September 1, 2022

Carly Jerla
Senior Water Resources Program Manager
U.S. Bureau of Reclamation

Electronically submitted to: CRB-info@usbr.gov

RE: Development of Post-2026 Colorado River Reservoir Operational Strategies for Lake Powell and Lake Mead Under Historically Low Reservoir Conditions

Dear Ms. Jerla:

The Arizona Game and Fish Department (Department) appreciates the opportunity to provide input to the Bureau of Reclamation's (Reclamation) Federal Register notice of June 24, 2022 Request for Input on Development of Post-2026 Colorado River Reservoir Operational Strategies for Lake Powell and Lake Mead Under Historically Low Reservoir Conditions. The Department is aware of the effects long-term drought has had on fish and wildlife and their habitats in the Southwest and in the broader Colorado River Basin, and continues to manage fish and wildlife resources within the Colorado River watershed and its system of reservoirs, rivers, and canals of Arizona.

Under Title 17 of the Arizona Revised Statutes (ARS), the Department, by and through the Arizona Game and Fish Commission (Commission), has jurisdictional authority and public trust responsibilities to conserve and protect the state fish and wildlife resources. In addition, the Department manages threatened and endangered species through authorities of Section 6 of the Endangered Species Act and the Department's 10(a)(1)(A) permit. It is the mission of the Department to conserve and protect Arizona's diverse fish and wildlife resources and manage for safe, compatible outdoor recreation opportunities for current and future generations. In addition to ARS Title 17 authorities, the Department has jurisdictional authority under ARS Title 5 Chapter 3 Boating and Water Sports, regulations, and boating opportunities in coordination with partners at water bodies around the state.

For your consideration, the Department provides the following comments based on the agency's statutory authorities, public trust responsibilities, and special expertise related to wildlife resources, wildlife-related recreation, and boating recreation as they relate to the Federal Register notice.

High Risk Non-native Fish

Drought conditions in the Colorado River basin have led to lower available run-off and lower reservoir elevation levels in many system reservoirs, including Lake Powell above Glen Canyon

Dam. As reservoir water elevation drops closer to the dam's penstocks, the quality of water released from the dam continues to change from what the system had experienced since the dam was constructed. The Department has concerns that elevated water temperatures and low dissolved oxygen levels pose a threat to a number of downstream resources, including the establishment of non-native species such as Smallmouth Bass (SMB) and impacts to native fish and the Rainbow Trout fishery at Lee's Ferry below Glen Canyon Dam.

Over recent years as the elevation of Lake Powell has been reduced, water temperatures at Lees Ferry have increased during the summer and fall. Given the critically low elevation of Lake Powell this year, the water temperature at Lees Ferry has been observed above 20℃ (68℉; August 2022), which is 4-5℃ warmer than has been recorded prior to 2021. There have been discussions among stakeholders within the Glen Canyon Dam Adaptive Management Program (GCDAMP) regarding the increased risk of a SMB population establishing in the Colorado River downstream of Glen Canyon Dam and the potential impacts this establishment poses to native fish, especially the Humpback Chub that was recently downlisted. Significant control efforts are currently being implemented in the upper Colorado River basin where high-risk non-native species are impacting conservation of native species. The costs of these control efforts are substantial, thus, preventative measures and changes to operations that can reduce the risk of establishment are critical to minimizing biological and economic impacts.

Higher water temperatures coming through Glen Canyon Dam and the increased risk of fish entrainment due to low reservoir elevations are the driving factors for establishment of SMB and other high risk non-native fish species downstream of the dam. Although these factors are a result of the existing water conditions within the Colorado River basin, both release temperature and entrainment can be influenced and managed by operations at Glen Canyon Dam. The Department requests that Reclamation develop a full suite of alternative operations and infrastructure enhancements that disadvantage high risk non-native species and reduce their establishment potential. This will help protect healthy self-sustaining native fish populations in Marble and Grand Canyons.

Rainbow Trout Fishery

The Department is concerned about impacts to the blue ribbon Rainbow Trout fishery at Lees Ferry below Glen Canyon Dam from higher water temperatures. The Lees Ferry tailwater has hosted a recreational Rainbow Trout fishery that has grown in importance and reputation locally, regionally, nationally, and internationally. Anglers from around the world travel to Lees Ferry to fish for high quality Rainbow Trout. This Blue Ribbon recreational sport fishery has become a financial and economic mainstay for the small community of Marble Canyon, the City of Page to the north, and Coconino County. A 2013 statewide angler survey estimated the contribution of the Lees Ferry fishery to the State's economy in excess of $16.8 million, helping to support 251 jobs in Arizona (Fedler 2014). Anglers support local businesses such as hotels, restaurants and other service providers, in addition to utilizing fishing and outdoor recreation equipment suppliers and guides. The Glen Canyon Dam Long-Term Experimental and Management Plan (LTEMP) states the resource goal for the Rainbow Trout fishery is to "Achieve a healthy high-quality recreational Rainbow Trout fishery in Glen Canyon National Recreation Area

(GCNRA) and reduce or eliminate downstream trout migration consistent with NPS fish management and ESA compliance" (Bureau of Reclamation and National Park Service, 2014). Maintaining cold water releases to <16°C (<60.8°F) from Glen Canyon Dam is critical for achieving this resource goal.

The forecasted water conditions in the Colorado River basin will create less favorable conditions for Rainbow Trout in coming years, with maximum release temperature projections to reach critical thermal tolerances for Rainbow Trout. Negative effects are expected even from sub-lethal warm water, as recent models on the bioenergetic response of Rainbow Trout to warmer temperatures at Lees Ferry suggests that the food base at Lees Ferry cannot sustain adequate Rainbow Trout growth rates at these warmer temperatures and a negative response in fish condition is expected (J. Korman, Ecometric, pers. comm.).

In addition to temperature concerns, low dissolved oxygen represents a risk to the Rainbow Trout fishery. Rainbow Trout are susceptible to increased stress, disease and death when dissolved oxygen levels dip below 5 ppm. High runoff events have been shown to lead to low dissolved oxygen plumes developing and traveling through Lake Powell. Similar to how reservoir elevations affect release temperature, lower reservoir elevations mean that these plumes are more likely to come through the Glen Canyon Dam due to their relation to the penstocks. Although oxygen saturation levels stabilize through diffusion and aeration processes in the river, low dissolved oxygen poses a threat to populations below the dam, particularly the first five miles, which represents the most productive sections of the Lees Ferry fishery. Additionally, the negative effects of low dissolved oxygen are exacerbated at higher temperatures.

This fishery has seen two collapses over the past two decades, one in 2006 and another in 2014/15. Recent modeling done on the response of Rainbow Trout to warmer temperatures at Lees Ferry suggests that it is highly probable that another fishery collapse is imminent. The fishery took many years to recover after each of the previous collapses and the current status of the fishery (e.g. lowest relative abundance in 20 years of monitoring) suggests that the next recovery could take longer. Success of a healthy high-quality recreational Rainbow Trout fishery in GCNRA requires maintaining release temperatures <16 °C.

Although 16-18°C is within the range of preferred temperatures for Rainbow Trout, recent analysis presented to the Technical Working Group of the GCDAMP suggests that an increase in basal trout metabolism resulting from the elevated temperature combined with the poor trout food base that exists at Lees Ferry will stress and starve trout (J. Korman, Ecometric, pers. comm.). Rainbow Trout recruitment has been limited since 2018 and the current population is largely composed of older/larger fish. These larger fish are more susceptible to metabolic effects of warmer water and lower dissolved oxygen and the Department is concerned that temperatures in Lees Ferry could exceed those that could sustain any population of Rainbow Trout, let alone meeting the LTEMP goal of a high quality recreational Rainbow Trout fishery. Therefore the Department recommends that Reclamation implement structural modifications to Glen Canyon Dam that allow for release of cooler water when the reservoir is at lower water surface elevations.

Recommendations Re: High Risk Non-native Fish and Rainbow Trout Fishery

Current conditions, and projected future water level will prohibit effective management of the Rainbow Trout fishery and high risk non-native species within the Colorado River. Intermittent use of the bypass tube has been previously proposed through the GCDAMP and the Department recommends this be considered for implementation. Infrastructure changes that facilitate long-term release temperature control while minimizing water storage or power loss could also be explored (e.g., power generation in the bypass tube, temperature control tower feeding penstocks). The Department also recommends Reclamation identify fish deterrents or exclusion mechanisms in the forebay in order to reduce entrainment of warmwater high risk non-native fish through the dam.

The Department acknowledges that there are necessary tradeoffs and competing values of water levels and releases between the two subject reservoirs. Infrastructure changes that would facilitate better control of water quality represent initial installation costs that, over time, would likely be significantly less expensive than non-native control costs to protect the threatened Humpback Chub population. Realistically, non-native control methods would not be effective without being combined with water temperature reduction as well, and thus funds spent on preventative measures now would reduce costs later. Due to the ability to control high risk non-native fish, solutions for maintaining cold water releases (<16°C) are mutually beneficial to multiple downstream resources listed in LTEMP, including the Rainbow Trout fishery and native fish such as the listed Humpback Chub. The Department recommends Reclamation identify and design infrastructure options and implement water release actions that maintain release temperatures below 16°C (<60.8°F) and dissolved oxygen above 5 ppm, while minimizing impacts to power production and water storage.

Boating and Recreation Access

The Department has concerns regarding impacts to boating recreation as water levels decline at Lake Mead and Lake Powell. Several boat ramps at these two large and very popular reservoirs have become unusable. The Department requests that NPS Glen Canyon Dam National Recreational Area at Lake Powell and Lake Mead National Recreation Area, in coordination with the Department and Reclamation, identify, design, and construct improved low-water boating access facilities at each of these lakes for the benefit of the boating and angling public.

In addition to reservoir based boating recreation, Lee's Ferry below Glen Canyon Dam is a popular place for motorized riverine trout fishing opportunities, one of the few such places in Arizona. Reductions in flow releases, as well as daily fluctuations in flows, can affect the ability of anglers to access the trout fishery upstream from Lees Ferry by motorboat. The Department recommends that Reclamation design flow release scenarios that allow for year round motorboat access to the entire reach of Lee's Ferry below Glen Canyon Dam.

Thank you for the opportunity to provide input on the post 2026 reservoir operational strategies for Lake Powell and Lake Mead. For further coordination, please contact David A. Weedman at dweedman@azgfd.gov or by phone call to 623-236-7607.

Sincerely,

Luke Thompson
Habitat, Evaluation, and Lands Branch Chief

AGFD # M22-06245328

Bureau of Reclamation and National Park Service, 2014. Alternatives for consideration in the Glen Canyon Dam Long-term Experimental and Management Plan Environmental Impact Statement: Salt Lake City, Utah, Bureau of Reclamation, Upper Colorado Region; Denver, Colorado, National Park Service, Intermountain Region.

Fedler, Anthony. 2014. 2013 Economic Impact of Fishing in Arizona. Responsive Management Harrisonburg Virginia.