



August 15, 2023

Commissioner Touton
U.S. Bureau of Reclamation
Attention: Post-2026
Upper Colorado Region
125 South State Street, Suite 8100
Salt Lake City, Utah 84138
crbpost2026@usbr.gov

Sent via email

RE: Notice of Intent to Prepare an Environmental Impact Statement and Notice to Solicit Comments and Hold Public Scoping Meetings on the Development of Post-2026 Operational Guidelines and Strategies for Lake Powell and Mead dated June 16, 2023 (88 Fed. Reg. 39455)

Dear Commissioner Touton,

The Grand Canyon Trust (“Trust”) submits this letter to provide scoping comments on the U.S. Bureau of Reclamation’s notice of intent to develop *Post-2026 Operational Guidelines and Strategies for Lake Powell and Lake Mead* (“Post-2026 Guidelines”) and prepare an Environmental Impact Statement (“Post-2026 EIS”).

The Grand Canyon Trust is a 501(c)(3) non-profit advocacy organization founded in 1985 with a mission to safeguard the wonders of the Grand Canyon and the Colorado Plateau, while supporting the rights of its Native peoples. We are headquartered in Flagstaff, Arizona and have more than 3,000 members and supporters. For decades, we have worked across the four corners region to secure protections for important cultural landscapes, safeguard water from uranium mining pollution, defend the unsustainable withdrawal of groundwater for development, protect the Grand Canyon ecosystem, and restore healthy forests and springs. We appreciate the opportunity to comment on the scope and development of the post-2026 operating guidelines and strategies for Lake Powell and Lake Mead. We look forward to working with you and others to improve and sustain the quality of life and healthy environment for all communities in the Colorado River Basin.

On June 16, 2023, U.S. Bureau of Reclamation (“Reclamation”) announced the start of a formal process under the National Environmental Policy Act (“NEPA”) to develop new guidelines for post-2026 operations of the Colorado River “[t]o assure the continued stability of the Colorado

River system into the future.” Reclamation requests feedback on “the scope of the operational guidelines, strategies, and other related issues.”¹ The new rules are needed to replace the existing 2007 Guidelines, 2019 Drought Contingency Plans, and other related agreements, which are all set to expire at the end of 2026. *Id.*

The scoping process—and ultimately what (or whom) gets included or excluded from the guidelines—may be one of the most important factors influencing the effectiveness, sustainability, and longevity of the post-2026 guidelines. Historically, rules and allocations related to the Colorado River’s waters were narrow, exclusive, and have proven unsustainable to meet changing conditions. This existing foundation upon which the current system was built is widely acknowledged to be flawed and climate change is revealing those weaknesses in ways that expose communities, economies, cultures, and environments to unacceptable risks and outcomes.

The warnings and urgency expressed describing the Colorado River system at the brink of collapse in 2022 were not an overstatement of the predicament that we still find ourselves in. With just a few dry years, we risk another steep decline in reservoir levels at the two largest reservoirs in the U.S. pushing both close or past critical levels where there is real uncertainty regarding the safety of the infrastructure to pass water through the dam and the ability of the reservoir to pass water at flow rates necessary to meet the water, cultural, environmental, recreational, community, and economic needs downstream.

These new guidelines will directly impact the water flowing between Lake Powell and Lake Mead through the Grand Canyon. The Colorado River is integral to the cultural landscape of the Grand Canyon and the ancestral and current homelands of at least a dozen tribes. The Grand Canyon is not just recognized locally, regionally, and nationally, but was designated by the United Nations Educational, Scientific, and Cultural Organization (UNESCO) as a World Heritage Site in 1979². The Grand Canyon is described by UNESCO as

among the earth’s greatest on-going geological spectacles. Its vastness is stunning, and the evidence it reveals about the earth’s history is invaluable. The 1.5-kilometer (0.9 mile) deep gorge ranges in width from 500 m to 30 km (0.3 mile to 18.6 miles). It twists and turns 445 km (276.5 miles) and was formed during 6 million years of geological activity and erosion by the Colorado River on the upraised earth’s crust. The buttes, spires, mesas and temples in the canyon are in fact mountains looked down upon from the rims. Horizontal strata exposed in the canyon retrace geological history over 2 billion years and represent the four major geologic eras.

¹ 88 Fed. Reg. 39456, June 16, 2023.

² Grand Canyon National Park, UNESCO World Heritage Site: <https://whc.unesco.org/en/list/75/>

“To be included on the World Heritage List, sites must be of outstanding universal value and meet at least one out of ten selection criteria.”³ The Grand Canyon meets four of the criteria including:

Criterion (vii): Widely known for its exceptional natural beauty and considered one of the world's most visually powerful landscapes, the Grand Canyon is celebrated for its plunging depths; temple-like buttes; and vast, multihued, labyrinthine topography. Scenic wonders within park boundaries include high plateaus, plains, deserts, forests, cinder cones, lava flows, streams, waterfalls, and one of America's great whitewater rivers.

Criterion (viii): Within park boundaries, the geologic record spans all four eras of the earth's evolutionary history, from the Precambrian to the Cenozoic. The Precambrian and Paleozoic portions of this record are particularly well exposed in canyon walls and include a rich fossil assemblage. Numerous caves shelter fossils and animal remains that extend the paleontological record into the Pleistocene.

Criterion (ix): Grand Canyon is an exceptional example of biological environments at different elevations that evolved as the river cut deeper portraying five of North America's seven life zones within canyon walls. Flora and fauna species overlap in many of the zones and are found throughout the canyon.

Criterion (x): The park's diverse topography has resulted in equally diverse ecosystems. The five life zones within the canyon are represented in a remarkably small geographic area. Grand Canyon National Park is an ecological refuge, with relatively undisturbed remnants of dwindling ecosystems (such as boreal forest and desert riparian communities), and numerous endemic, rare or endangered plant and animal species.

It should go without saying that water flowing into and through the Grand Canyon in the Colorado River is integral to the health of the landscape and the Native peoples that have deep spiritual and cultural connections to the land and water in and around the canyon. These important cultural and environmental resources need to be front and center in the development of the post-2026 guidelines.

We appreciate the efforts being made at the federal and state levels to be more inclusive and equitable in this process; however, we also recognize that to remedy a century of historical exclusion and injustice for tribes, the environment, and likely others there is a difficult unlearning process that takes time, serious intention, and much awareness and course correction along the way. We believe the development of the post-2026 guidelines is a key

³ See <https://whc.unesco.org/en/criteria/>.

opportunity to acknowledge the errors in the foundational underpinnings of the Law of the River, begin the process to transition away from those rules, and redefine the river’s long-term management into the future. We hope the Secretary and the representatives of the seven basin states, Mexico, 30 basin tribes, and other stakeholders will seize this moment to resolve uncertainty and make compromises that will sustain the river, its communities, economies, cultures, and ecosystems for many generations to come.

We understand that every issue will not be addressed by the post-2026 guidelines, but a strong effort is needed to plan for a transition to a new approach that recognizes, values, and honors: 1) the health and integrity of the Colorado River and its tributaries; 2) tribal sovereignty and water security of the 30 tribal nations; 3) equity for both people and nature; 4) the importance of and need to conserve groundwater resources; and 5) sustainability for present and future generations. These concepts should not only be acknowledged, but reflected, in the purpose and need of the proposed action and as part of the goals and objectives of this new iteration of guidelines.

The Trust details its specific comments below:

- I. **ENSURE THE SUSTAINABILITY OF THE COLORADO RIVER AND ITS TRIBUTARIES. The post-2026 guidelines must go beyond the operation of Lakes Powell and Mead and include provisions that acknowledge and ensure the sustainability of the Colorado River and its tributaries.**

Reclamation requests comments “concerning the scope of specific operational guidelines, strategies, and any other issues that should be considered” as well as “specific input on how the purpose and the elements of the 2007 Interim Guidelines should be retained, modified or eliminated to provide greater stability to water users and the public throughout the Colorado River Basin through robust and adaptive operational guidelines.” 88 Fed. Reg. at 39455 and 39457. Generally, the Trust recommends that the post-2026 guidelines have a broader scope than the 2007 Guidelines to ensure a more holistic view of the basin and that incorporates environmental and cultural values of the river. This was widely supported concept in the pre-scoping process.⁴ The following principles and considerations should guide the development of the post-2026 guidelines:

A. SUSTAIN THE COLORADO RIVER. Integrate protections for the health of the Colorado River and its tributaries into the new guidelines.

- 1. *The purpose and need of the post-2026 guidelines must include maintaining the sustainability of the Colorado River and its tributaries.***

⁴ Summary of Pre-Scoping Comments for Development of Post-2026 Colorado River Reservoir Operations dated January 2023 at 1. https://www.usbr.gov/ColoradoRiverBasin/documents/Post-2026_Pre-Scoping%20Comment%20Summary%20Final_Updated1.30.2023_508.pdf

The Colorado River and its tributaries are waterways with ecological, spiritual, and cultural significance since time immemorial. While providing incredible benefits to society, the Colorado River has its own intrinsic value as a river. As an example, the Quechan Indian Tribe⁵ stated in its pre-scoping comment letter

The Colorado River has been the lifeblood of the Quechan people since time immemorial, and we have a deep and abiding responsibility to be good stewards of the River—for the Tribe and its members, for the species and ecosystems that it sustains, and for the benefit of our fellow tribes and non-Indian neighbors throughout the Basin.

This captures just a few of the values that should be elevated in the post-2026 process.

Further, we believe some vital statements already submitted to Reclamation about how the river is valued and the requests of some of the basin tribes need to be highlighted and considered in developing the purpose and need for the new guidelines, including the quotes below:

- ◆ The highest priority must be given to keeping the Colorado River flowing as a living river. -Quechan Indian Tribe
- ◆ The Life of the River and all that depend on its waters must be preserved and protected. -The Colorado River Indian Tribes
- ◆ The Nation encourages focus on the long-term goal—stabilizing and protecting the river for years to come. -Jicarilla Apache Nation
- ◆ The low water at Lake Powell is a direct result of drought conditions also faced by the Navajo Nation. These circumstances reflect an environmental imbalance that threatens the physical and spiritual wellbeing of Navajo People. Our effort to inform your agency of the effects of drought on the Navajo Nation requires us to impart impacts to both material and traditional cultural lifeways. -Navajo Nation
- ◆ The Post-2026 Operating Guidelines should not only deal with management of Lake Mead and Lake Powell but should also consider the integrity and health of the Colorado River and its tributaries. -Southern Ute Indian Tribe
- ◆ With respect to the management strategies, recognizing the value of the river as a river and its spiritual, cultural, and ecological significance to Tribes and others can be part of the purpose and need in the NEPA process(es), and

⁵ Quechan Indian Tribe Pre-Scoping Comment Letter at page 1.

https://www.usbr.gov/ColoradoRiverBasin/documents/post2026/pre-scoping/PS_653_QIT_AZ.pdf

accounting for and modeling the full extent of Tribal water rights could be integrated into the NEPA evaluation. -Water and Tribes Initiative

We agree with the statements above and believe that the only way to acknowledge and honor the Colorado River as a river with intrinsic value is to incorporate into the purpose and need of the post-2026 guidelines. The post-2026 guidelines can no longer exclude consideration for and protections of the Colorado River and its tributaries.

The purpose of the 2007 Guidelines does not reflect the inherent value of the river or recognize the full range of the basin tribes' interests:

The purpose of the proposed federal action is to: 1) improve Reclamation's management of the Colorado River by considering the trade-offs between the frequency and magnitude of reductions of water deliveries, and considering the effects on water storage in Lake Powell and Lake Mead, water supply, power production, recreation, and other environmental resources; 2) provide mainstream United States users of Colorado River water, particularly those in the Lower Division states, a greater degree of predictability with respect to the amount of annual water deliveries in future years, particularly under drought and low reservoir conditions; and, 3) provide additional mechanisms for the storage and delivery of water supplies in Lake Mead.

88 Fed. Reg. 39456-39457. This above purpose statement is centered on the mandates of the Colorado River Compact and the Law of the River to ensure the satisfaction of water entitlements and does not reflect the value of the river itself or operating it in a sustainable manner. The purpose only requires "considering the effects on water shortage in Lake Powell and Lake Mead, water supply, power production, recreation and other environmental resources," but provides no protection of any of these resources or interests.

Further, even the purpose statement in the most recent NOI "to assure the continued stability of the Colorado River system into the future" fails to capture the nuance of protecting the sustainability of the river itself. 88 Fed. Reg. at 39456. The sustainability of the "system" and the sustainability of the "river" are not the same thing.

If we want to transition away from the old guidelines that were deemed "insufficient" to protect against system collapse,⁶ the purpose of the post-2026 guidelines need to be reassessed or at a minimum expanded. A goal or purpose of the new guidelines should include a statement regarding the need to, "protect the long-term sustainability of the Colorado River and its tributaries." Some examples of language based on the suggestions above from some of the tribes could include: to "preserve and protect" the river, "to keep it flowing as a living river," "to stabilize and protect it for years to come," "to restore balance and protect the spiritual and physical wellbeing of native peoples and cultures," "consider the integrity and

⁶ 87 Fed. Reg. 69042 (November 17, 2022).

health of the river and its tributaries,” or to “recognize the value of the river as a river and its spiritual, cultural, and ecological significance to Tribes and others.” With this as a central theme, it allows the post-2026 decision framework to incorporate and include these considerations that are now only an afterthought.

We request integrating and prioritizing the intrinsic value and health of the river and its tributaries into the goals and objectives of the post-2026 guidelines as well as specifically including it in the scope of the EIS analysis. Reclamation should engage the 30 basin tribes to help craft such a purpose as these communities have lived in the basin and sustained the river since time immemorial.

2. The foundational objectives of the post-2026 guidelines must be modified to ensure the sustainability of the Colorado River and its tributaries.

Reclamation needs to expand the objectives of the post-2026 guidelines beyond the narrow and outdated goals of the Law of the River to ensure equity and sustainability in the basin for both people and nature for generations to come. The 2007 Guidelines established four foundational objectives designed to collectively meet the 3-fold purpose and need of the 2007 Guidelines, two of the four are included below:

Shortage Guidelines: Determines those conditions under which the Secretary would reduce the annual amount of water available for consumptive use from Lake Mead to the Lower Division states below 7.5 million acre-feet pursuant to the Consolidated Decree.

Coordinated Reservoir Operations: Defines the coordinated operations of Lake Powell and Lake Mead to provide improved operation of these two reservoirs, particularly under low reservoir conditions. As described in Section XI.G.6. of the Record of Decision, the objective of the operation of Lake Powell and Lake Mead is “to avoid curtailment of uses in the Upper Basin, minimize shortages in the Lower Basin and not adversely affect the yield for development available in the Upper Basin.”

88 Fed. Reg. at 39457. These guidelines were established to protect the entitlements of water users under the Colorado River Compact and Law of the River, but maintaining these objectives has proven unsustainable given the impacts of climate change on water supply. See discussion in Section I.B on Demand below.

For example, Section 6 of the 2007 Interim Guidelines establishes that the objective for operating the reservoirs “is to avoid curtailment of uses in the Upper Basin, minimize shortages in the Lower Basin and not adversely affect the yield for development available in the Upper

Basin.”⁷ However, continuing to prioritize these objectives simply perpetuates the unsustainable use and management of water in the Basin that got us into this crisis in the first place. In fact, the objectives that are being protected here are those principles that need to be fundamentally reformed. In crafting these new objectives, Reclamation should consider the values we articulated above including: 1) the health and integrity of the Colorado River and its tributaries; 2) tribal sovereignty and water security of the 30 tribal nations; 3) equity for both people and nature; 4) the importance of and need to conserve groundwater resources; and 5) sustainability for present and future generations. New objectives will need to address the existing imbalance of supply and demand in the basin and will certainly require reducing demand to a sustainable level. Reclamation and the basin states need to rethink the historically exclusive, consumptive, and narrowly tailored way in which we manage and value the Colorado River.

3. *Specific environmental goals need to be established and incorporated into the post-2026 guidelines.*

One of the primary omissions from the 1922 Colorado River Compact is the fact that the health of the river itself was not mentioned, allocations were not made or reserved for the 30 tribal nations in the basin, nor to protect and preserve the environment. Likewise, the Law of the River itself typically does not include or integrate the value of the river, the environment, or incorporate specific protections that are based in the law. For example, the Grand Canyon Protection Act of 1992⁸ is not typically considered as part of the “Law of the River,” nor are other environmental and cultural protections (e.g. the Endangered Species Act, the Natural Historic Preservation Act, the Clean Water Act, the Wild and Scenic Rivers Act, among others). These laws were all passed much later in time—in response to the consequences this omission (e.g. species extinction, pollution, etc.). It is time that these two parallel worlds are intermingled. We can’t keep creating policies on one hand to meet the needs of water users and on the other hand create different laws that help mitigate the damage being done. What if the laws that allocated and managed water also integrated buffers and mandates to ensure cultural values were honored and the river would continue to flow and thrive? This should be the goal of the post-2026 guidelines.

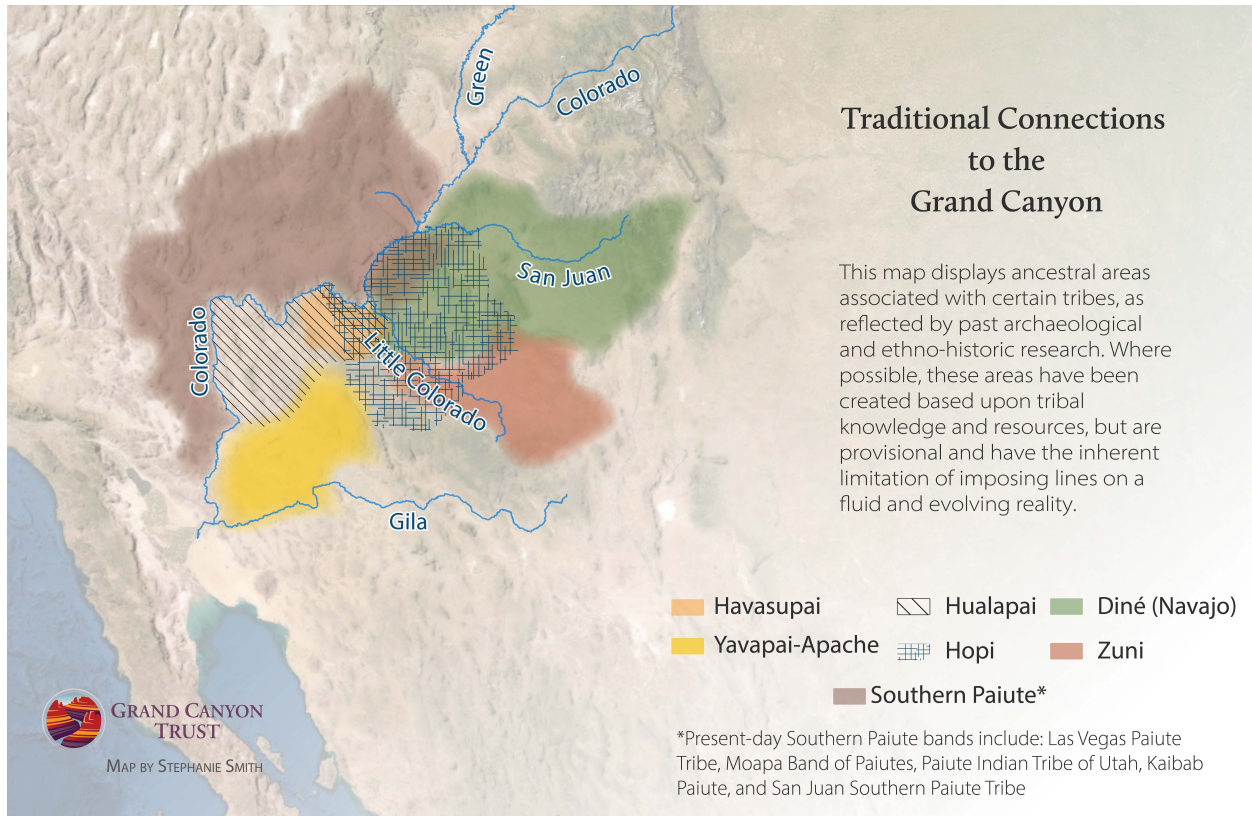
We appreciate that values are changing and that there is more acknowledgement of these inherent environmental and cultural importance of the river and its tributaries; however, the effort to incorporate these values into the laws, policies, rules, and guidelines that ultimately determine the management and operation of the river and its infrastructure on a day-to-day and year-to-year basis lags behind. Incorporating these values into the purpose and need of the guidelines would be a great first step, but ultimately these values need to be incorporated objectively into specific environmental and cultural goals that guide management, much the same as the tiered shortage tables guide water deliveries or shortages in the Lower Basin or the releases from Lake Powell.

⁷ U.S. Bureau of Reclamation. 2007. Record of Decision: Colorado River Interim Guidelines for Lower Basin Shortages and Coordinated Operations for Lake Powell and Lake Mead: Final Environmental Impact Statement. Washington, D.C. : U.S. Bureau of Reclamation. December 13.

⁸ Grand Canyon Protection Act of 1992, Pub. L. No. 102-575, 106 Stat. 4600 (1992).

4. The health of the Grand Canyon and its affiliated tribal communities are inextricably linked to the operational decisions and annual volumes of water that will be determined as a part of the post-2026 guidelines.

The Colorado River is integral to the cultural landscape of the Grand Canyon and the ancestral and current homelands of at least a dozen tribes.⁹



Schmidt *et al.* (2023) found that

Whereas environmental conditions between Yuma and Hoover Dam are mostly decoupled from reservoir operations, the future of the Grand Canyon ecosystem is tightly linked with decisions regarding reservoir operations and water use. In the context of the Law of the River, flow through Grand Canyon represents the delivery of water from the Upper Basin to the Lower Basin. In the context of environmental conditions in Grand Canyon, the magnitude of annual volumes as well as the amount of water stored in both reservoirs are significant drivers of ecosystem conditions.

Id. at 6. This is important because the post-2026 guidelines in the context of reservoir operations and water deliveries will have either significant consequences or benefits to the

⁹ Map of ancestral areas of associated with certain tribes with connections to the Grand Canyon. <https://www.grandcanyontrust.org/traditional-connections-grand-canyon-map>.

Grand Canyon ecosystem and tribal interests in the canyon. Schmidt *et al.* (2023) discuss in detail the consequences of when Lake Powell's water levels fall below elevation 3,490 feet or minimum power pool.

When water storage in Lake Powell is less than 4.0 million af (4.93 billion m³) (16% of capacity), the elevation of the reservoir is too low to safely withdraw water through the penstocks into the turbines of the power plant. The capacity of the turbines is approximately 31,000 ft³/s (approximately 880 m³/s). If water cannot be withdrawn through the penstocks, the only way to release water is through the river outlets whose maximum capacity is between 5000 and 15,000 ft³ (140 and 420 m³/s), depending on reservoir elevation. When reservoir storage drops below the elevation of the river outlets, no water can be released downstream (i.e., dead pool). As the total annual release decreases, it will be more difficult to provide sufficient base flows that ensure safe river navigation by large, motorized rafts through Grand Canyon's rapids. Low water storage in Lake Powell also jeopardizes implementation of controlled floods (administratively called High Flow Experiments) (Bruckerhoff *et al.*, 2022). If reservoir releases are steady without hydropeaking or controlled floods, vegetation encroachment onto sand bars used as campsites is likely (Sankey *et al.*, 2015).

Id. at 6.

The Long-Term Environmental Management Plan (LTEMP) and the Adaptive Management Working Group (AMWG) were created to help balance, mitigate, and inform management of releases from Glen Canyon Dam to ensure compliance with the Grand Canyon Protection Act of 1992.¹⁰ The role of LTEMP and AMWG serves to make monthly and daily operational parameters and decisions to benefit the canyon environment and cultural resources. However, it is the post-2026 guidelines that will set the stage for these decision by determining target reservoir elevation for Lake Powell and the annual release amount from Glen Canyon Dam, which will have a significant impact on the opportunities available for these purposes of LTEMP and AMWG. See Bruckerhoff *et al.*, 2022.

It is our understanding that certain provisions of the LTEMP may be reviewed and an environmental impact statement prepared in 2024 related narrowly to adjusting the sediment accounting window for triggering high flow experiments and to consider operations of Glen

¹⁰ The GCPA provides that:

The Secretary shall operate Glen Canyon Dam in accordance with the additional criteria and operating plans specified in section 1804 and exercise other authorities under existing law in such a manner as to protect, mitigate adverse impacts to, and improve the values for which Grand Canyon National Park and Glen Canyon National Recreation Area were established, including, but not limited to natural and cultural resources and visitor use.

Canyon Dam to prevent non-native fish species from passing through the dam and establishing in the Grand Canyon to the detriment of native fish. While we appreciate the effort to move forward with these adjustments to LTEMP, a more comprehensive review of LTEMP seems warranted given the development of the post-2026 guidelines. The decisions regarding the framework for the post-2026 guidelines are too important to the future of the Grand Canyon not to integrate the discussion and massive amounts of science that have been generated over the past decade through LTEMP and AMWG into parallel if not simultaneous discussions. It is important to integrate discussions about how operations under the new guidelines can serve not just the interests of water users downstream or the generation of power, but also create the most flexibilities and opportunities for protecting one of the most recognized and valuable cultural landscapes in the world.

B. REDUCE DEMAND. Develop a plan to significantly reduce water demand to stabilize and recover reservoir levels in the short-term and create a more balanced and sustainable system in the long-term.

Over the past 20 years, the natural flow in the Colorado River at Lees Ferry has declined by nearly 20 percent from the 20th century average (15.2 million acre-feet (MAF) per year).¹¹ The annual average flow from 1906-1999 of 15.2 MAF is almost enough to meet the 15.4 MAF of demand per year, which includes annual use of 4 MAF in Upper Basin, 9 MAF in the Lower Basin and Mexico, and 2.4 MAF of evaporation losses. *Id.* Since 2000, however, the natural flow has declined to 12.3 MAF per year, leaving a significant deficit each year (about 3.1 MAF per year) that must either be made up for out of withdrawing water from reservoir storage or reducing demand. *Id.*

Between January 2000 and April 2023, the combined reservoir storage in Lake Powell and Lake Mead fell by 65 percent (from 95% to 30% of combined capacity). Schmidt et al. at 4. This is a loss of more than 33.5 MAF of water in storage, which is twice the average annual demand in the basin (or 2.8 MAF deficit each year for 12 years). This occurred and continued to occur even after the 2007 Guidelines took effect, the DCPs were finalized and implemented, and other emergency measures such as releases from upstream reservoirs under the Drought Response Operations Agreements. These measures did not work.

There appear to be two options for how to proceed: 1) develop post-2026 guidelines that acknowledge the high risk to the system if we proceed under the status quo and implement deep cuts to uses across all sectors and in all states that prioritize recovering reservoir storage in the short term and a sustainable allocations over the long-term, or 2) the basin states with the U.S., Mexico and 30 basin tribes work to revise and renegotiate the fundamental and unsustainable fixed allocations agreed upon in the Colorado River Compact and the Law of the River. Either path requires care and consideration for the many communities, cultures, environments, economies, and livelihoods that will be affected.

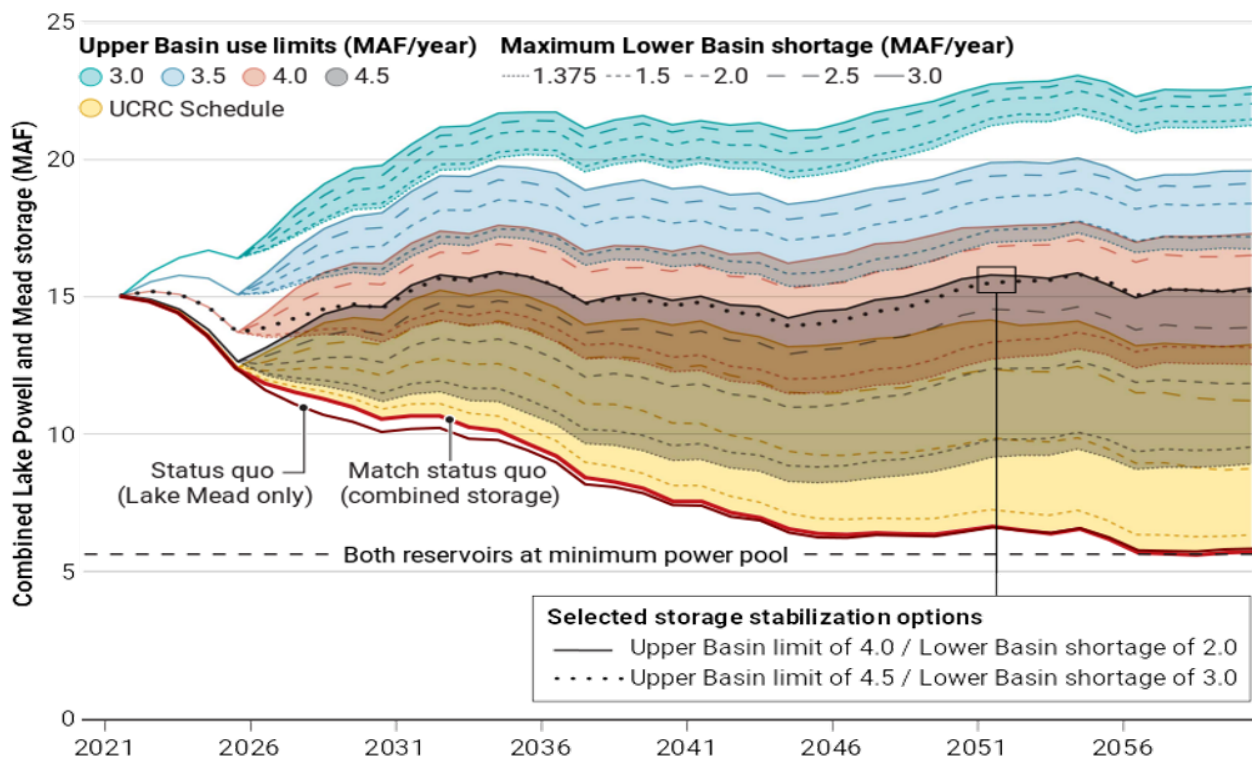
¹¹ Wheeler, K., Udall, B., Wang, J., Kuhn, E., Salehabadi, H., & Schmidt, J. C. (2022). What will it take to stabilize the Colorado River? *Science*, 377(6804), 373–375. <https://www.science.org/stoken/author-tokens/ST-631/full>

1. The post-2026 guidelines must permanently reduce demand in the basin.

“The Colorado River cannot provide a sustainable water supply unless consumptive use is reduced to match declining supply.” Schmidt *et al.* at 7. However, to recover reservoir storage and raise reservoir elevations to add flexibility and safeguard the system, greater reductions in use will be needed. *Id.* at 7-8. One way to reduce demand is to include evaporation and seepage losses below Lees Ferry in the allocations of the Lower Basin states (Arizona, California, and Nevada). See **Section I.D.** below for a more detailed discussion of this strategy. However, the discussion around this issue is just a smaller scale discussion over the true issue of how to address “systemwide overallocation and the reduction of flows due to climate change.” Fleck and Kuhn 2023 at 2.

a. To stabilize Lake Powell and Lake Mead, basin-wide water use must be reduced by about 13-20% of the 21st century average (2-3 million acre-feet per year).

Schmidt *et al.* (2023) notes that while it may “easy to articulate the general principal [sic] that use must match supply, it is more difficult to precisely define the magnitude of the needed reduction.” *Id.* at 7-8. K. Wheeler *et al.* (2022) conducted an analysis and produced a graph “showing average end-of-year combined Lake Powell and Lake Mead storage, assuming hydrologic conditions of the Millennium Drought continue.” *Id.* at 7, Figure 5; Wheeler *et al.* at 374. This Figure shows a range of scenarios including combinations of upper basin use limits and reductions in use by the lower basin and the resulting impact on combined storage in Lakes Powell and Mead. *Id.*



Based on the analysis, Schmidt et al. (2023) concluded that

Assuming persistence of conditions like those of the past 20 years, use would have to be reduced by 1.5 million af/yr . . . to match supply, but an additional 1 million af/yr . . . of reduction would be needed to recover lost reservoir storage. Thus, to stabilize the reservoirs, Basin-wide use would have to be reduced to 12-13 million af/yr . . . , 13-20% less than the average during the 21st century. Reduction in Basin-wide use by 2-3 million af/yr . . . is equivalent to eliminating the combined consumptive use of Colorado and Utah or the total use of Arizona.

Id. at 8,. The scale of the reductions is immense.

The analysis by Wheeler et al. (2022) “used the combined storage of the two reservoirs to trigger consumptive use reductions to the Lower Basin and Mexico. [This] approach acknowledges the hydrologic reality that water stored in both reservoirs is consumed almost exclusively in the Lower Basin and Mexico.” Id. at 375. Such a change would simplify the post-2026 guidelines and also provide additional flexibility for the operation of Lake Powell and Lake Mead.

b. Both basins play an important role in not increasing (upper basin) or reducing (lower basin) water use to bring the system back into balance.

It is important to recognize the balance between lower basin reductions and upper basin limitations on water use. To balance these, Wheeler *et al.* (2022) “identified combinations of Upper Basin consumptive use limitations and Lower Basin reductions to maintain reservoir levels if the Millennium Drought continues.” Id at 374. For example, in one scenario:

If the Upper Basin commits to limit water uses to 4.5 MAF/year (60% of their 7.5 MAF/year allocation, approximately 0.8 MAF/year higher than recent use), then the Lower Basin and Mexico must commit to more than doubling their current maximum reductions in existing use to 3.0 MAF/year []. In this scenario, the Lower Basin and Mexico receive 66.7% of their allocation, nearly matching the Upper Basin percentage.

Id. at 375. Alternatively,

If the Upper Basin limits their depletions to 4.0 MAF/year (53.3% of their allocation, 0.3 MAF/year higher than recent use), then the Lower Basin and Mexico would need to decrease uses by approximately 2.0 MAF/year to stabilize the reservoirs [], assuring 77.8% of their allocation. This is close to recently proposed maximum Lower Basin and Mexico commitments to reduce existing use, which would not be invoked until Lake Mead declines further by 3 MAF.

Id. These scenarios are reflected in the figure above where reservoir levels hover around 15 MAF. Id. at 374.

This analysis highlights the Upper Basin’s significant role in helping stabilize and recover reservoir storage. Lower basin reductions in use are inconsequential if they are offset by increases in demand by the upper basin. Further, it is unrealistic to think, given where we are today, that there is or will be enough water in the Colorado River and its tributaries to support the full upper basin development of their 7.5 MAF allocation under the Colorado River Compact. Therefore, the two basins will have to work together to find a compromise on what their respective allocations should be going forward.

- c. *The gap between supply and demand will only increase given the need to recover reservoir storage, account for climate change, and satisfy unfulfilled tribal water entitlements.*

Notwithstanding the increasing demand for water to recover reservoir storage, account for climate warming, and meet the unfulfilled promises of water for the tribes, climate scientists predict runoff will decline by an additional 1-3 million acre-feet per year by 2050.¹² This further reduction in supply and increasing demands only widens the supply-demand gap.

Kuhn and Jacobs (2022) noted this predicament and acknowledged that due to the historic imbalance of supply and demand “[w]e are now engaged in a stressful balancing act due to the historical commitments.” *Id.* at 46. The authors note the “great deal of ingenuity” that has gone into developing “work arounds” to making any change to the original allocations. *Id.* at 47. However, “future conditions are expected to be much more challenging, and the existing management framework is inconsistent with what is now known about hydrologic realities and economic consequences.” *Id.* at 47. Thus, it may be time for the basin states in concert with the U.S., Mexico and 30 basin tribes to come together to finally update or modify the original compact allocations, resolve some of the uncertainties that have remained for a century, and move toward a new system.

Kuhn and Jacobs (2022) suggest “[a] nonstationary allocation scheme is needed because the river system is now very unpredictable and inherently dynamic, and the stakes are extremely high. The vise-grip created by the Colorado River Compact’s flow obligations and climate change’s impacts on the basin’s hydrology benefits the Lower Basin states at the expense of the Upper Basin states, tribal sovereigns, and the river system’s ecosystems.” *Id.* at 66.

- d. *Equity principles should apply as water use reductions are evaluated.*

Fundamentally we need to balance supply and demand by making water use reductions in all states and in all sectors; however, in doing so, Reclamation should apply equity principles. All communities in the basin are not similarly situated and Reclamation has an obligation to ensure critical needs are met, that public health is safeguarded, and fundamental access to drinking water exists. For example, the Draft SEIS for near-term operations set out two vastly different approaches to allocating reductions—one largely based on the existing system of priority and the other allocating a pro rata share of the reductions to each water user regardless of priority.

¹² Udall, B., and J. Overpeck (2017). The twenty-first century Colorado River hot drought and implications for the future. *Water Resources Research*, 53, 2402-2418, doi:10.1002/2016WR019638. <https://agupubs.onlinelibrary.wiley.com/doi/epdf/10.1002/2016WR019638>

However, given the historic exclusion of the tribes and their later in time development of their water entitlements (e.g. sometimes settling for more junior rights such as CAP), equity principles could be applied to not include tribal water rights and entitlements in mandatory reductions, as an example. However, instead tribal water rights and entitlement mechanisms should be developed to ensure that tribes can realize the value of their entitlement through voluntary contributions of water and for their non-use.

Finally, Reclamation should prepare a full analysis of tradeoffs of demand reductions on communities, cultures, environment, economies, etc. that should be evaluated and then inform equitable decision making. This might be similar to a vulnerability assessment that is used to evaluate how climate change risks are distributed in communities.¹³

2. Reclamation needs to develop methods for improving the accuracy of its 24-month forecasts of reservoir elevations.

Wang et al. (2021)¹⁴ conducted a comprehensive review of the accuracy of Reclamation’s 24-month studies to determine how to improve them going forward and found that the studies overestimated inflows into Lake Powell and as a result often predicted reservoir elevations that were higher than what occurred in those years. In a warming and drying climate such overestimations lead to higher releases from Lake Powell and a false sense of security for water managers. We strongly recommend that Reclamation consider the findings of this study and incorporate its learnings into its development of the post-2026 guidelines.

3. Reclamation must prioritize water conservation and demand reduction as part of any solution.

Reclamation must prioritize water use reductions and conservation to maximize management options and flexibility. Bruckerhoff *et al.* (2021) used environmental metrics to compare “the outcome of combinations of water storage scenarios and consumptive use limits.”¹⁵ The study determined that where water was stored “was less important when less water was available, highlighting the importance of keeping water in the system to provide flexibility for achieving ecosystem goals.” *Id.* at 1. The authors concluded

Reservoir levels of both Lake Powell and Lake Mead will likely continue to decline regardless of where water is stored unless consumptive use is limited, so limiting consumptive use may provide the most flexibility in managing ecosystem drivers.

¹³ Grand Canyon Trust’s Scoping Comments on the SEIS for Near-Term Operations of Lake Powell and Lake Mead dated December 20, 2023 at 11-12. These comments are incorporated herein by this reference.

<https://www.grandcanyontrust.org/scoping-comments-operations-lake-powell-and-lake-mead>

¹⁴ Wang, J., Udall, B., Kuhn, E., Wheeler, K., and Schmidt, J.C. (2021). Evaluating the Accuracy of Reclamation’s 24-month Study Lake Powell Projections. Utah State University Center for Colorado River Studies, White Paper No. 7. <https://qcnr.usu.edu/coloradoriver/files/news/White-Paper-7.pdf>

¹⁵ Bruckerhoff, L.A., Wheeler, K., Dibble, K.L, Mihalevich, B.A., Neilson, B.T., Wang, J., Yackulic, C., and Schmidt, J.C. 2022. Water Storage Decisions and Consumptive Use May Constrain Ecosystem Management under Severe Sustained Drought, *Journal of the American Water Resource Association* 58 (5): 654-72.

<https://doi.org/10.1111/1752-1688.13020>

Id. at 16. We reiterate this point to encourage Reclamation to do everything in its power to reduce water use within the basin to levels that allow reservoirs to recover and increase flexibilities for water management at least in the short-term.

- C. PROTECT GROUNDWATER. Evaluate and address how surface water shortages stress groundwater resources in the Lower Colorado River Basin and create or incentivize policies to protect groundwater resources basin-wide.

Groundwater is a significant source of water in the Colorado River Basin.¹⁶ It contributes to surface flows in the Colorado River and its tributaries through baseflows and enters rivers through springs and seeps.¹⁷ As surface water supplies are reduced, water users will shift their use to groundwater, especially where regulations are not in place to ensure conjunctive (or joint) management of surface and groundwater resources.¹⁸ The Secretary of the Interior, and its bureaus and offices, are uniquely situated to play an important role in incentivizing and acknowledging the connection between groundwater and surface water throughout the basin and should show strong leadership on this issue.

1. Reclamation must take a holistic view of the basin and account for and protect groundwater and baseflow contributions to the Colorado River.

- a. *Baseflows originating in the Upper Colorado River Basin are a critical source of water basin-wide and are projected to decrease due to climate change by 33 percent.*

Baseflows are an important source of water that supports streamflow in the Upper Colorado River Basin.¹⁹ However, climate change in headwater areas is also influencing “basin-wide hydrology and water availability,” including water availability in the Lower Basin. *Id.* at 7. “Approximately 85%-90% of the total water year runoff in the [Colorado River Basin] starts in the [Upper Colorado River Basin].” *Id.* at 2. Further, over half the streamflow in the Upper Colorado River Basin begins as baseflow—groundwater discharge into streams—that help maintain surface water flows. *Id.* “Projected reductions in baseflow may affect future surface water availability, given the reliance of streamflow on baseflow, that may impact a range of water users including human (e.g., agriculture or municipal and industrial systems) and environmental users.” *Id.* at 7. This could also impact the Upper Basin’s ability to meet its delivery obligation to the Lower Basin. *Id.* at 7.

¹⁶ Miller, O. L., Miller, M. P., Longley, P.C., Alder, J. R., Bearup, L. A., Pruitt, T., et al. (2021). How will baseflow respond to climate change in the Upper Colorado River Basin? *Geophysical Research Letters*, 48, e2021GL095085. <https://doi.org/10.1029/2021GL095085>

¹⁷ Miller *et al.* and Wang, J., and Schmidt, J.C. 2020. *Stream flow and Losses of the Colorado River in the Southern Colorado Plateau*, White Paper No. 5, The Future of the Colorado River Project, Quinney College of Natural Resources, Utah State University at 10. <https://qcnr.usu.edu/coloradoriver/futures>

¹⁸ Kuhn, E., & Jacobs, K. L. (2022). Science and apportionment: Alternative futures for the Colorado River system. In J. A. Robison (Ed.), *Cornerstone at the confluence: Navigating the Colorado River's Compact's next century* (pp. 45–69). The University of Arizona Press. <https://uapress.arizona.edu/book/cornerstone-at-the-confluence>

¹⁹ Miller, *et al.* at 2.

Miller *et al.* (2021) estimated the response of baseflows to climate change. *Id.* at 1. The study concluded that “water originating as baseflow supplied to the Lower [Colorado River Basin] is **projected to decline by up to 33%.**” *Id.* at 9, emphasis added. “The percentage of baseflow lost during in-stream transport is projected to increase by 1%-5% relative to historical conditions” due to increased evapotranspiration that reduces the amount of water that reaches the upper basin tributary streams. *Id.* “The projected baseflow changes are expected to impact both human and ecological users with the greatest declines occurring under the [hot/dry] scenario.” *Id.* “Study findings suggest that ongoing water availability challenges in the [Colorado River Basin] may continue and be exacerbated in the future.” *Id.*

Kuhn and Jacobs 2022²⁰ identified a

serious science gap, primarily impacting the watershed of Lower Basin tributaries, is the failure to acknowledge groundwater’s role in supporting the river system’s flows, both directly and indirectly. The hydrologic connectivity between groundwater systems and surface flows throughout the basin needs to be acknowledged and quantified to manage increasing stresses.

Id. at 47. It is evident from this study that climate warming is impacting groundwater in similar ways as it impacts surface flows. Given the connectivity between surface and groundwater and the significance of the cumulative impacts of those reductions on overall flows in the Colorado River, the Secretary of the Interior needs to make research in this area a priority and incorporate groundwater issues more intentionally into the development of the post-2026 guidelines. Further, based on the impacts that have occurred to water supplies already due to climate change, Reclamation should prioritize and plan for worst-case hydrologic scenarios to determine the amount of water that can responsibly be allocated in the Colorado River Basin for use and maintain water needed to sustain ecological, tribal, and other unaccounted for needs in the Basin.

b. Significant groundwater contributions to the Colorado River within the Grand Canyon need to be understood and protected from depletion.

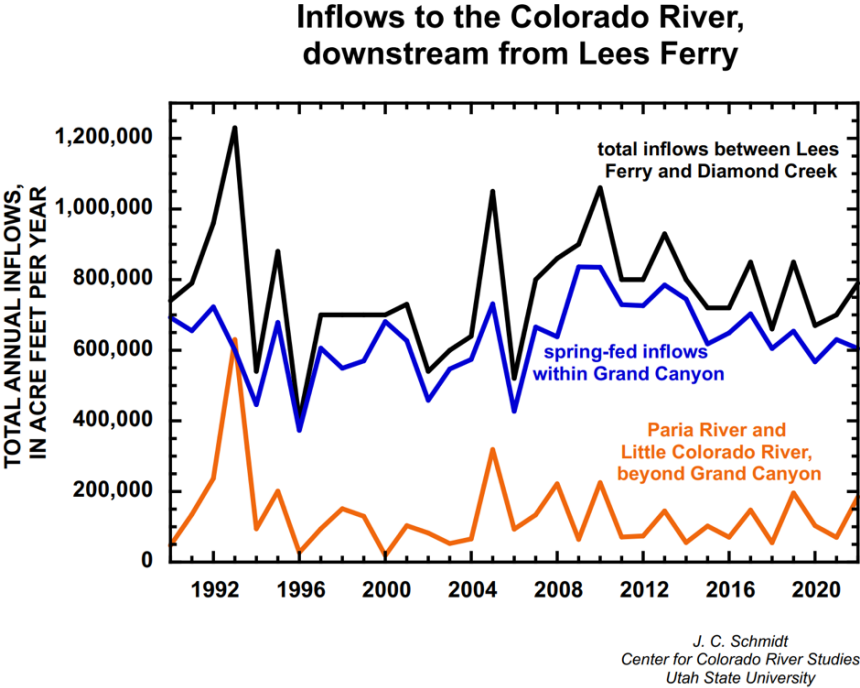
The Colorado River downstream of Lees Ferry receives significant intervening flows from tributary streams as well as from large springs within the Grand Canyon that contribute to ground and surface water in the region.²¹ Between 1990 and 2018, 768,000 acre-feet of water per year entered the Colorado River between the Lees Ferry and the Diamond Creek gauges. *Id.* at 11. The Paria and Little Colorado rivers contributed 17 percent (133,000 acre-feet per year) of these intervening flows and the remaining 83 percent (635,000 acre-feet per year) came from groundwater within the Grand Canyon. *Id.* Similarly, flow data collected from 2007 to

²⁰ Kuhn, E., & Jacobs, K. L. (2022). Science and apportionment: Alternative futures for the Colorado River system. In J. A. Robison (Ed.), *Cornerstone at the confluence: Navigating the Colorado River's Compact's next century* (pp. 45–69). The University of Arizona Press. <https://uapress.arizona.edu/book/cornerstone-at-the-confluence>

²¹ Wang, J., and Schmidt, J.C. 2020. *Stream flow and Losses of the Colorado River in the Southern Colorado Plateau*, White Paper No. 5, The Future of the Colorado River Project, Quinney College of Natural Resources, Utah State University at 10. <https://qcnr.usu.edu/coloradoriver/futures>

2018 showed intervening flows in the Grand Canyon averaged 710,000 acre-feet per year. *Id.* at 13. Importantly, the study concluded “gaging measurements between 2007 and 2018 suggest that most of the intervening inflows came from spring sources within the Grand Canyon that directly drain to the Colorado River or its perennial tributaries. *Id.* Springs in the lower part of the Little Colorado River canyon are a large source of water.” *Id.*

A graph of these inflows developed by J.C. Schmidt, Center for Colorado River Studies, Utah State University, August 2023 shows the total inflows between the Lees Ferry and Diamond Creek in black, spring-fed inflows within Grand Canyon in blue, and tributary contributions from the Paria River and Little Colorado River in red.



The 1990-2022 data shows a decline in spring-fed inflows within the Grand Canyon between 2009 to 2022. The flows of these Grand Canyon springs and seeps that contribute water to the Colorado River may also be influenced by climate change, as shown by Miller et al. (2021) for Upper Basin baseflows, but additional assessments should be made to confirm and assess this trend.

Kuhn and Jacobs also recommend “improved data related to groundwater use, storage, and recharge rates in the context of alternative scenarios of surface water availability in a changing climate is a critical science need for the Colorado River Basin.” *Id.* at 65. We agree with Kuhn and Jacobs assessment that more research is vital to understanding the impacts of climate change on these groundwater inflows and the impact of those declines on surface flows in the Colorado River and its tributaries and believe that both western science and incorporating traditional knowledge from the basin tribes is also crucial to this effort. Reclamation should incorporate this analysis into development of the post-2026 guidelines.

Further, Reclamation and other basin partners should make every effort to ensure that these flows are protected from unregulated groundwater pumping for development in and around the Grand Canyon in Arizona. Groundwater withdrawals in this area threaten flows into the Colorado River, the Grand Canyon ecosystem, and the water source as well as cultural and spiritual interests of tribes. As water supplies dwindle, Reclamation needs to account for and consider valuable every drop of water in the basin including that from groundwater sources and advocate for its protection.

- c. *Reclamation can no longer ignore the vital role of groundwater in supporting flows in the Colorado River and its tributaries and must ensure it is protected basin wide.*

The significant contributions of groundwater to the Colorado River and its tributaries and its vulnerability due to climate change and unregulated use should raise a red flag regarding the future of groundwater management in the Colorado River Basin. As described by Kuhn and Jacobs (2022)

Because groundwater management within the United States and Mexico is conducted by the states (outside of federal authority), it has been relatively easy to ignore groundwater management issues in the Colorado River Basin other than quantifying groundwater use that directly influences mainstem flows. However, climate change may raise the visibility of these issues at multiple scales.

Id. at 65. While some states manage surface and groundwater together (Colorado), other states manage groundwater as a separate regulatory system (California and Arizona). Arizona only manages groundwater in designated, mostly urban areas leaving the rural parts of the state without any regulation of groundwater resources. Groundwater basins in northern and western Arizona adjacent to the Colorado River and its tributaries are not regulated under Arizona's 1980 Groundwater Management Act, except for the newly formed Hualapai Valley Irrigation Non-expansion Area designated in October of 2022.²²

This is particularly problematic because groundwater is commonly "used as a backup during drought and or surface water shortages, and the consequences of managing the water rights regimes separately can be devastating." *Id.* at 65. Thus, reductions in surface water use will likely translate into increased use of groundwater. This has already happened in the context of the negotiations on the Drought Contingency Plans (DCPs) in Arizona where "agricultural users were authorized to 'mine' additional groundwater in the Pinal Active Management Area to offset reduced availability of Central Arizona Project water for agriculture stemming from the DCP. *Id.* This is likely to happen on a much larger scale if additional water cuts are made to water users that receive allocations from the Central Arizona Project. This would just shift the crisis from surface water to groundwater resources.

²² See Arizona Department of Water Resources Map showing Active Management and Irrigation Non-Expansion Areas regulated under the 1980 Groundwater Management Act. https://new.azwater.gov/sites/default/files/AMAs%20and%20INAs_2023%20%283%29.pdf

As a part of the development of the post-2026 guidelines, Reclamation needs to consider the impact of any surface water use reductions on groundwater resources within the basin. Reclamation needs to devise a method for understanding these effects on communities, the availability of groundwater, and the environment. Further, on the flip side, Reclamation needs to ensure that water users are not getting two bites at the same apple by taking water out of the Colorado River and its tributaries through wells and outside of the surface water allocation system. This is especially important when states and water users are making substantial cuts to their surface water supplies to benefit the entire system.

For example, if an unregulated groundwater well in Arizona were to pump groundwater that is connected hydrologically to the Colorado River (groundwater that would eventually end up in the river), that would be a depletion to the Colorado River that is unaccounted for as a part of Arizona's allocation. If the well is located upstream of Lake Mead (e.g. adjacent to the Grand Canyon) that water user would be taking part of Arizona's allocation before that allocation was made based on the post-2026 guidelines. Thus, Arizona would be using its allocation plus this unregulated use of groundwater that is hydrologically connected to the Colorado River and its tributaries. This hypothetical illustrates the concept that it is hard to conserve water if the bucket has a hole in it. Arizona's lack of groundwater regulation is a giant hole in the bucket of the Colorado River Basin that given the challenging hydrology can no longer be ignored.

In summary, the Secretary, unlike the individual states, has the ability to 1) view the watershed holistically and weigh the impacts of specific state policies on the basin as a whole, 2) mobilize its bureaus and offices to develop scientific resources to better understand the interaction between groundwater and surface water in the basin, and 3) engage to protect groundwater throughout the basin especially where it is hydrologically connected to the Colorado River and its tributaries. We strongly recommend the Secretary step into this role and prioritize and incorporate considerations of and protections for groundwater resources into the scope and objectives of the post-2026 guidelines.

D. UNIFORMLY ASSESS AND ALLOCATE SYSTEM LOSSES. Account for and allocate seepage, evaporation, and other system losses to water users.

The foundational accounting and allocation of losses from the Colorado River and its tributaries is one key element in balancing supply and demand in the Basin. Reclamation identified "assessing how to account for and allocate system losses due to evaporation, seepage and other losses" as an administrative priority in September 2022²³; however, it remains unclear the status of that analysis, how or if it will be integrated into or align with the development of the post-2026 guidelines, and if the basin states will be able to agree to the accounting system and allocations proposed. The evaporation study was not mentioned in the June 16, 2023 Notice in the Federal Register. More transparency, communication, and alignment regarding this ongoing

²³ U.S. Department of the Interior Press Release dated 8/16/2022 *Interior Department Announces Actions to Protect Colorado River System, Sets 2023 Operating Conditions for Lake Powell and Lake Mead.* <https://www.doi.gov/pressreleases/interior-department-announces-actions-protect-colorado-river-system-sets-2023>

action is needed from Reclamation. We believe this analysis is critical to development of the post-2026 guidelines and is directly within the scope of the EIS to be prepared.

1. Seepage losses must be measured and allocated as upper basin deliveries.

Seepage losses around Glen Canyon Dam contribute a significant amount of water to the Lower Basin, but are not measured, accounted for, or assessed as a delivery from the Upper Basin. Wang and Schmidt (2020) assessed seepage losses from Lake Powell finding “[a] significant amount of water seeps around Glen Canyon Dam and enters the Colorado River upstream from Lees Ferry.”²⁴ Based on water years 2005 to 2019, streamflow between Glen Canyon Dam and Lees Ferry is about 150,000 acre-feet per year. *Id.* This amount is about half of Nevada’s total Colorado River allocation. *Id.* “This amount of seepage is significant, and is a transfer of water from the Upper Basin to the downstream river.” *Id.* The authors recommend

There should be renewed study of the magnitude of inflows to the Colorado River that occur between Glen Canyon Dam and Lees Ferry. Measurements since 2005 consistently indicate that flow increases between these two points, and the magnitude of this difference is of the same order as the annual consumptive uses of the state of Nevada. This study should include ground-water modelling of seepage around Glen Canyon Dam and independent analysis of the accuracy of measurements of Glen Canyon Dam releases and gaging at Lees Ferry.

Id. at 2 and 23. We agree that Reclamation should study and determine a method to account for and allocate the seepage amount as a water delivery from the Upper to the Lower Basin of the Colorado River. It is only fair that this amount of water entering the lower basin is accounted for as an upper basin delivery. The amount of water now entering the canyon as seepage (an additional unaccounted for and unallocated delivery) can now be stored in Lake Powell for later delivery downstream (e.g. ten years of seepage losses is about 1.5 million acre-feet of water).

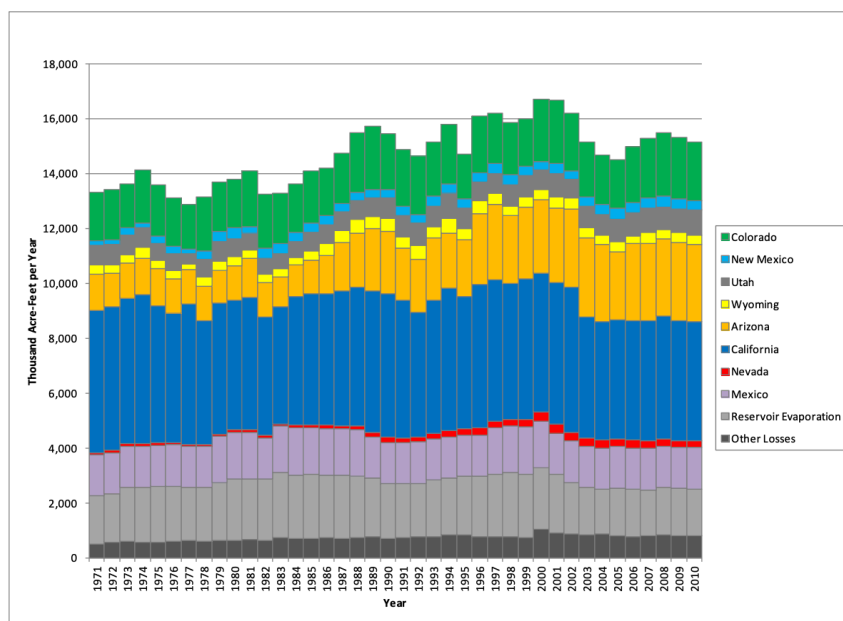
2. Evaporation losses are significant and must be fully accounted for and allocated.

The amount of water lost to evaporation and other system losses is substantial. (Fleck and Kuhn at page 16.) “Depending on the level of storage, the loss of water is in the range of 1.5 – 2 million acre-feet per year, more than the annual consumptive use of four of the seven individual basin states.” *Id.* Reservoir evaporation accounts for “about 20% of the available water supply for mainstream users on the Lower Colorado River.” *Id.* at 17. Figure C-2²⁵, below, shows the reservoir evaporation in light gray from 1971-2010.

²⁴ Wang, J., and Schmidt, J.C. 2020. *Stream flow and Losses of the Colorado River in the Southern Colorado Plateau*, White Paper No. 5, The Future of the Colorado River Project, Quinney College of Natural Resources, Utah State University at 8. <https://qcnr.usu.edu/coloradoriver/futures>

²⁵ Colorado River Basin Water Supply and Demand Study, Technical Report C – Water Demand Assessment, December 2012, Figure C-2, at page C-7. https://www.usbr.gov/lc/region/programs/crbstudy/finalreport/Technical%20Report%20C%20-%20Water%20Demand%20Assessment/TR-C-Water_Demand_Assessmemt_FINAL.pdf

FIGURE C-2
 Historical Colorado River Water Consumptive Use¹ and Loss by State, Mexico, Reservoir Evaporation², and Other Losses³, 1971–2010



¹ Excluding consumptive use in Lower Basin tributaries.

² Reservoir evaporation losses are accounted differently in the Upper and Lower Basin. In the Upper Basin, reservoir evaporation losses are accounted as part of each state's total uses. In the Lower Basin, reservoir evaporation losses are accounted separately from each state's uses. Reservoir evaporation losses from Upper and Lower Basin reservoirs have been aggregated for this presentation.

³ Phreatophyte and operational inefficiency losses.

Wang and Schmidt (2020) also recently assessed post-2010 data regarding evaporation losses from Lake Mead. The 2020 study found that from 2010-2015, the annual evaporation losses from Lake Mead were about “559,000 acre-feet per year and were 5.4 percent of the total outflows and losses from Lake Mead.” *Id.* at 17. On average about 6 feet of water is lost out of Lake Mead each year.²⁶ These losses are still significant even when Lake Mead is at only a fraction of its capacity. In July 2010, Lake Mead was only 38 percent of capacity²⁷ and its water levels were even lower in 2015.²⁸ “Evaporation losses from Lake Mead [alone] were more than twice the consumptive uses by the state of Nevada.” *Id.*

Despite the 1.5 million acre-feet of estimated water lost from the Colorado River through reservoir evaporation annually, “there is no common basin-wide approach to measuring and reporting evaporation.” (Fleck and Kuhn, page 16.) Fleck and Kuhn suggest that “[t]he development of a comprehensive method to assess Lower Basin reservoir evaporation and, if

²⁶ USGS, Nevada Water Sciences Center, May 26, 2017. <https://www.usgs.gov/centers/nevada-water-science-center/science/evaporation-lake-mead-and-lake-mohave-lower-colorado>

²⁷ Las Vegas Review Journal, July 3, 2022, *Lake Mead through the decades* by Taylor Lane. <https://www.reviewjournal.com/local/local-las-vegas/lake-mead-through-the-decades-photos-2602149/>

²⁸ Earp, Katherine J., and Michael T. Moreo, USGS, 2021, *Evaporation from Lake Mead and Lake Mohave, Nevada and Arizona, 2010-2019*. <https://pubs.usgs.gov/of/2021/1022/ofr20211022.pdf>

appropriate, conveyance system losses is long overdue.” (Fleck and Kuhn 2023 at 4.) Likewise, Wang and Schmidt recommend

maintaining the long-term program to measure evaporation from Lake Mead and make the present experimental program at Lake Powell a permanent monitoring program. Total, or gross, evaporation should be regularly reported for both reservoirs, because that is the actual amount of water lost to the atmosphere.

(Wang and Schmidt at 2 and 23.) We agree with these suggested approaches and encourage Reclamation to develop and fund a long-term and uniform program for monitoring evaporation losses throughout the Colorado River Basin.

Further, in addition to inconsistent and varied accounting methods, evaporation losses below Glen Canyon Dam, are not assessed as a part of the water allocations to the Lower Basin States of Arizona, Nevada, and California. Thus, as climate change reduces water availability and demand outpaces supply, these evaporation losses work (outside of those allocations) as a major additional depletion of water in the system. In fact, estimated reservoir evaporation losses have matched the decline of Lake Powell and Lake Mead—an average of 1.5 million acre-feet a year—since the onset of the Millennial drought in 2000.²⁹

As discussed in more detail by Fleck and Kuhn, the Lower Basin states acknowledge the need to distribute reservoir evaporation and system losses going forward and two very different approaches were proposed by California and the remaining six basin states as a part of Reclamation’s near-term revisions of the 2007 Guidelines. (Fleck and Schmidt 2023 at 1, 2, and 17.) This is what Fleck and Kuhn had to say about the choice to be made

These two approaches expose the fundamental problem on the river. There is not enough river water to meet the needs of Arizona, California, and Nevada on the Lower River, to meet the current needs and future aspirations of the Upper Division States, to address the unmet senior rights of the Basin’s Native Americans, and to satisfy the 1944 Treaty obligations to Mexico. **The simple reality is that the three Lower Division States need to cut their collective mainstream uses by at least 1.5 million acre-feet per year, the only questions are which entities are cut and by how much.** Both proposals accomplish the necessary cuts, but the way each distributes the pain is different.

(Fleck and Kuhn at 18, Emphasis added.)

A suggested vehicle for future agreements around how to allocate evaporation and other system losses include the negotiation of a Lower Basin Compact to address unresolved issues from the 1922 Colorado River Basin Compact. *Id.* at 18. Allocation of evaporation losses is just

²⁹ Fleck and Kuhn, pages 2, 8 and 17; *See also*, Brad Udall’s presentation *Current and Projected Hydrology: A Dangerous Trajectory* at the 43rd Annual Colorado Law Conference, June 8, 2023, <https://www.youtube.com/watch?v=egKHhNzk3Hk> at 19:30.

one of several issues left unsettled over the past 100 years that would benefit from forward looking and proactive agreements by the Lower Basin states. Fleck and Kuhn suggest that

without such a compact, critical allocation and management questions such as the definition of consumptive use, the status and meaning of article III(b) of the 1922 Compact, and the assessment of evaporation and system losses remain unanswered and subject to dispute.

Id. at 4.

A recent analysis by the Southern Nevada Water Authority estimated 1.5 million acre-feet of water is lost each year from evaporation and system losses from Lee’s Ferry to the northern international boundary with Mexico and developed a proposed methodology to allocate these losses among individual water users “based upon the user’s recent history of their consumptive use.”³⁰ The Southern Nevada Water Authority reasoned that “[b]ecause these losses occur without regard to priority, they should NOT be implemented in a manner that applies reductions exclusively to junior priority users.” This analysis is an important starting point for serious negotiations between the basin states on this issue. We would caution that equity principles, as discussed above, should still apply with regard to the basin tribes in this context.

It is not the responsibility of the Department of the Interior to resolve all the outstanding disputes among stakeholders in the Colorado River Basin. It is long past time that the basin states show leadership and reach agreement on longstanding issues that are at the foundation of the water crisis before us. These agreements should be the foundation of the balancing of supply and demand in the basin. Based on lessons from the past, these negotiations will need to include the 30 basin tribes, U.S., Mexico and include discussions with other interested parties; however, the states must be willing to make hard choices that benefits the system in the long run and reconcile miscalculations made in the past. It is because the states cannot reach an agreement that the Secretary of Interior is left in the role of trying to clean up the mess that has been created.

“A consistent and accurate method of measuring and assessing reservoir evaporation” is needed and is “critical to future water management in the Basin.” (Fleck and Kuhn 2023 at 16.) We agree with this assessment and encourage Reclamation to lead this effort to determine how to uniformly and accurately measure and report evaporation, seepage, and other system losses throughout the Basin. A Reclamation evaporation study needs to be completed and its methods affirmed by the other sovereigns in the basin (e.g. 30 basin tribes, Mexico, and the seven basin states) as soon as possible, but definitely before the Draft EIS for the post-2026 guidelines is released in 2024. Further, the Lower Basin States need to consider the best vehicle for permanently ensuring that these losses are accurately divided among existing water users in the lower basin and execute an agreement resolving this (and hopefully other) outstanding issues clouding the interpretation of the Colorado River Compact of 1922 and leading to continued disagreement between the states. The reprieve of 2023 is not likely to buy the basin

³⁰ Fleck and Kuhn at 3; *See also*, Letter from Southern Nevada Water Authority and Colorado River Commission of Nevada to Interior regarding the revised guidelines for near-term Colorado River Operations at page 7 and Attachment 2 at pages 12-13. <https://s3.documentcloud.org/documents/23590432/2022-12-20-snwa-letter.pdf>

more time to resolve these complicated and longstanding issues, so the time is now to come together and make the hard choices need to sustain the Colorado River and its tributaries long into the future.

II. PROMOTE MEANINGFUL INCLUSION OF TRIBES. Meaningfully consult with and provide each of the 30 tribal nations in the Colorado River Basin an opportunity to participate as equal sovereigns directly in post-2026 negotiations between the U.S., the seven basin states (Arizona, California, Colorado, Nevada, New Mexico, Utah, Wyoming), and Mexico.

- A. PROPOSE AND IMPLEMENT A PROCESS. Reclamation should propose and implement a process to promote meaningful inclusion of the 30 basin tribes as soon as possible.

Reclamation indicates that it “intends to develop an approach that facilitates inclusion at multiple levels and enhances tribal engagement and inclusivity . . . including individual outreach, leverage existing groups and forums, create new groups and forums, and provide for clear and timely communication with the public.” 88 Fed. Reg. at 39457. We appreciate the intention and work Reclamation is putting into developing these processes. Given the “resounding consensus advocating for increased tribal participation in the post-2026 process” from the pre-scoping comments, we were hopeful that Reclamation would have a suggested process or would have provided additional thoughts on what that process might look like in the scoping notice. See Pre-Scoping Report at 10.

Now that the formal NEPA process has begun, we recommend Reclamation propose and implement a process to promote meaningful inclusion of the basin tribes. This process needs to be in place as soon as possible to ensure those engagement opportunities are available throughout the process.

Further, it would be helpful to understand what existing or new groups Reclamation is planning to utilize or form as a part of the post-2026 process, what the composition of the existing groups are, and what tribes or individuals participate. Some questions to consider include: Are there barriers to participation that Reclamation might be able to help overcome with resources or other support? Is there a way non-governmental organization could help provide resources if federal support is not available? Are there new voices or tribes that are interested in engaging? Is Reclamation visiting each of the tribes in person? What is each tribe’s preference for engaging (e.g. written comments, in person meetings)? Where are the meetings being held?

- B. OPPORTUNITY FOR TRIBES TO PARTICIPATE AS EQUAL SOVEREIGNS. Reclamation should seriously consider the request by many tribes to be given the opportunity to participate as equal sovereigns with the U.S., basin states and Mexico directly in the post-2026 negotiations.

The Summary of the Pre-Scoping Comments for “Tribal outreach and involvement” provides that

Throughout the stakeholder and tribal letters, there was a resounding consensus advocating for increased tribal participation in the post-2026 process.

Recommendations included inviting tribes to participate directly in federal-state negotiations and establishing regularly scheduled meetings; meaningfully considering, integrating, and responding to tribal input; clearly and explicitly specifying opportunities and timeframes for tribal input; directly involving DOI or other federal agency personnel involved with tribal coordination; and initiating Section 106 (pursuant to the National Historic Preservation Act) government-to-government consultation with tribes early in the process. Stakeholders further recommended using Indigenous Traditional Ecological Knowledge to inform the decision-making process.

Id. at 9-10.

Many stakeholders in the basin attended the Getches-Wilkinson Center Conference: Crisis on the Colorado River on June 8, 2023.³¹ The tribal water panel coordinated by the co-chairs of the Water and Tribes Initiative elicited very specific requests and the expression of concerns by individual tribal representatives about the development of the post-2026 guidelines. That presentation was recorded and we attach the link and incorporate those request by reference into these comments.

A very specific request was made by the Governor Lewis of the Gila River Community as well as other tribes to be included as equal sovereigns in any meetings between the United States and the seven basin states in an effort to provide “all basin tribes need [the opportunity] to be at the table.” Governor Lewis’s request was as follows :

the table should include representatives from all 38 sovereign governments in the United States’ portion of the basin. So that is of course the United States, the seven basin states, and the 30 basin tribes. Now some basin tribes may not want to participate for whatever reason but nonetheless they should have a seat if they want one. And I strongly believe that this group of 38 sovereigns should meet whenever the United States feels it has to meet with all of the principals of the seven basin states. And as we develop a post-2026 plan it’s no longer acceptable for the United States to meet with seven basin states separately and then come to basin tribes after the fact with post-hoc explanation or rationalization of what was discussed or even worse what was decided. . . . Only when US decides to meet with all basin states principals would the requirement to include all tribes at that time would be triggered. This new inclusion plan should be done as soon as possible so it can be used as we start this post-2026 process. I strongly believe it should be established and in place before the post-2026 scoping comment period deadline. (Minute 1:07-1:10)

Other tribes that made similar requests:

- ◆ “We must be a part of the discussions as they occur” - **Jicarilla Apache Nation**, Pre-scoping Letter dated September 1, 2022 at 1.

³¹ Getches-Wilkinson Center Conference: Crisis on the Colorado River, [Tribal Water Panel](https://www.youtube.com/watch?v=yzzLTnhgHFM), Minute 1:02:45, June 8, 2023. <https://www.youtube.com/watch?v=yzzLTnhgHFM>

- ◆ “The Tribe wants to be at the table *during* discussions and negotiations. As a sovereign in the Basin, the Tribe does not want to be updated on the negotiations between the States and the Federal team after decisions are made; the Tribe wants to be at the table during discussions and negotiations.” - ***Southern Ute Indian Tribe***, Pre-scoping Letter dated September, 1 2022 at 2.
- ◆ “The Tribe is ready and eager to engage at the highest levels of the discussions and negotiations that will be necessary both to create a sustainable post-2026 future and to address the crisis the Basin is already facing. We will show up wherever we are invited- and will seek to interject ourselves even when we are not - because the health of the River, and our ability to continue to utilize our hard-won water rights for the benefit of our members, are of existential importance to the Tribe.” - ***Quechan Indian Tribe***, Pre-scoping Letter dated August 29, 2022
- ◆ “The Secretary must ensure that the Nation and other tribes with CAP allocations are able to equitably participate in any operational strategies that may be adopted for Post-2026 operations. This includes not only ensuring that tribes may legally participate, but also ensuring that any practical barriers to participation are addressed given the fact that tribes have a unique legal and jurisdictional status within the Colorado River system. - ***Yavapai-Apache Nation***, Pre-scoping Letter dated September 1, 2022 at 2.
- ◆ “We strongly request that (1) the Ute Indian Tribe be seated as a participant on the Upper Colorado River Commission; and (2) the Bureau of Indian Affairs have visible and active representation as a federal partner in Reclamation’s leadership role in working to develop strategies for the post-2026 management of the Colorado River.” - ***Ute Indian tribe***, Pre-scoping Letter dated August 30, 2022 pre-scoping at 2.
- ◆ “I repeat my hope that the United States will fully implement its commitment to engage in pre- decisional, government- to- government consultation with Ak-Chin and other Basin Tribes as it works to develop post-2026 Colorado River operating guidelines and to identify and implement interim conservation measures. It is vital that the federal government both hear from Tribes and provide them with information and assistance necessary to understand and evaluate any proposals that will affect tribal rights and interests will in advance of such proposals being adopted.” - ***Ak-Chin Indian community***, Pre-scoping Letter dated September 1, 2022 at 2.
- ◆ “This process should not be difficult. The Tribes should be included in all substantive meetings to develop the next set of operational guidelines. The CRIT do not want to be informed of the decisions made or agreements reached with the Basin States. It is critical that we be in the meetings and provide our voices to shape those decisions and agreements. Because our water use is accounted for as part of each state’s apportionment, does not mean we are state water users, within the jurisdiction of state water laws, or that the states know or understand

our interests in the Colorado River.” - *Colorado River Indian Tribes*, Pre-scoping Letter dated September 1, 2022 at 1.

III. **CLIMATE RESILIENCE PLANNING IS CRITICAL. In a parallel timeframe to the post-2026 guidelines, Reclamation must continue to conduct additional climate resilience planning and implement solutions.**

The Trust appreciate Reclamation’s efforts to conduct a series of actions simultaneously to address the challenges the basin faces due to low runoff and reservoir elevations. These actions—from the near-term revisions to the 2007 Guidelines to the infrastructure review and assessment of Glen Canyon and Hoover Dams—are all vital to addressing the immediate crisis as well as planning for alternatives and scenarios to address foreseeable and untenable future problems. Given the breadth of these actions, it would be helpful if Reclamation was more transparent, communicative, and coordinated in updating the public on the status of those studies. For example, we understand that an evaporation and seepage study is underway, but it is unclear when it will be released and how it will inform (both related to timing and substance) the development of the post-2026 guidelines. The process to develop the post-2026 guidelines can only be enhanced and supported by these other actions and studies. We encourage Reclamation to develop a central location to provide such status updates and information for the public and stakeholders to access.

A. ALIGN/INTEGRATE OTHER ACTIONS BY RECLAMATION. Reclamation must coordinate the alignment of other actions it is undertaking in the basin with the development of the post-2026 guidelines.

In August of 2022, the Department of the Interior announce “a number of administrative actions” it intends to take in the Basin³² in addition to the development of the post-2026 guidelines, including the following:

- *Prepare Draft Supplemental Environmental Impact Statement for Near-Term Colorado River Operations* to revise 2007 Interim Guidelines—including “actions needed to authorize a reduction of Glen Canyon Dam releases below 7 million acre-feet per year, if needed, to protect critical infrastructure at Glen Canyon Dam” and “actions needed to further define reservoir operations at Lake Mead, including shortage operations at elevations below 1,025 feet to reduce the risk of Lake Mead declining to critically low elevations.”
- *Prepare Studies of River Outlet works at Glen Canyon Dam*—including “accelerate ongoing maintenance actions and studies to determine and enhance projected reliability of the use of the river outlet works, commonly referred to as the bypass tubes, at Glen Canyon Dam for extended periods.”

³² U.S. Department of the Interior Press Release dated 8/16/2022 *Interior Department Announces Actions to Protect Colorado River System, Sets 2023 Operating Conditions for Lake Powell and Lake Mead.*
<https://www.doi.gov/pressreleases/interior-department-announces-actions-protect-colorado-river-system-sets-2023>

- *Investigate Physical Modifications at Glen Canyon Dam*—including “support technical studies to ascertain if physical modifications can be made to Glen Canyon Dam to allow water to be pumped or released from below currently identified critical and dead pool elevations.”
- *Drought Response Operation Agreement*—including “work with the Basin states, Basin Tribes, stakeholders and partners to be prepared to implement additional substantial releases from Upper Basin Reservoirs to help enhance reservoir elevations at Lake Powell under the Drought Contingency Plan’s Drought Response Operations Agreement.”
- *Evaporation and System Loss Study*—including “prioritize and prepare for additional administrative initiatives that would ensure maximum efficient and beneficial use of urban and agricultural water, and address evaporation, seepage and other system losses in the Lower Basin.”
- *Investigate Physical Modification at Hoover Dam*—including “support technical studies to ascertain if physical modifications can be made to Hoover Dam to allow water to be pumped/released from elevations below currently identified dead pool elevations.”

In addition to these actions announced last year, additional investigations or efforts on the horizon include:

- *LTEMP Review and Amendment*—Evaluate alternatives for operating Glen Canyon Dam to prevent passage and establishment of non-native fish species in the Grand Canyon and to review a change to the sediment accounting window for determining when to conduct high flow experiments in the canyon.
- *Feasibility Study of Fish Barrier in Lake Powell*—Evaluate feasibility of installing fish barrier in Lake Powell to prevent the passage of non-native species into the Grand Canyon.
- *Quantify and settle tribal water rights*—Negotiate and implement settlements of unfulfilled tribal water rights.

While we understand that every issue or investigation cannot fall within the scope of the post-2026 guidelines, at a very minimum, all the actions listed above should be timed and coordinated with the development of the post-2026 guidelines. It would also be incredibly helpful to have a little more insight into that status of these processes and how Reclamation sees them as integrated with or separate from the post-2026 guidelines.

B. WORST-CASE SCENARIO PLANNING. Reclamation needs to conduct worst-case scenario planning to address low runoff conditions and avoid or mitigate critical reservoir elevations.

1. Reclamation should reassess dam infrastructure and develop alternatives for passing water through the dam at low reservoir elevations.

Reclamation has identified, as have other stakeholders in the basin,³³ their concerns regarding the infrastructure challenge of passing water through Glen Canyon and Hoover Dams at low

³³ The Southern Nevada Water Authority also expressed its concern regarding “the risks associated with losing the ability to release water through the Glen Canyon Dam power plants.” SNWA SEIS comments (12-20-2022) at p. 4.

reservoir elevations. In the Draft Supplemental EIS for Near-term Colorado River Operations, Reclamation provides

In recent months, a primary concern for the Department has been to identify and implement actions to ensure that Glen Canyon Dam continues to provide downstream water deliveries as designed and intended (i.e., remains above elevations at/about 3,490 feet above mean sea level). While additional analysis may find that water can be released through the hydropower units when Lake Powell is at slightly lower levels, at this time, 3,490 feet is the cutoff for routine operations. Below this elevation, all water could only be released through Glen Canyon Dam's four river outlet works (reducing operational redundancy and, thus, increasing operational risk for downstream releases). This would create a risk of water supply interruptions to water users that rely on Lake Powell for drinking water supplies; hydropower interruptions to users that rely on Glen Canyon Dam for power supplies; and increased uncertainty regarding downstream releases should Lake Powell continue to decline. As discussed herein, if strategies are adopted to reduce Glen Canyon Dam releases to protect the reliability of routine operations, Lake Mead's water levels will decline at an accelerated rate, increasing risk of Lake Mead declining to critically low levels and threatening water deliveries to those that rely on Lake Mead for water supplies.

(DSEIS at 1-8, footnote 9.)

This issue is important in terms of water deliveries, hydropower operations, but also for the cultural, environmental, and recreational interests in the Grand Canyon. See Schmidt and Kuhn (2023) at 6. The Trust is concerned that if conditions remain warm and dry and reservoir levels again decline that there is not a plan in place or underway to ensure that water can pass through Glen Canyon Dam in a way that protects the canyon's resources, downstream water users, and the safety of the dam itself.

We believe that this type of climate resilience planning at Glen Canyon and Hoover Dams is critical and should occur alongside the development of the post-2026 guidelines. This planning should be public and inclusive and should look not only at the immediate problem, but incorporate other related concerns such as passing of non-native fish through the dam, operations to prevent the establishment of non-natives in the canyon, lack of sediment passage through the dam, water temperature, inability to conduct high flow experiments at low reservoir levels at sufficient magnitude, inability to generate hydropower, vegetation

The SNWA states that “[t]hese risks fundamentally harm water supply reliability for all those that rely upon water in the Lower Basin. The inability to release water from Glen Canyon Dam imposes unacceptable risk to Lower Basin water supply and the predictability of that supply” and requests that “[a]ny preferred alternative must ensure water deliveries from Glen Canyon Dam are not compromised, in turn requiring that sufficient elevations be maintained in Lake Powell.” *Id.*

encroachment, etc. Schmidt and Kuhn (2023) at 6. This is the type of integrated planning that is likely required in a drier and more uncertain future.

We understand that Reclamation has presented some initial summary of its investigations in a presentation titled *Glen Canyon Dam Low-Head Hydropower Modifications*. It is unclear, however, the status of these investigations and if and when this process becomes more public. This process could benefit from public scoping or informal pre-scoping to identify the issues and investigations that are most important and relevant to stakeholders and the public.

2. Reclamation should investigate the costs and benefits of how storage is distributed between Lake Powell and Lake Mead under low reservoir elevations.

The 2007 Guidelines prioritized the balancing of reservoir elevations at Lake Powell and Lake Mead. This may not be feasible given the worst-case scenario that these reservoirs remain at only a fraction of their capacity or fall even further below where they are today. Schmidt and Kuhn (2023) warn that “[t]he likelihood that the combined storage in Lake Mead and Lake Powell will rarely exceed 50% of capacity (K. Wheeler et al., 2022) suggests a need to evaluate the environmental and hydropower trade-offs associated with policy alternatives that emphasize storage of water in Lake Powell or Lake Mead.” Id at 8. We agree that it may be time to investigate the scenario of low reservoir storage and evaluate the costs, benefits and impacts of different reservoir elevations and storage alternatives for the worst-case scenario. Such climate resilience planning would allow Reclamation and the basin stakeholder to get ahead of the next emergency on the river and develop a plan forward.

In summary, worst-case scenario planning could ensure that the infrastructure and operations of Lake Powell and Lake Mead can withstand low flows and reservoir elevations. In the future, it is possible that the Grand Canyon Protection Act of 1992 may mandate that some of these worst-case scenario plans are implemented if the existing mitigation and balancing choices fail to meet the mandates of “protect, mitigate adverse impacts to, and improve the values for which Grand Canyon National Park and Glen Canyon National Recreation Area were established.” It is possible that at very low reservoir levels many of the mitigation measures set forth in LTEMP (e.g. high flow experiments) to offset and improve conditions in the Grand Canyon may be very difficult if not impossible to conduct. Thus, this type of investigation may prove important given the mandates of the Grand Canyon Protection Act of 1992 going forward.

IV. RELEVANT STUDIES TO CONSIDER.

The following studies may provide insights into the environmental review process for development of the post-2026 guidelines:

- Bruckerhoff, L.A., Wheeler, K., Dibble, K.L, Mihalevich, B.A., Neilson, B.T., Wang, J., Yackulic, C., and Schmidt, J.C. 2022. Water Storage Decisions and Consumptive Use May Constrain Ecosystem Management under Severe Sustained Drought, *Journal of the American Water Resource Association* 58 (5): 654-72. <https://doi.org/10.1111/1752-1688.13020>

- Connor, Michael. June 1994. Extracting the Monkey Wrench from Glen Canyon Dam: The Grande Canyon Protection Act – An Attempt at Balance. 15 *Pub. Land L. Rev.* 135. <https://scholarworks.umn.edu/cgi/viewcontent.cgi?article=1313&context=plrlr>
- Fleck, John and Kuhn, Eric, An Historical Perspective on the Accounting for Evaporation and System Losses in the Lower Colorado River Basin (June 1, 2023). Science Be Dammed Working Paper #4 (June 2023), Available at SSRN: <https://ssrn.com/abstract=4466530> or <http://dx.doi.org/10.2139/ssrn.4466530> (Fleck and Kuhn 2023)
- Kuhn, E., & Jacobs, K. L. (2022). Science and apportionment: Alternative futures for the Colorado River system. In J. A. Robison (Ed.), *Cornerstone at the confluence: Navigating the Colorado River's Compact's next century* (pp. 45–69). The University of Arizona Press. <https://uapress.arizona.edu/book/cornerstone-at-the-confluence>
- Miller, O. L., Miller, M. P., Longley, P.C., Alder, J. R., Bearup, L. A., Pruitt, T., et al. (2021). How will baseflow respond to climate change in the Upper Colorado River Basin? *Geophysical Research Letters*, 48, e2021GL095085. <https://doi.org/10.1029/2021GL095085>
- Udall, B., and J. Overpeck (2017). The twenty-first century Colorado River hot drought and implications for the future. *Water Resources Research*, 53, 2402-2418, doi:10.1002/2016WR019638. <https://agupubs.onlinelibrary.wiley.com/doi/epdf/10.1002/2016WR019638>
- Wang, J., and Schmidt, J.C. 2020. Stream flow and Losses of the Colorado River in the Southern Colorado Plateau. *The Future of the Colorado River Project*, Quinney College of Natural Resources, Utah State University, White Paper No. 5. <https://qcnr.usu.edu/coloradoriver/files/news/White-Paper-5.pdf>
- Wang, J., Udall, B., Kuhn, E., Wheeler, K., and Schmidt, J.C. (2021). Evaluating the Accuracy of Reclamation’s 24-month Study Lake Powell Projections. Utah State University Center for Colorado River Studies, White Paper No. 7. <https://qcnr.usu.edu/coloradoriver/files/news/White-Paper-7.pdf>
- Wheeler, K., Kuhn, E., Bruckerhoff, L., Udall, B., Wang, J., Gilbert, L., Goeking, S., Kasprak, A., Mihalevich, B., Neilson, B., Salehabadi, H., & Schmidt, J. C. (2021). Alternative management paradigms for the future of the Colorado and Green Rivers. Utah State University Center for Colorado River Studies, White Paper No. 6. https://qcnr.usu.edu/coloradoriver/files/CCRS_White_Paper_6.pdf
- Wheeler, K., Udall, B., Wang, J., Kuhn, E., Salehabadi, H., & Schmidt, J. C. (2022). What will it take to stabilize the Colorado River? *Science*, 377(6804), 373–375. <https://www.science.org/stoken/author-tokens/ST-631/full>

We appreciate the opportunity to provide scoping comment on the development of the post-2026 guidelines. We look forward to working with you and others in the basin to find solutions

to the complex and critically important challenges facing Colorado River Basin and work toward a more just and sustainable future for the river and its communities.

Sincerely,

A handwritten signature in black ink, appearing to be 'Jen Pelz', with a long horizontal flourish extending to the right.

Jen Pelz
Water Advocacy Director
Grand Canyon Trust