 5.0                                                         | 3525                           | 982                          |
| 20% less than average (10.9 maf/yr)<br>(similar to 1988-92)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 2023          | 30%                                 | 5.0                                                         | 3565                           | 1026                         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 2024          | 30%                                 | 6.0                                                         | 3585                           | 1031                         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 2025          | 25%                                 | 7.0                                                         | 3589                           | 1043                         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 2026          | 25%                                 | 7.0                                                         | 3592                           | 1056                         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 2027          | 20%                                 | 7.0                                                         | 3593                           | 1062                         |
| 10% less than average (12.2 maf/yr)<br>(similar to 2003-07)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 2023          | 30%                                 | 5.0                                                         | 3587                           | 1028                         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 2024          | 25%                                 | 7.0                                                         | 3606                           | 1042                         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 2025          | 25%                                 | 8.0                                                         | 3613                           | 1069                         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 2026          | 20%                                 | 8.23                                                        | 3615                           | 1091                         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 2027          | 10%                                 | 8.0                                                         | 3615                           | 1100                         |
| Average (13.6 maf/yr)<br>(average defined as 2016-20)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 2023          | 30%                                 | 5.0                                                         | 3609                           | 1029                         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 2024          | 25%                                 | 8.23                                                        | 3627                           | 1063                         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 2025          | 10%                                 | 8.75                                                        | 3633                           | 1084                         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 2026          | 10%                                 | 8.75                                                        | 3639                           | 1102                         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 2027          | 0%                                  | 8.23                                                        | 3645                           | 1104                         |
| 10% above average (14.9 maf/yr)<br>(similar to 2005-09)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 2023          | 30%                                 | 5.0                                                         | 3631                           | 1031                         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 2024          | 25%                                 | 9.0                                                         | 3652                           | 1077                         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 2025          | 10%                                 | 9.0                                                         | 3667                           | 1101                         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 2026          | 0%                                  | 8.23                                                        | 3682                           | 1104                         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 2027          | 0%                                  | 9.5                                                         | 3688                           | 1121                         |
| 20% above average (16.3 maf/yr)<br>(similar to 1996-2000)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 2023          | 30%                                 | 5.0                                                         | 3652                           | 1032                         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 2024          | 25%                                 | 9.0                                                         | 3681                           | 1080                         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 2025          | 10%                                 | 12.0                                                        | 3682                           | 1139                         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 2026          | 0%                                  | 11.0                                                        | 3687                           | 1169                         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 2027          | 0%                                  | 11.0                                                        | 3691                           | 1194                         |
| <sup>1</sup> . Assumes a consistent level of water availability from year to year, and does not account for likely variations. Total water availability shown in parentheses is water available in the upper basin prior to its use, diversion, evaporation. The amount available for inflow to Lake Powell is considerably less, and is the remainder after Upper Basin water use, diversions, or evaporation is considered.<br><sup>2</sup> . Follows protocols established in this plan.<br><sup>3</sup> . Assumes that 500,000 AF is released to Lake Powell from upper basin reservoirs beyond typical release patterns in 4 of the 5 years. |               |                                     |                                                             |                                |                              |



## What if The States and BOR Don't Take Meaningful Steps in 2023?

In June 2022, the BOR called on the seven states to find a way to reduce their collective water use by 2-4 maf, and gave them 60 days to come up with a plan. This was a sensible and necessary step to take. But even if they come to an agreement, it may be difficult to fully implement those steps in 2023. Table 7 shows what would happen if the states and BOR are not able to implement the necessary water use measures in WY 2023, and instead defer these actions until 2024. That table assumes only a modest 10% reduction in water use in 2023, and that releases through Glen Canyon Dam would be 7.048 maf as currently planned (based on the June 2022 24-Month Study published by BOR).

In general, the recovery of the reservoirs would be substantially slower than if stronger conservation measures were implemented in 2023. More importantly, power generation at Glen Canyon Dam would end in WY2023 if water availability via precipitation is 40% below normal, or a condition similar to what occurred in either 2002 or 2021. This could be avoided if releases through the dam were slowed considerably, but this would have a substantial adverse effect on Lake Mead, especially if water use reduction is only 10%, not 30% as advocated in this plan.

On the other hand, if snowpack conditions improve in the coming years, some of the most severe outcomes could be avoided, but that still assumes substantial water use reductions would be implemented starting in 2024.

Deferring immediate and decisive action is a huge gamble. It's a bet that the drought will break in 2023, or that it will at least not be as severe as it has been in years past, even as recently as 2021. Absent a significant break in the ongoing drought, and without immediate action to address its consequences, the power produced, water supplied and recreational opportunities offered by both Lake Mead and Lake Powell will eventually cease.



# We Can't Afford to Wait

**Table 7. Possible Outcomes of Plan Implementation (if “business as usual” in WY 2023)**

| Water Availability scenarios (WY 2023-27) <sup>1</sup>                  | Water Year | Water Use Reduction <sup>2</sup> | Release through Glen Canyon Dam <sup>3</sup> (maf) | Lake Powell level (Sept 30) | Lake Mead level (Sept 30) |
|-------------------------------------------------------------------------|------------|----------------------------------|----------------------------------------------------|-----------------------------|---------------------------|
|                                                                         | 2022       | 0%                               | 7.0                                                | 3525                        | 1037                      |
| 40% less than average (8.1 maf/yr) <sup>4</sup><br>(similar to 2000-04) | 2023       | 10%                              | 7.048                                              | 3484                        | 1029                      |
|                                                                         | 2024       | 30%                              | 5.0                                                | 3490                        | 1016                      |
|                                                                         | 2025       | 30%                              | 5.0                                                | 3486                        | 1001                      |
|                                                                         | 2026       | 30%                              | 5.0                                                | 3491                        | 985                       |
|                                                                         | 2027       | 30%                              | 5.0                                                | 3487                        | 978                       |
| 20% less than average (10.9 maf/yr)<br>(similar to 1988-92)             | 2023       | 10%                              | 7.048                                              | 3520                        | 1032                      |
|                                                                         | 2024       | 30%                              | 5.0                                                | 3570                        | 1021                      |
|                                                                         | 2025       | 30%                              | 6.5                                                | 3583                        | 1034                      |
|                                                                         | 2026       | 25%                              | 7.0                                                | 3586                        | 1047                      |
|                                                                         | 2027       | 25%                              | 7.0                                                | 3589                        | 1059                      |
| 10% less than average (12.2 maf/yr)<br>(similar to 2003-07)             | 2023       | 10%                              | 7.048                                              | 3541                        | 1033                      |
|                                                                         | 2024       | 25%                              | 6.0                                                | 3582                        | 1032                      |
|                                                                         | 2025       | 25%                              | 7.0                                                | 3601                        | 1047                      |
|                                                                         | 2026       | 20%                              | 8.23                                               | 3606                        | 1078                      |
|                                                                         | 2027       | 10%                              | 8.0                                                | 3606                        | 1086                      |
| Average (13.6 maf/yr)<br>(average defined as 2016-20)                   | 2023       | 10%                              | 7.048                                              | 3563                        | 1034                      |
|                                                                         | 2024       | 25%                              | 6.0                                                | 3616                        | 1035                      |
|                                                                         | 2025       | 25%                              | 8.75                                               | 3628                        | 1077                      |
|                                                                         | 2026       | 10%                              | 8.75                                               | 3634                        | 1096                      |
|                                                                         | 2027       | 0%                               | 8.23                                               | 3641                        | 1098                      |
| 10% above average (14.9 maf/yr)<br>(similar to 2005-09)                 | 2023       | 10%                              | 7.048                                              | 3585                        | 1036                      |
|                                                                         | 2024       | 25%                              | 7.5                                                | 3629                        | 1060                      |
|                                                                         | 2025       | 10%                              | 9.0                                                | 3645                        | 1085                      |
|                                                                         | 2026       | 10%                              | 9.0                                                | 3660                        | 1108                      |
|                                                                         | 2027       | 0%                               | 9.5                                                | 3666                        | 1124                      |
| 20% above average (16.3 maf/yr)<br>(similar to 1996-2000)               | 2023       | 10%                              | 7.048                                              | 3606                        | 1037                      |
|                                                                         | 2024       | 25%                              | 9.0                                                | 3645                        | 1085                      |
|                                                                         | 2025       | 10%                              | 9.0                                                | 3671                        | 1109                      |
|                                                                         | 2026       | 0%                               | 11.0                                               | 3676                        | 1143                      |
|                                                                         | 2027       | 0%                               | 11.0                                               | 3681                        | 1172                      |

1. Assumes a consistent level of water availability from year to year, and does not account for likely variations. Total water availability shown in parentheses is water available in the upper basin prior to its use, diversion, evaporation. The amount available for inflow to Lake Powell is considerably less, and is the remainder after Upper Basin water use, diversions, or evaporation is considered.
2. Follows protocols established in this plan, except for WY 2023, where only a 10% reduction in water use is implemented (instead of 30%).
3. Follows protocols established in this plan, except for WY 2023, where BOR releases 7.0 maf through Glen Canyon Dam as previously planned (instead of 5.0 maf per updated protocol).
4. Assumes that 500,000 AF is released to Lake Powell from upper basin reservoirs beyond typical release patterns in 4 of the 5 years.





# Fill Lake Powell

POWELLHEADZ



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