

March 25, 2024

Bureau of Reclamation
LTEMP SEIS Project Manager
125 South State Street, Suite 800
Salt Lake City, UT 84138

VIA ELECTRONIC MAIL

LTEMPSEIS@usbr.gov

RE: Upper Division States' Comments on the Draft Supplemental Environmental Impact Statement for December 2016 Record of Decision Entitled Glen Canyon Dam Long-Term Experimental and Management Plan

To Whom It May Concern,

The Colorado River Upper Division States' AMWG Representatives (Upper Division States' Representatives) provide the following comments in response to the Bureau of Reclamation's (Reclamation) February 9, 2024 Federal Register Notice announcing solicitation of public comment on the Draft Supplemental Environmental Impact Statement (SEIS) for the December 2016 Record of Decision entitled "Glen Canyon Dam Long-Term Experimental and Management Plan" (LTEMP). 89 Fed. Reg. 9147.

The Upper Division States' Representatives support the efforts of Reclamation to expeditiously address potential smallmouth bass (SMB) establishment within this NEPA process and existing law. We also strongly support the additional short-, mid- and long-term actions not included in this NEPA process that will be necessary to successfully prevent SMB establishment beyond the timeline for this SEIS.

Building from our prior comment letters submitted in both the Environmental Assessment process and this SEIS process¹, the Upper Division States' Representatives submit these comments on the Draft SEIS. Overarching comments are presented below in the body of the comment letter. Technical comments are included in Attachment 1 to this letter and are incorporated herein by reference.

¹ See Upper Division States' Representatives and Upper Colorado River Commission comment letter dated December 15, 2022; Basin States' Representatives comment letter and Upper Division States' Representatives comment letter dated March 10, 2023; Basin States' Representatives comment letter and Upper Division States' Representatives comment letter dated November 3, 2023.

A. Purpose and Need

The purpose and need of an EIS should describe the goal or objective that the action agency is trying to achieve *and* the underlying problem or opportunity to which that agency is responding with the proposed action. As drafted, the purpose and need for modifying the High Flow Experiment (HFE) Protocol merely describes the proposed action Reclamation is seeking to take. The Final SEIS should describe the underlying need to modify the HFE Protocol.

The Upper Division States' Representatives agree that the stated purpose and need to "disrupt the establishment" of SMB below Glen Canyon Dam provides a more accurate description of the goal of the proposed alternatives and emphasizes the necessity of additional mid- and long-term actions. However, the Final SEIS must include metrics to evaluate the success of meeting the disruption goal.

B. Scope

A primary concern of the Upper Division States' Representatives is that the Draft SEIS evaluates two proposed actions separately, yet neither action is informed by the potential impacts of the other on the resources and the impacts to other experiments.

The Upper Division States' Representatives also remain concerned about the two distinct timelines for the proposed actions, in particular how those different timelines impact the alternatives' analysis. The Draft SEIS is unclear as to which timelines are carried forward in the analyses.

The scope of the Draft SEIS states the operational alternatives could be implemented between 2024 – 2027 and that "Reclamation's goal is to implement additional strategies in the future to prevent the establishment of smallmouth bass and other warmwater nonnative fish." The Final SEIS needs to include information regarding the "additional strategies" to prevent the establishment of SMB and other warmwater nonnative fish. The Upper Division States' Representatives recommend including expectations on timelines for implementation of mid- and long-term strategies, and prioritizing installation of an entrainment control device at Glen Canyon Dam.

With respect to concurrent NEPA actions on other Colorado River Operations, Section 1.8 of the SEIS should state that additional environmental analysis and compliance for the LTEMP may be needed for any post-2026 operations, as the LTEMP is subject to Glen Canyon Dam annual releases. Additionally, the cumulative effects of the proposed operational alternatives may require additional compliance with consultation requirements under the Endangered Species Act.

C. Operational Alternatives to Disrupt Smallmouth Bass Establishment:

1. Analysis of the Non-Bypass Alternative:

The Upper Division States' Representatives strongly encourage additional analysis of the non-bypass alternative in order to provide implementation flexibility, particularly in light of the structural damage to the bypass tubes following the most recent 2023 HFE.

2. Implementation of Operational Alternatives:

The Final SEIS should clarify and expressly state that implementation of operational alternatives is temporary and will follow the communication and consultation processes that have been developed according to Section 1.4 of the LTEMP Record of Decision. Moreover, the operational alternatives analyzed in the Draft SEIS may individually need to be implemented depending on conditions. The Upper Division States' Representatives recommend that more than one single operational alternative be available for implementation in a given year. The Upper Division States' Representatives request that Reclamation create a process or schedule consistent with the existing LTEMP communication and consultation processes in order to provide Western Area Power Administration (WAPA) sufficient time to plan for experimental flows, including potential grid stabilization or replacement purchase power activities.

The Upper Division States' Representatives also recommend two additional points for inclusion in the Final SEIS: (1) offramps for emergency exception criteria, including a threshold below which the Upper Colorado River Basin Fund (established under Section 5 of the Colorado River Storage Project Act) cannot fall, and (2) the criteria Reclamation will use to evaluate the effectiveness of the chosen operational alternative(s) at disrupting SMB establishment. To determine the effectiveness of the operational alternatives for disrupting SMB establishment, Reclamation should include evaluation of:

1. spawning behavior of SMB before, during, and after implementation of an operational alternative;
2. estimated population sizes of SMB and select native fish species before and after implementation of an operational alternative in a given year and before and at the end of 2024-2027 experimental period;
3. evidence of displacement of SMB to warmer downstream waters;
4. evaluation of habitat and/or spawning behavior before and after flow releases; and
5. temperature monitoring through river mile 61 and specifically at some of the nearshore habitat areas, including the -12-mile slough to ensure that the releases effectively disrupt the nonnative species establishment in these environments that can act as refuges for nonnative species.

Because the intention of most of these operational alternatives is to reduce water temperatures, the Final SEIS should take into further consideration that SMB may behaviorally avoid cold-water temperatures and seek warmer temperatures downstream, along the channel margins, in backwaters or in tributaries to the river such as the Little Colorado River. This is imperative as the Draft SEIS does not provide evidence that SMB would not potentially be displaced downstream. Other literature, not specific to this River system, suggests that as water temperatures decline below 15°C, SMB migrate to deeper water and are known to migrate more than 47 miles to reach winter refugia (Breton et al. 2014).

D. HFE Protocol Modification:

1. HFE Alternatives Analysis

The alternatives analysis must meaningfully discuss the impacts of the proposed action. The Draft SEIS includes one action alternative that modifies the HFE Protocol and separate action alternatives related to SMB that incorporate the modified HFE Protocol. The alternatives analysis for the action modifying the HFE Protocol, and the combined effects of the SMB and HFE releases do not take a hard look at the impacts of modifying the HFE Protocol. Additional modeling and impact analysis should be conducted regarding the HFE Protocol. The HFE modeling should extend through the entire period of the LTEMP to comport with the intention stated in this Draft SEIS.

2. Known Issues to be Analyzed:

The Flow Ad Hoc Group of the Technical Work Group, in partnership with the Grand Canyon Monitoring and Research Center and Reclamation, developed a Proposal to Amend the HFE Protocol and Other Considerations (Proposal). The Proposal was accepted by the Technical Work Group and recommended and accepted by the Adaptive Management Work Group in the Fall of 2023. The Proposal recommends several additional analyses necessary to appropriately formulate HFE Protocol alternatives and fully analyze impacts. Based on the Proposal, the Final SEIS should analyze:

1. the risk of spring HFEs to distribute nonnative fish farther downstream and whether that risk is significantly less than implementation of fall HFEs;
2. potential treatment of rollover sediment;
3. sediment accounting windows longer than one year;
4. the full potential impact to hydropower generation, the power grid, and hydropower customers and beneficiaries, including Tribal Nations and disadvantaged communities; and
5. impacts to cultural resources.

The Upper Division States' Representatives recommend the Proposal be used to amend the HFE Protocol, and the amended Protocol be utilized in the Final SEIS.

3. Potential Conflicts:

The LTEMP Record of Decision and the Biological Opinion document concerns regarding impacts to fisheries from HFEs. Specifically, there is concern that HFEs and other experiments, such as "Bug Flows", may actually promote the establishment of warmwater non-native species by relocating the species farther downstream or by creating more suitable habitat, respectively. This concern is supported by research conducted by Breton et al. 2014. The Final SEIS should evaluate this potential risk or clarify how risks from the proposed operational alternatives differ from those risks presented by experimental flows.

The Draft SEIS discusses how increasing water temperatures has helped humpback chub (HBC) populations grow as it increases their hatching success, larval survival, and larval and juvenile growth; improve swimming ability; and reduced predation vulnerability (Hamman 1982; Ward 2011; Ward and Morten-Starner 2015). Therefore, the effects of the proposed operational alternatives target temperature of 15.5°C should be analyzed as they may negatively impact HBC, which have demonstrated increased survival and success due to warmer water temperatures.

Because the Draft SEIS evaluates the two proposed actions separately, neither action is informed by the potential impacts of the other. There is potential for compounding effects if both actions are implemented within the same year. The full impacts and tradeoffs of potential implementation of both actions outlined in the Draft SEIS within the same year should be analyzed and considered, including the full range of impacts of potential multiple bypass actions within a single HFE implementation window.

E. No Action Alternative

Throughout the Draft SEIS, Reclamation frames the impacts under the No Action Alternative in terms of ongoing drought, aridification, and low reservoir conditions. While these conditions are integral to the underlying purpose and need for the proposed actions, the proposed operational alternatives do not directly mitigate or address drought and low reservoir conditions. Drought will likely continue to impact resources under the action alternatives as well as under the No Action Alternative. The Upper Division States' Representatives recommend that Reclamation reframe the impacts under the No Action Alternative to better align with the proposed actions.

F. Concurrent Management Actions to Address Non-Native Fish

Operational alternatives alone are insufficient to meet the purpose and need of the proposed action due to continuing entrainment of SMB through Glen Canyon Dam. Any use of operational alternatives to help disrupt establishment of non-native species should be implemented in conjunction with non-operational alternatives (e.g., 12-mile slough modification and installation of a fish exclusion device) as detailed in the Non-Native Fish Strategic Plan². The Draft SEIS recognizes the concurrent efforts to implement such non-operational alternatives; however, it is unclear whether these concurrent actions are considered and analyzed in the impacts to fisheries, particularly under the No Action Alternative.

It is also important to note that, as detailed in the Non-Native Fish Strategic Plan, the actions considered in the Draft SEIS may not be successful in the absence of timely implementation of the additional, non-operational alternative management actions.

GENERAL

The Final SEIS should be reviewed by a technical editor to reduce repetitive text, delete unnecessary technical jargon, provide clear citations, and clearly and thoroughly describe the analyses and findings. In particular, the Final SEIS should provide a clear assessment of the magnitude and timing of the risk SMB pose to HBC. Without such an assessment of the risk to HBC from SMB, it is unclear to the reader why there is an urgent need for operational alternatives to control SMB.

RESERVATION OF RIGHTS

The Upper Division States' Representatives comments are intended to highlight overarching issues that will require acknowledgment, specification, or clarification as the SEIS process continues to progress. Failure of the Upper Division States' Representatives to provide specific comments regarding details of the SEIS shall not be construed as an admission with respect to any factual or legal issue or the waiver of rights for the purposes of any future legal, administrative, or other proceeding. Moreover, the comments herein are specific to this SEIS process and should not be interpreted to apply to any other ongoing NEPA processes. Finally, the Upper Division States' Representatives reserve the right to comment further on SEIS documentation as Reclamation proceeds with subsequent phases of the SEIS process.

² The Non-Native Fish Strategic Plan was recommended for adoption to the Secretary of Interior's Designee by the GCDAMP Adaptive Management Work Group in February 2023.

CONCLUSION

The Upper Division States' Representatives appreciate the opportunity to provide these public comments on the LTEMP Draft SEIS. If questions or concerns arise regarding this letter, or any other aspect of the Upper Division States' Representatives' interest, concerns, or suggestions regarding the LTEMP SEIS process, please contact us at your earliest convenience.

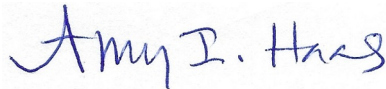
Sincerely,



Michelle Garrison, AMWG Representative
Colorado



Ali Effati, AMWG Representative
New Mexico



Amy Haas, AMWG
Representative Utah



Charlie Ferrantelli, AMWG Representative
Wyoming

Attachment 1 – Technical Comments

The Upper Division States’ Representatives offer the following technical comments for consideration.

1. General

The Upper Division States’ Representatives suggest clarifying the description of Reclamation’s duties in the following sentence under page 1-5, stating: “The Secretary is also vested with the responsibility of managing the mainstream waters of the Colorado River pursuant to federal law,” by appending to the end of the sentence: “below Glen Canyon Dam.”

Technical Editing – The document would benefit greatly from review by a technical editor to reduce repetitive text, especially in the Description of Alternatives. Also, unnecessary technical jargon such as “univoltine” and “multivoltine” species should be replaced with plain language.

Support of Purpose and Need – The Final Supplemental Environmental Impact Statement (SEIS) should provide a clear assessment of the magnitude and timing of the risk smallmouth bass (SMB) pose to humpback chub (HBC). For example, the document does not fully provide a rationale for assuming the necessity and effectiveness of any of the temperature-based operational alternatives at disrupting SMB establishment and population growth through spawning because SMB spawning has been documented at temperatures as low as 12.5°C (Graham and Orth, 1986). It is unclear if any of the operational alternatives will reduce water temperatures below 13°C. Further, the document does not fully take into account the literature documenting reduced reproductive success of SMB due to timing and changing of flows (not temperature reduction) (Winemiller and Taylor 1982; Peterson and Kwan 1999; Larimore and Duever 1968; Bestgen and Hill 2016; Bestgen 2018).

Citations and References – The Final SEIS should be updated to include the most recent studies and citations. For example, the Aquatic Resources section [pg. 3-82] contains extensive detail on prior fish removal efforts, but there is a lack of recent information beyond 2018. The Final SEIS should include recent information on SMB rapid response actions as well as targeted efforts in the slough. In addition, clear citations should accompany any data provided. Citations should provide access to full bodies of work to demonstrate that the best available information and science is being utilized.

Presentations supporting the Draft SEIS, such as the January 2023 temperature modeling presentation (Mihalevich), should be listed in the Draft SEIS with a link to slides and/or other presentation materials.

Also, a disproportionate amount of the text is dedicated to background information (e.g., Affected Environment sections) and could be incorporated by reference to the original LTEMP EIS. Instead, the Final SEIS should place more emphasis on clearly describing the

analyses completed for the Environmental Consequences sections of the Draft SEIS and the findings of those analyses.

The following are specific instances for editorial consideration:

- The Draft SEIS describes the implementation of the Spring 2023 HFE as occurring “outside the HFE protocol, but consistent with LTEMP.”¹ The Upper Division States’ Representatives raised concerns about the implementation of the Spring 2023 HFE, particularly with respect to the process and compliance with the LTEMP ROD. The Upper Division States’ Representatives believe the Supplemental Information Report did not demonstrate that the action was in compliance with the LTEMP.
- The paragraph regarding “equalization flows” on page 3-83 should be removed as it seems to have no relevance to this SEIS.

2. Purpose and Need

Reclamation inconsistently describes the proposed action and purpose of SMB flow alternatives within the Draft SEIS. For example, in the Proposed Action section of the Draft SEIS, Reclamation indicates that “the reduction of water temperature and adjustments in flow velocity may serve as essential tools to disrupt the successful spawning and establishment of SMB.” Within the Purpose of and Need for Action section, Reclamation indicates that “the need is to disrupt the establishment of SMB below Glen Canyon Dam by limiting additional recruitment...”. Spawning is the act of reproducing and is the first step in recruitment. However, recruitment also involves growth and transitioning to different life stages. Disrupting spawning is a good way to lead to recruitment failure, but spawning and recruitment are two different things and should not be used interchangeably. Also, because SMB are being entrained through the dam, additional SMB continue to be recruited into the system.

3. Modeling, Analysis, and Assumptions

Data - There are data assumptions that would benefit from added clarification as to the value of the specific choices. For example:

- Throughout the Draft SEIS, the lambda (λ) variable is used to represent population growth rate and describe effectiveness of alternatives. Since this is the metric being used to assess the effectiveness of alternatives, the Final SEIS must include additional explanation about the variable (e.g., What does it mean when $\lambda > 1$? What does $\lambda < 1$ mean? Does a lambda of 1.5 carry the same weight as a lambda of 2 or 3?)

¹ Draft SEIS at page 1-4.

- In addition to predicting SMB intrinsic rate of population growth (λ) under the six flow alternatives, the Final SEIS should contain an estimate of the current SMB population size and analyses of how long it would take for SMB to establish and move downstream to the location of HBC given entrainment and spawning projections under a variety of hydrologic conditions.
- The Final SEIS should provide the basis for determining that the uncertainty in temperature forecasts is accounted for by a 0.5°C margin (i.e., the margin between the 16°C biological impact temperature and the 15.5°C used as the trigger in modeling flow alternatives) by providing 95 percent confidence intervals for the raw data used for this analysis. If variation in the uncertainty in temperature forecasts is larger than 0.5°C, a different temperature trigger may be required to adequately address uncertainty in temperature modeling of the flow alternatives. Demonstrated downriver model performance against measurements and the calculated model uncertainty for downriver warming are needed for the downriver temperature model as it was applied, after adaptation of the model of Dibble et al. (2021).
- Further clarification of the choice of 16° with a 0.5°C margin is needed, given that spawning is shown as low as 13°C in Figure 3-23 in the Draft SEIS.
- Downriver warming of water released from Glen Canyon Dam is calculated with an adaptation of the model developed by Dibble et al. (2021) for SMB flow alternatives. Dibble et al. (2021) includes a description of their model and documentation of the performance of their model relative to measurements; however, it is not clear if similar model performance is still achieved when the model is adapted from a monthly to daily scale for the Draft SEIS. The Final SEIS should include the performance of the adapted model as applied for the Draft SEIS.
- The Final SEIS should include a monitoring plan to track impacts to the structural integrity of the bypass tubes and identify “offramps” for termination of the use of the bypass tubes if the structural integrity is compromised.

Hydrologic Traces – The Draft SEIS does not provide the level of justification needed for the use of only 30 hydrologic traces, which are the basis for most analyses in the Draft SEIS. Additional information is needed to: 1) clarify the criteria for choosing the 30 hydrologic traces out of the 90 considered in the Interim Guidelines SEIS, 2) demonstrate that 30 traces will produce statistically valid results, and 3) quantify the extent to which the 30 traces provide “a wide range of hydrologic conditions” and “a robust range of monthly data.” This information should be provided in the Final SEIS.

Competing Models – The Draft SEIS uses different (and potentially competing) models to analyze impacts to resources and does not provide sufficient justification for using one model over the other. The Final SEIS should clearly justify why the selected models are being used, especially if two competing models are used for the same analysis.

- *Hydropower*: The Draft SEIS does not include an initial statement at the beginning of Section 3.3.2 to describe why two modeling approaches (from two different entities) were used for the hydropower analysis. The Upper Division States' Representatives recommend including in the Final SEIS only the analysis and tables of information provided by WAPA as part of its comments on the Draft SEIS.
- *Glen Canyon Dam Release Temperature*: Water Quality impacts (Section 3.11) were analyzed using the CE-QUAL-W2 model, yet the SMB population growth model incorporates Glen Canyon Dam release temperatures that are modeled based on historical data from 2000-2021 (Epehimer et al 2024). The Final SEIS should justify the use of the Epehimer 2024 model over the more established CE-QUAL-W2 model that is traditionally used by Reclamation, as the Epehimer model: 1) only includes data through 2021, and 2) still has a Root Mean Square Error of 1.28°C for 2023 (GCDAMP 2024 Annual Reporting Meeting, January 23, 2024). The use of a separate temperature model introduces additional uncertainty especially if the implementation of alternatives will be based on temperature forecasts using Reclamation's standard CE-QUAL-W2 model.
 - The Final SEIS should include figures of the fitted and actual temperature profiles to assess the fit of actual vs modeled data and relative accuracy of the analysis.
 - The Final SEIS Section 3 discussion needs to be expanded to include displays of the temperature residuals (i.e., modeled minus observed).
 - The Root Mean Square Error and the residuals from the model testing should be evaluated in the context of the 0.5°C temperature difference factor associated with the use of 15.5°C as the trigger in the SMB flow alternatives rather than the 16°C temperature requirement for SMB oviparity and Young-Of-Year growth.

Smallmouth Bass Model (Epehimer pre-print, 2024) – The Epehimer et al. (2024) pre-print report does not provide specifics regarding modeling methodology and/or data used to support models, and instead refers to supplemental materials, which makes it more difficult for the reader.

- The Epehimer et al. (2024) pre-print admits that the model could be improved by refining certain model inputs, including the quantification of life-stage specific entrainment survival. Given the statement on page 6 of the Supplemental Materials, which states that the entrainment survival rate could be biased either high or low, it is difficult to have confidence in this estimate.

- The Draft SEIS must distinguish more clearly between the two distinct Eppheimer et al. (2024) references, the manuscript for publication and the United States Geological Survey data repository.

High Flow Experiment Analysis – The adjustment of the sediment accounting period allows for more discretion related to HFE releases in the spring or fall. However, the Draft SEIS does not explain its assumption that spring HFEs are preferred over fall HFEs, nor why increasing the likelihood of spring HFEs by 26% is beneficial.

Additionally, the Draft SEIS lacks clarity regarding analysis of potential expansion of the HFE implementation window for different alternatives, including those with proposed flow spikes during the HFE implementation window. Section 3.4 Geomorphology/Sediment appears to provide the most robust analysis of the HFE flows, including (1) how changes to flow and the sediment accounting period would affect the probability of triggering HFEs; and (2) how flow fluctuations and flow spikes would affect sediment load transport, accumulation, and erosion. The Upper Division States’ Representatives encourage Reclamation to include a similar level of detail regarding potential impacts of changes to the HFE implementation window.

Hydropower Analysis – Section 3.3.1 provides a thorough description of multiple components of hydropower production and distribution. Section 3.3.2 is too narrowly focused and needs to address potential impacts to the various components described in 3.3.1. Further, the average of thirty traces, including the years in which no experiment was triggered, is not a sufficient metric to analyze hydropower impacts as it mutes the larger extreme impacts. For the Cool Mix Alternative, the average of all 30 traces, including zeros, at RM 15 is 147 GWh, while the average of the 8 traces in which an experiment is triggered at RM 15 is 584 GWh. The economic impact of the Cool Mix Alternative increases from an estimate of \$12.82M (averaging all 30 traces) to an average of \$60.72M (averaging the 8 traces that trigger an experiment at River Mile 15) (WAPA GTMax Model 2024). Additionally, Table 3-15 shows that the 90th percentile and maximum statistics are considerably larger than the average, suggesting that, when flow experiments occur, the impacts are large. These larger impacts should be more fully considered in the Final SEIS.

The Upper Division States’ Representatives recommend WAPA and Reclamation coordinate the timing of any experiments to avoid implementing the alternative during peak energy use times in order to lower the costs of experiments.

Combined Modeling Approach – For all alternatives, the combined effects of the SMB and HFE releases have minimal analysis, except under the Geomorphology/Sediment Analysis (Section 3.4). Generally, the focus of this Draft SEIS appears to be on SMB releases. For Spike Flow Alternatives, any analysis related to HFE releases appears to simply be subsumed into the analysis of the spike flows. For Non-Spike Flow Alternatives, the analysis for HFE releases seems minimal, and generally limited to geomorphology/sediment issues.

The combined effects of the SMB and HFE releases should be more fully analyzed and described in the Final SEIS.

Inconsistent Modeling Assumptions – The Draft SEIS contains several inconsistencies related to description of modeling assumptions, which should be addressed in the Final SEIS.

- *Temperature Targets*: The Draft SEIS inconsistently describes how flow alternatives would be implemented according to temperature and river mile targets. The initial modeling assumption section states that action alternatives are initiated if water temperatures *either* at river mile 15 or river mile 61 are at or above 15.5°C [page 2-4]. It also states that temperature targets for cold water alternatives were calculated *either* at river mile 15 or river mile 61 [e.g., page 2-8]. Later sections imply that the four bypass alternatives are designed to maintain temperature targets or a cold shock all the way down to the Little Colorado River (river mile 61) [e.g., pages 3-88 to 3-94] or would be initiated based on temperature at the Little Colorado River [e.g., page 2-15]. The Non-Bypass alternative is also described to be initiated based on forecasted temperatures in areas where spawning is observed, such as the -12-mile slough [e.g., pages 2-17, 3-95]. The Final SEIS should ensure that all river mile implementation assumptions are consistent and expressly related to mainstem temperature targets *either* at river mile 15 or 61.
- *Description/ Purpose of Flow Spikes*: Throughout the Draft SEIS, flow spikes are sometimes referenced for the purposes of cooling side channel habitat [e.g., pages 2-1, 3-12] and sometimes referenced for the purpose of increasing velocities to reduce spawning habitat [e.g., pages 2-8, 2-20]. While flow spikes may accomplish both, the Final SEIS needs to be clear about the primary intent of flow spikes, as temperature and velocity are two different variables.
- *Timing of Flow Spikes*: The Draft SEIS inconsistently describes when flow spikes may be available or implemented. As an example, the Draft SEIS notes that flow spikes could occur during 1) May, June, July, August, and September [e.g., page 2-17], 2) during May to July [e.g., page 3-103], and 3) June to mid-July [e.g., page 3-103]. The timing of flow spikes should be a consistent assumption and reflected as such throughout the Final SEIS.

4. **Resource Considerations**

Risk to Humpback Chub (HBC) – The Draft SEIS does not provide specifics or provide a risk assessment on the threat posed by SMB located between Glen Canyon Dam and Lees Ferry (river mile 0), to the population of HBC primarily located at river mile 61 near the Little Colorado River, beyond generally referencing the large impacts to HBC populations from SMB in the Upper Colorado River Basin. The Final SEIS would benefit from modeling the rate and time of the expansion of SMB into HBC habitat using assumptions for temperature, population growth and expansion and other parameters. On page 3-68, the Draft SEIS states the modeling used for SMB is currently not linked to other population

models, including the HBC; therefore, it is not clear whether SMB would prove to be a significant threat to the threatened species. Also, noted on page 3-86, high velocities of HFE releases could displace nonnative fish, such as green sunfish (*Lepomis cyanellus*) and SMB, into population centers of HBC, where nonnative fish prey on and compete with the native fish. Adding specifics in the Final SEIS could provide a rationale for not only the Proposed Action, but also the selection of the preferred Alternative.

The Draft SEIS discusses how increasing water temperatures has helped HBC populations grow as it increases their hatching success, larval survival and larval and juvenile growth, improved swimming ability, and reduced predation vulnerability (Hamman 1982; Ward 2011; Ward and Morten-Starner 2015). Therefore, the effects of the operational alternatives target temperature of 15.5°C should be analyzed and presented in the Final SEIS as they may negatively impact HBC, which have been shown to have increased survival and success due to warmer water temperatures.

Biological Assessment – The Draft SEIS mentions on page-4-3 that a Biological Assessment (BA) was developed in relation to LTEMP. Because there is no citation, it is unclear if this is a reference to the original LTEMP BA or a new BA related to the LTEMP Draft SEIS.