BUREAU OF RECLAMATION

Glen Canyon Dam Long-Term Experimental and Management Plan Draft Supplemental Environmental Impact Statement

Draft SEIS Public Meeting

February 2024

BUREAU OF RECLAMATION

Glen Canyon Dam Long-Term Experimental and Management Plan Draft Supplemental Environmental Impact Statement (LTEMP SEIS)

Virtual Public Draft SEIS Meetings – February 16, 20, and 22, 2024

For technical support, please contact Jessica Sams: jessica.sams@swca.com

Draft SEIS Public Meeting Agenda

- Introductory Remarks and Welcome
- Presentation
- Question and Answer Session
- Closing Remarks

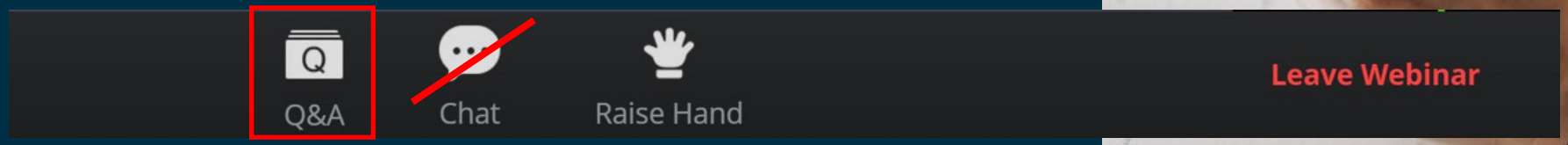
Zoom Orientation

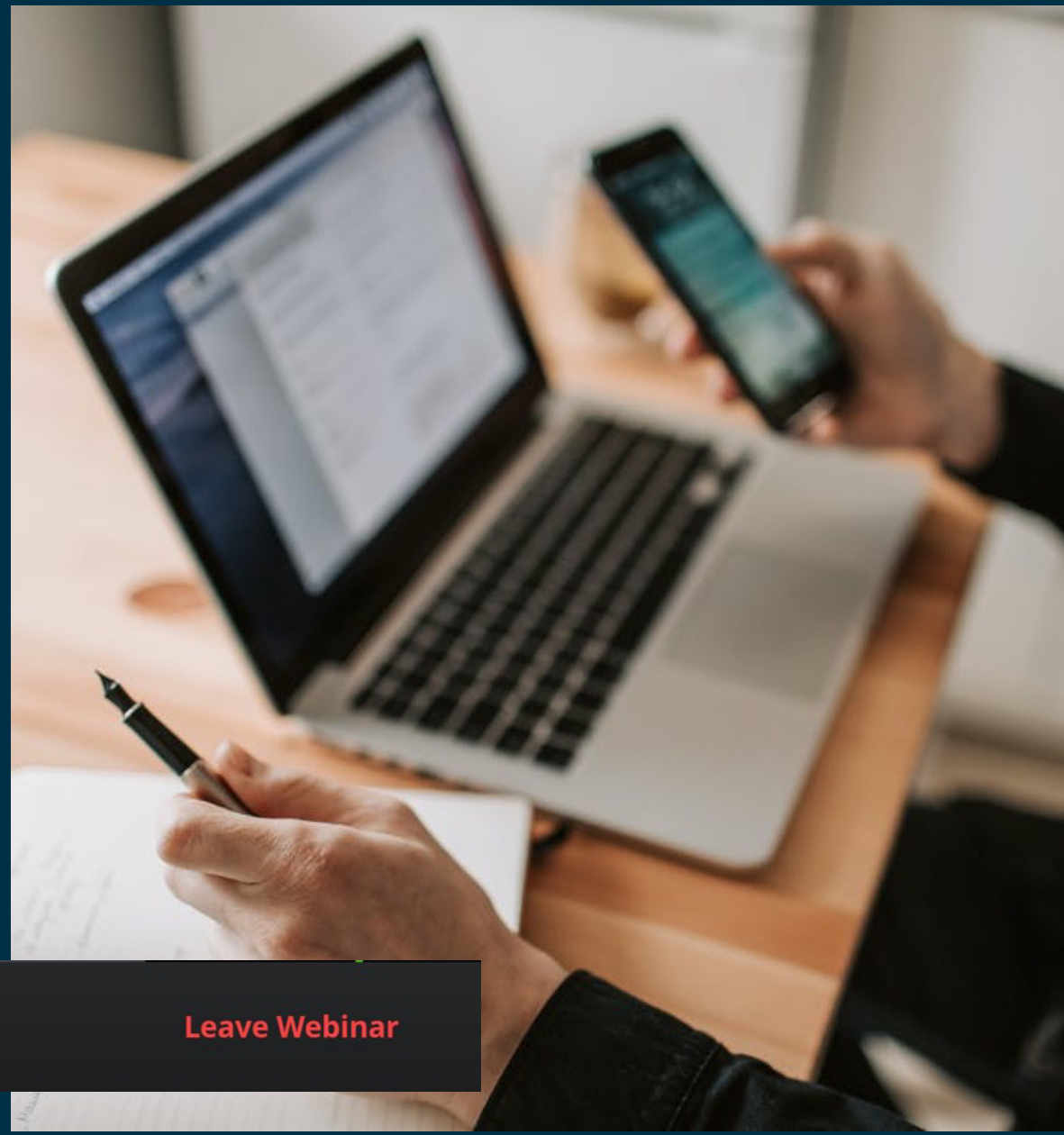
Webinar is being recorded

Microphones are muted

Chat feature is turned off

Submit questions using Q&A during at any time during the presentation or Q&A session

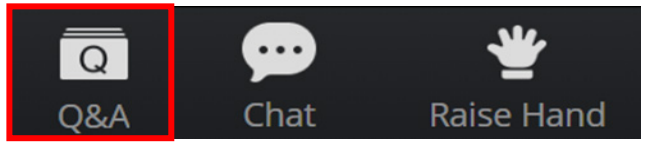




Questions about the Presentation?

How to submit a question

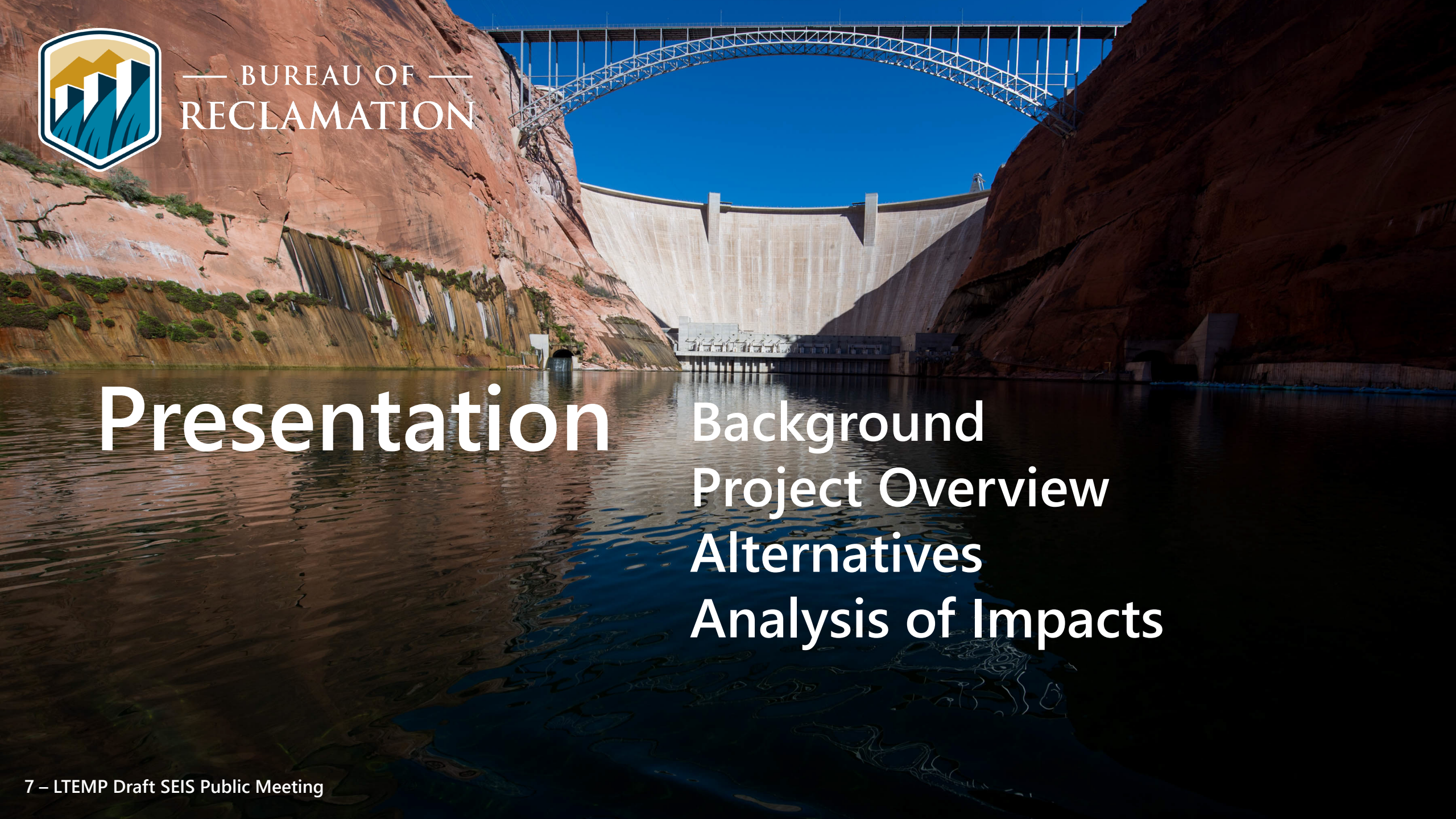
- Click the Q&A button
- A box will pop up
- Type your question
- Click send
- Responses to questions will appear in the Q&A box



Questions are not part of the project record

Welcome

Wayne Pullan, Regional Director
Bureau of Reclamation
Upper Colorado Basin Region



Presentation

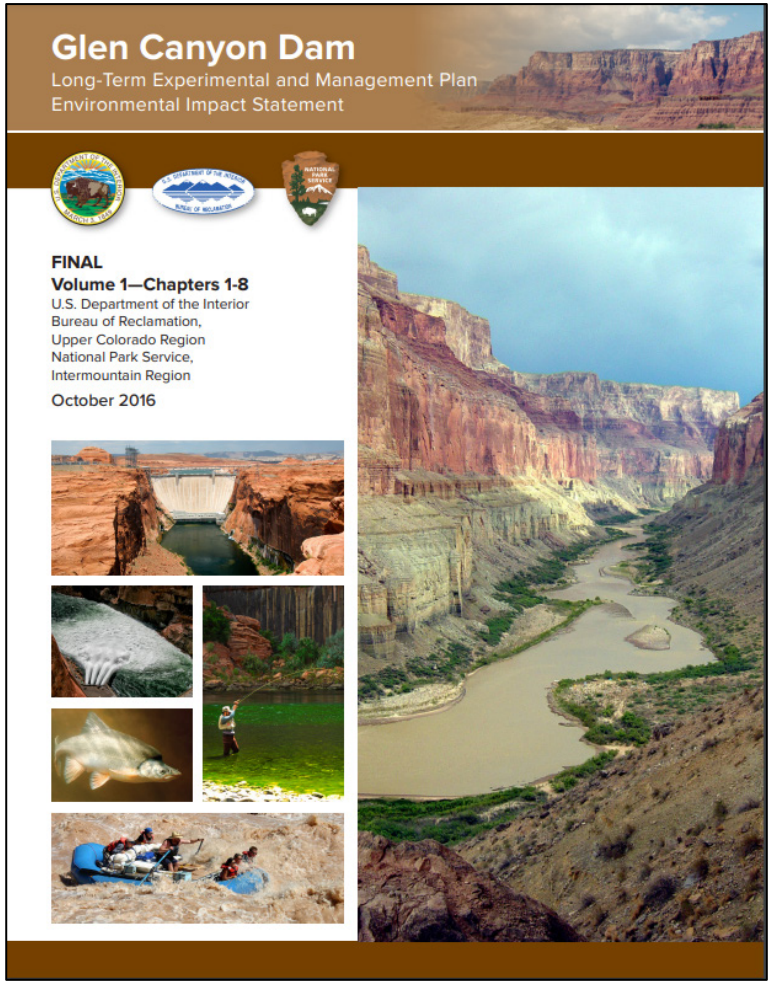
Background
Project Overview
Alternatives
Analysis of Impacts

Background

LTEMP Record of Decision

December 2016 - Reclamation published the *Long- Term Experimental and Management Plan* (LTEMP) *Record Of Decision*

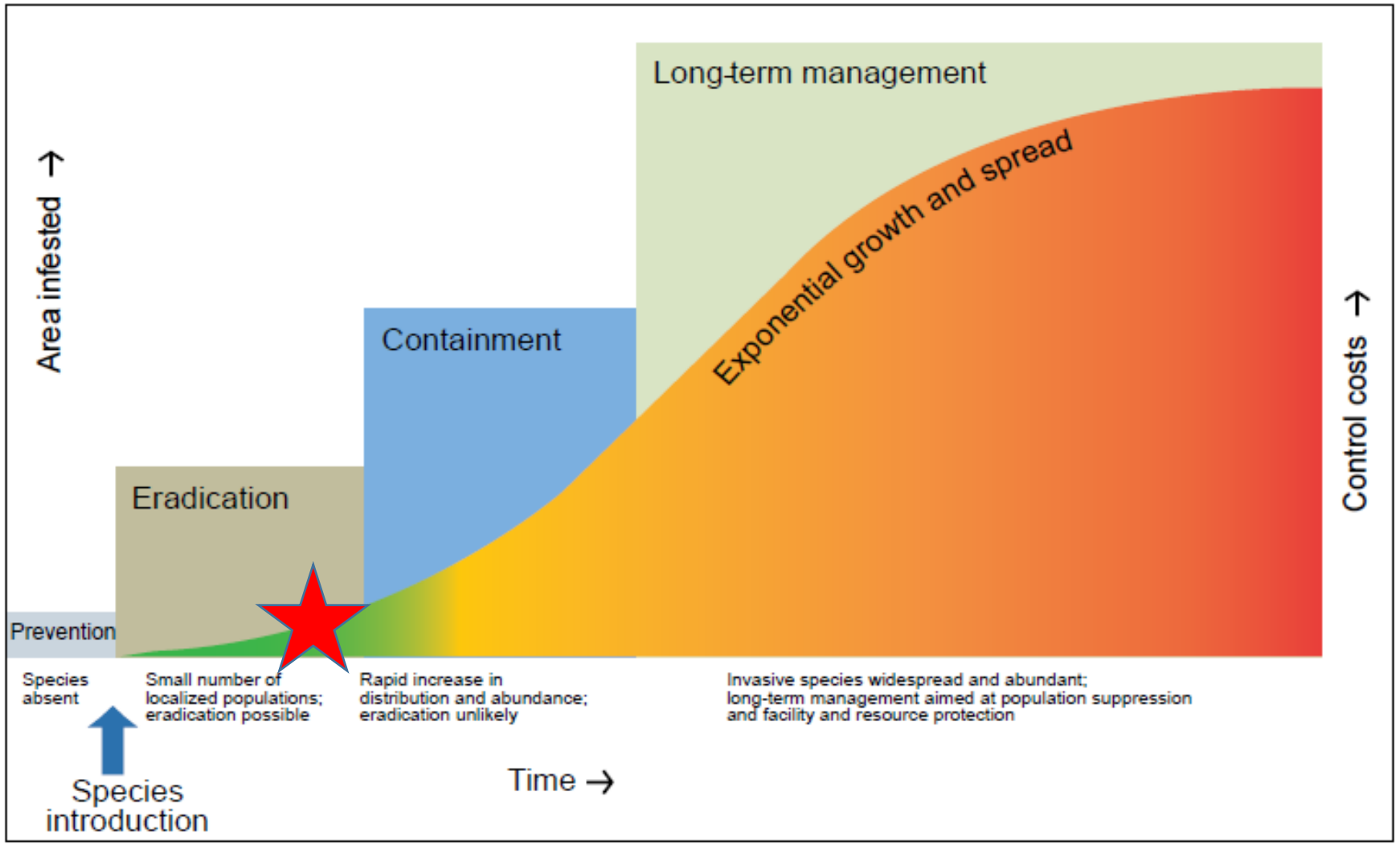
- Provides a framework for adaptively managing Glen Canyon Dam operations consistent with the Grand Canyon Protection Act (GCPA).
- Identifies specific options for dam operations based on timing of hourly, daily, and monthly release patterns.
- Identifies appropriate experimental and management actions that meet the GCPA's requirements, hydropower production, and improving downstream resources, including those important to American Indian tribes.



Warm Water Non-Native Species

- The prolonged drought in the Colorado River Basin is resulting in lower reservoir elevations.
- The *epilimnion* (upper layer of water) where most fish reside is closer to the Glen Canyon dam's intakes.
- Nonnative fish in Lake Powell are now more likely to pass through the dam and downstream into the Colorado River.
- Water below the dam is now warmer making conditions suitable for warmwater nonnative fish including smallmouth bass.
- Smallmouth bass and other predatory non-native fish pose a threat to federally listed fish species and other native fish downstream.

The Invasion Curve from DOI Invasive Species Strategic Plan (2021-2025)



High Flow Experiments (HFEs)

- HFEs are experiments to further understanding of incorporating high water releases into future dam operations to maintain or improve beaches, sandbars, and associated habitat.

Relationship of the LTEMP SEIS to other Colorado River planning activities

	NEAR-TERM COLORADO RIVER OPERATIONS (Interim Guidelines SEIS)	Glen Canyon Dam Long-Term Experimental and Management Plan (LTEMP SEIS)	LONG-TERM COLORADO RIVER OPERATIONS (Post-2026 Process)
PLANNING EFFORT			
RANGE OF OPERATIONS	Limited sections of the 2007 Interim Guidelines Focused on annual releases	Limited sections of the 2016 LTEMP ROD; Sub-annual flows – timing of hourly, daily, monthly releases from Glen Canyon Dam	Revisit all sections of the 2007 Interim Guidelines and other operating agreements that expire in 2026. Focused on annual releases
DURATION	2024 – 2026 (3 YEARS)	2024 – 2027 (Flow Alternatives) 2024 – 2036 (HFE protocol)	2026 AND BEYOND

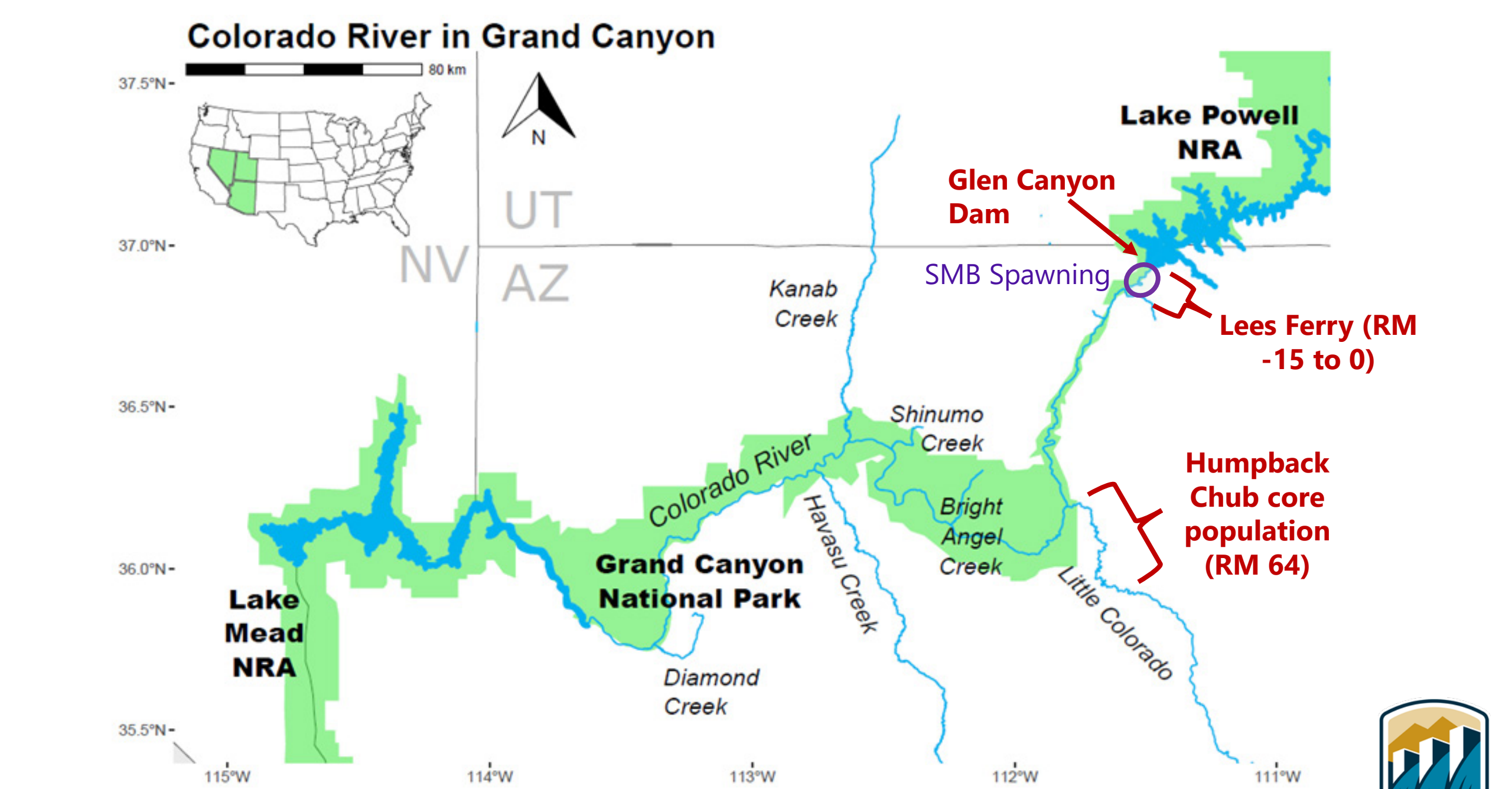
Project Overview

LTEMP Supplemental Environmental Impact Statement

- **June 19, 2023** – Reclamation was directed to prepare a **Supplemental Environmental Impact Statement** (SEIS) to the December 2016 Record of Decision for the Glen Canyon Dam Long-Term Experimental and Management Plan (LTEMP) Final Environmental Impact Statement

- **October 4, 2023** - **Notice of Intent** was published in the *Federal Register* announcing the LTEMP SEIS and requesting scoping input

- **February 9, 2024 – Notice of Availability** was published in the *Federal Register* announcing the draft LTEMP SEIS and starting 45-day public comment period


Colorado River in Grand Canyon
80 km
N
37.5°N
37.0°N
36.5°N
36.0°N
35.5°N
115°W
114°W
113°W
112°W
111°W
UT
NV
AZ
Lake Powell NRA
Glen Canyon Dam
SMB Spawning
Lees Ferry (RM -15 to 0)
Kanab Creek
Shinumo Creek
Colorado River
Bright Angel Creek
Humpback Chub core population (RM 64)
Havasu Creek
Little Colorado
Grand Canyon National Park
Lake Mead NRA
Diamond Creek

Proposed Federal Action

Humpback Chub

- Analyzing range of reservoir releases with varying combinations of temperature and release volumes to assess effectiveness in disrupting smallmouth bass spawning and preventing recruiting populations from expanding.
- Examines the sediment accounting periods associated with the HFE protocol analyzed in LTEMP

Purpose and Need

- The **purpose** of the LTEMP SEIS is for Reclamation to analyze additional flow options at Glen Canyon Dam in response to the nonnative smallmouth bass and other warmwater nonnative species recently detected directly below the dam.
- The **need** is to disrupt the establishment of smallmouth bass below Glen Canyon Dam by limiting additional recruitment, which could threaten populations of threatened humpback chub below the dam.
- The LTEMP SEIS also considers the HFE protocol in the LTEMP FEIS by including the latest scientific information to improve Reclamation's ability to implement HFE releases. Specifically, Reclamation is considering adjusting sediment accounting periods and HFE implementation windows.

Cooperating Agencies

- Federal cooperating agencies include:
    - National Park Service
    - U.S. Fish and Wildlife Service
    - Bureau of Indian Affairs
    - Western Area Power Administration
- Twelve additional state, Tribal, and public utility agencies
- U.S. Geological Survey is providing scientific and modelling support

LTEMP SEIS: Schedule

◆ Key NEPA Process milestones – Opportunities for Tribal, State, Partner, Stakeholder, and Public engagement

Alternatives Analyzed

Alternatives

- **No Action** – Glen Canyon Dam operations will continue as defined in the 2016 LTEMP ROD.

Cold Water Alternatives

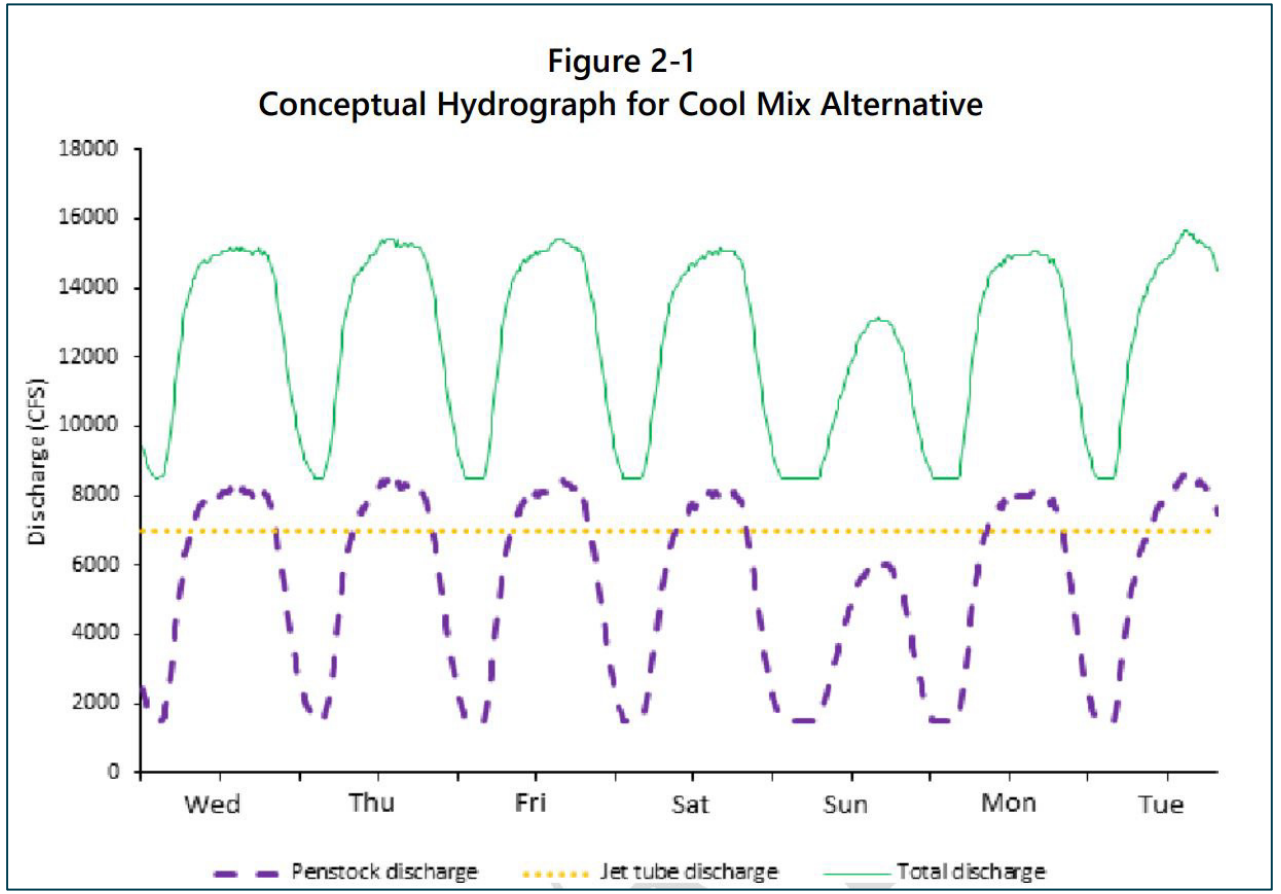
- **Cool Mix Alternative**
- **Cool Mix with Flow Spike Alternative**
- **Cold Shock Alternative**
- **Cold Shock with Flow Spike Alternative**

- **Non-Bypass Alternative**

HFE Protocol Update is Common to all Action Alternatives

Cool Mix Alternative

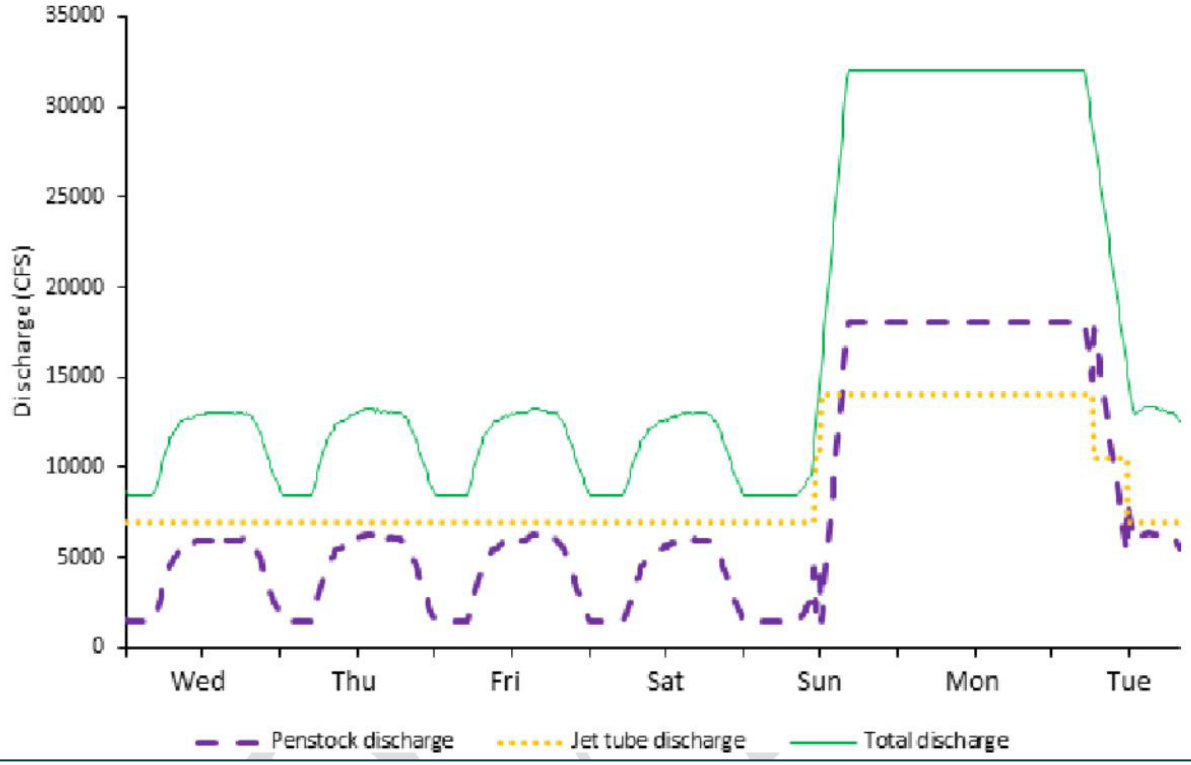
- Strategic water releases from both the penstocks and river outlet works to maintain a daily average water temperature below 15.5°C (60°F) as far down as the Little Colorado River (RM 61).
- Bypass release quantity would vary based on predicted temperatures and monthly water volumes, ensuring the minimum necessary release to meet the water temperature goal
- Implementation would occur weekly.



Cool Mix with Flow Spike Alternative

- Operate in a manner similar to the Cool Mix Alternative, by disrupting smallmouth bass spawning.
- Includes up to three 8-hour flow spikes in addition to those under the Cool Mix Alternative.
- Flow spikes would release water through penstocks and river outlet works to maintain the target temperature in margin habitats such as the minus 12-mile slough.

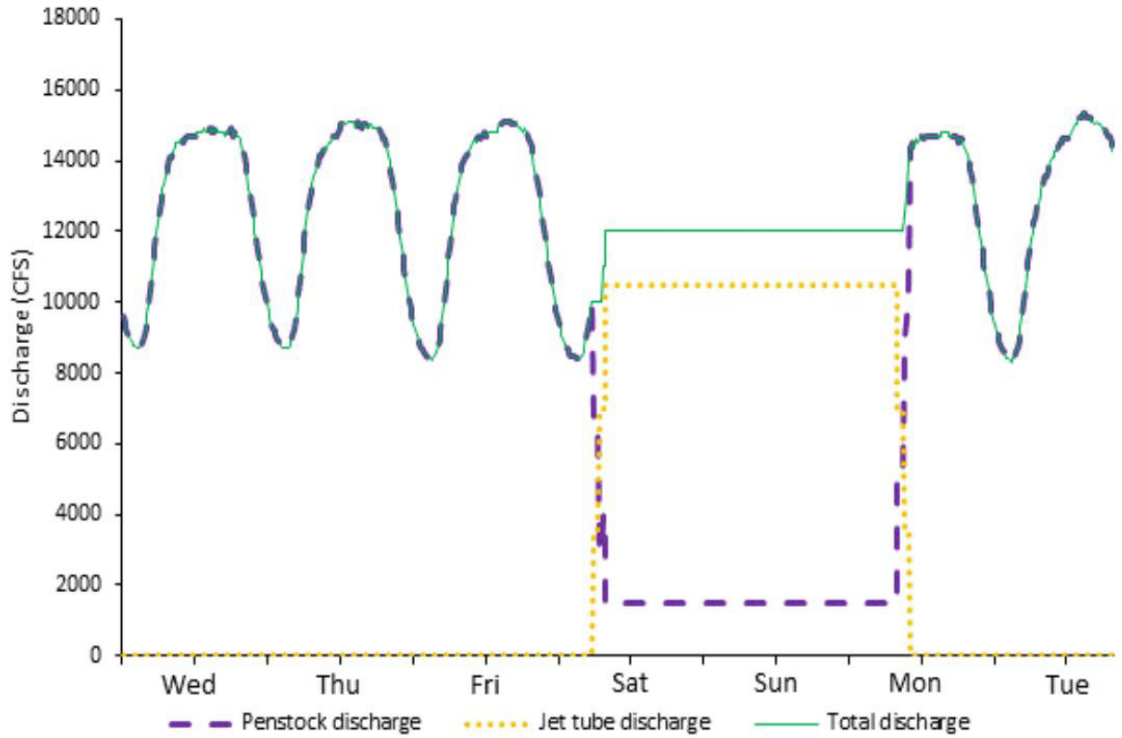
Figure 2-2
Conceptual Hydrograph for Cool Mix with Flow Spike Alternative



Cold Shock Alternative

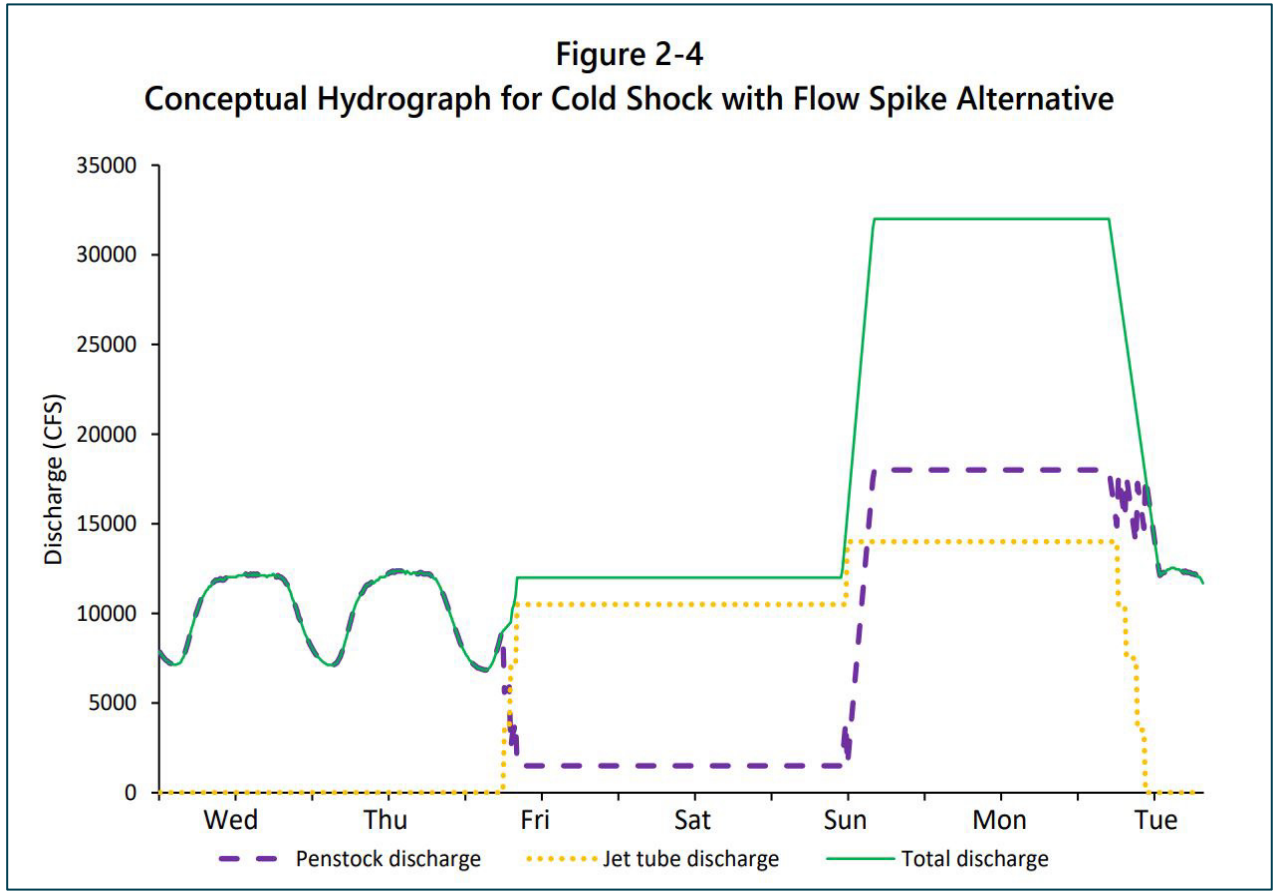
- Induce a cold shock, targeting temperatures of 13°C (55°F) as far down as the Little Colorado River (RM 61).
- Triggered when temperatures rise above 15.5°C (60°F) and would occur for 48 hours on a weekly schedule for 12 weekends.
- Release amount would vary based on temperature conditions and capacity considerations.

Figure 2-3
Conceptual Hydrograph for Cold Shock Alternative



Cold Shock with Flow Spike Alternative

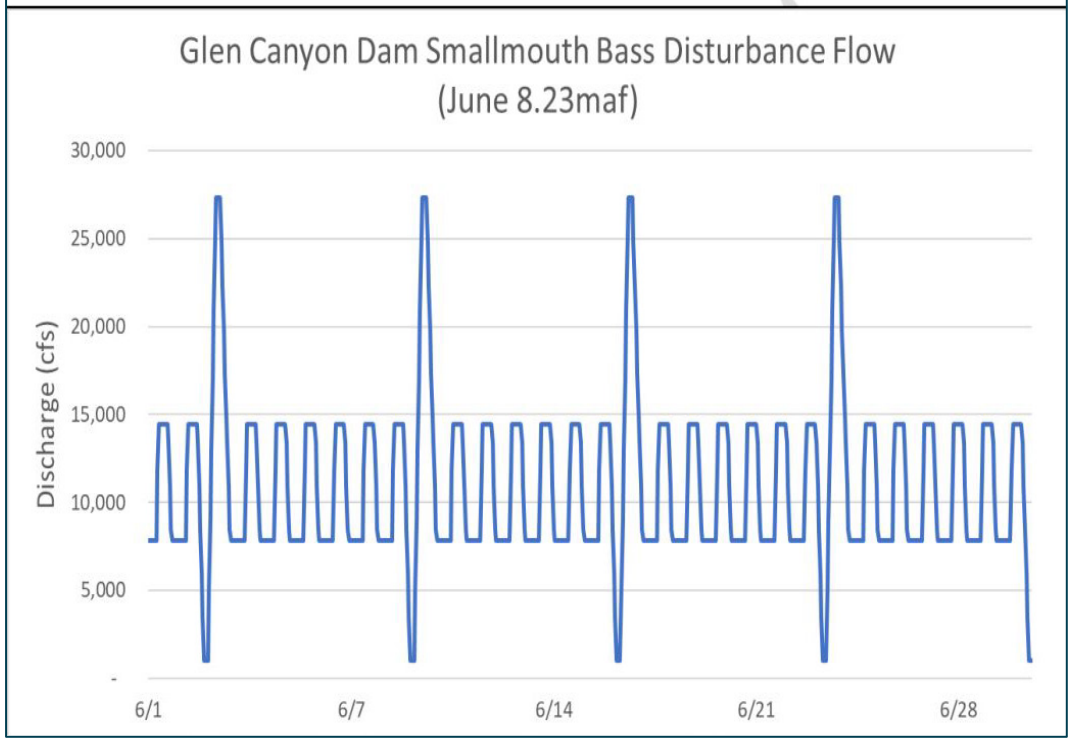
- Combining cold shocks and flow spikes
- Initiated when daily water temperatures at either Lees Ferry or the Little Colorado River reach 15.5°C (60°F).
- Includes weekly 48-hour cold-shock releases and up to three 8-hour flow spikes.
- Release quantity based on predicted temperatures, with flow spikes aiming to disrupt spawning in margin habitats.



Non-Bypass Alternative

- Focus on disrupting smallmouth bass nests and spawning activities below Glen Canyon Dam
- Once-weekly, short-duration, low-flow release (~2,000 cfs) immediately followed by a short-duration high flow (up to 27,300 cfs)
- Repeated weekly once water temperatures are forecasted to rise above 15.5°C (60°F) in areas where smallmouth bass are observed spawning (for example, the 12-mile slough) to disrupt renesting.

Figure 2-5
Conceptual Hydrograph of the Non-Bypass Alternative



Common to All Action Alternatives

Operations would continue pursuant to the continued implementation of existing agreements that control operations of Glen Canyon Dam.

HFE Sediment Accounting Window

- Reclamation would implement changes to the sediment accounting period and implementation windows.
- Changes would consist of adjusting the semiannual sediment accounting period to an annual period with the option for a spring and/or a fall High Flow Event (HFE).

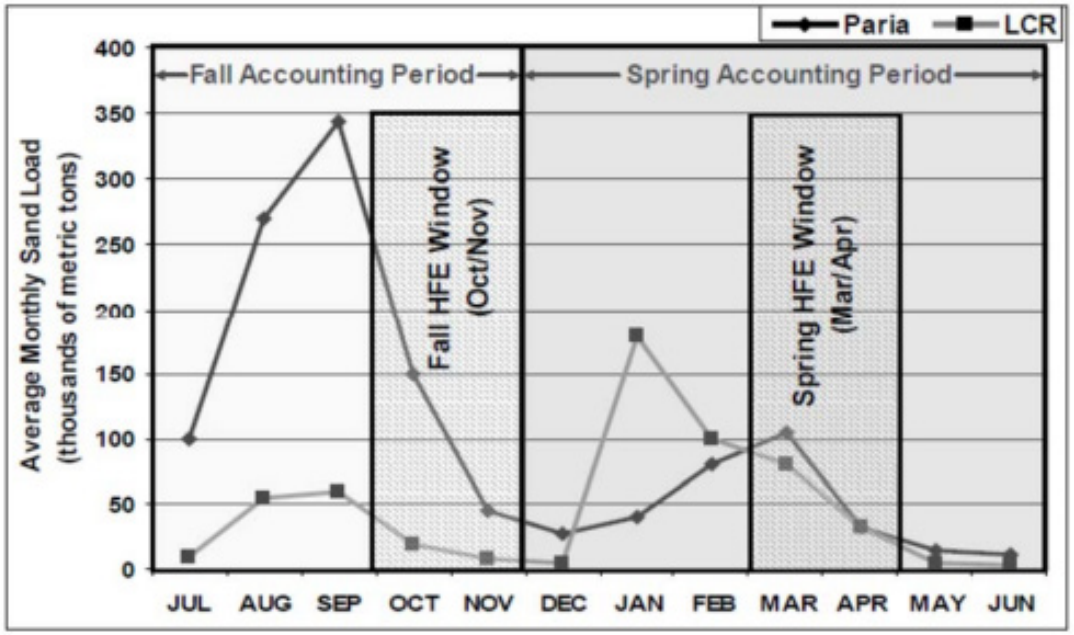


FIGURE 1 Average Monthly Sand Load from the Paria River and Little Colorado River Showing the Fall and Spring HFE Accounting Periods and Implementation Windows

Analysis of Impacts

Resources Analyzed in Detail – Chapter 3

- Energy and Power
- Geomorphology/Sediment
- Aquatic Resources
- Special Status Species
- Tribal Resources
- Cultural Resources
- Environmental Justice
- Hydrologic Resources
- Climate
- Socioeconomics
- Recreation
- Water Quality
- Terrestrial Resources and Wetlands
- Wildlife
- Air Quality
- Visual Resources

Energy and Power – Section 3.3

Issue Areas:

- Generation
- Economic Analysis

Energy and Power – Section 3.3

No-Action Alternative - Power generation and revenue from power sales would continue, similar to historical levels, depending on hydrologic and grid conditions

Generation:

- All cold-water alternatives estimate a loss of power generation ranging from 1.6% to 0.5%; greatest loss under Cool Mix, smallest loss under Cold Shock and Cold Shock with Spike Flow
- Non-Bypass alternative shows small gain of power generation of 0.1% to 0.3%

Economic Analysis

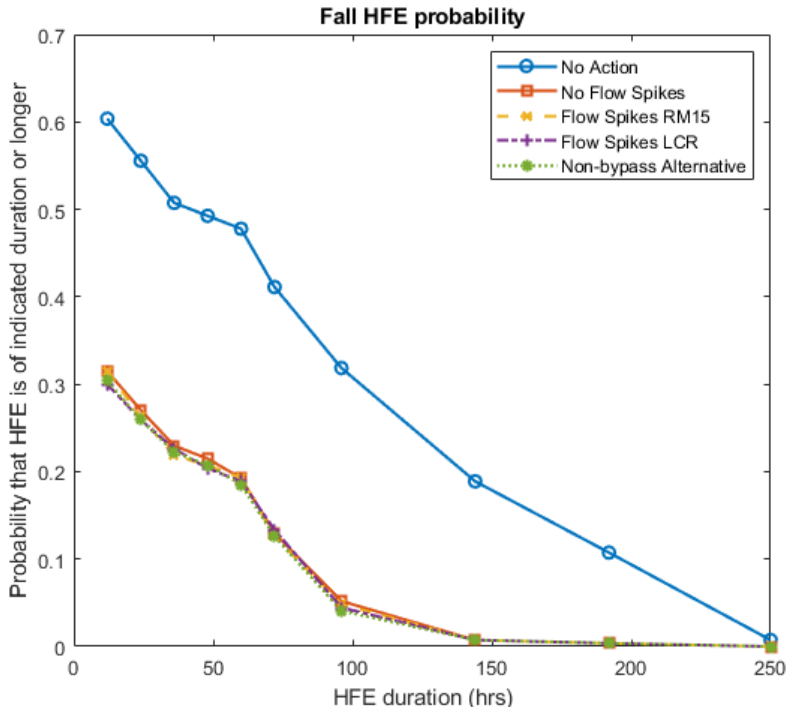
- All cold-water alternatives estimate a loss of economic value ranging from 2.2% ($26.2 million) to 0.6% ($6.5 million); greatest loss under Cool Mix, smallest loss under Cold Shock
- Non-Bypass alternative shows small gain of economic value of 0.1% (~$1million)

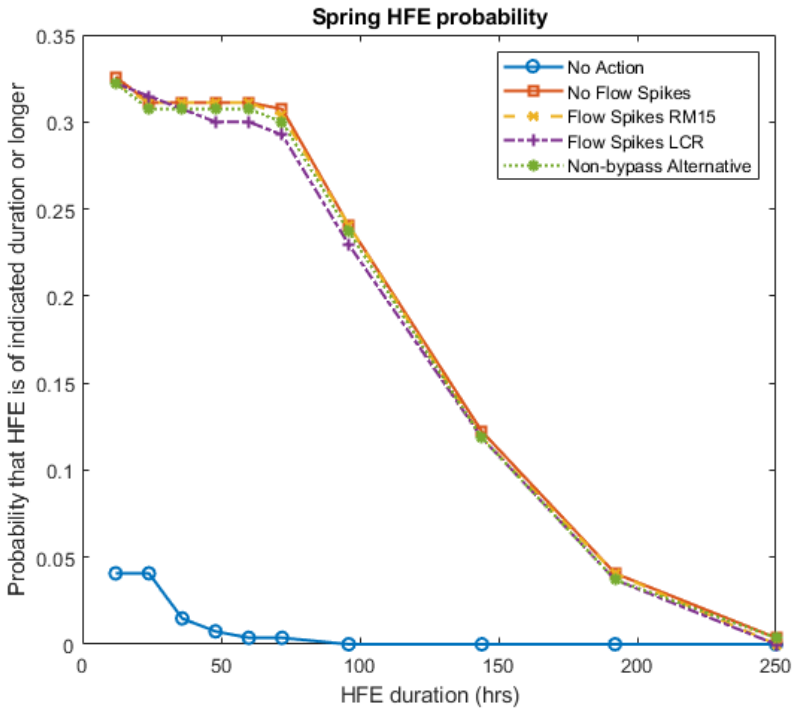
Geomorphology and Sediment – Section 3.4

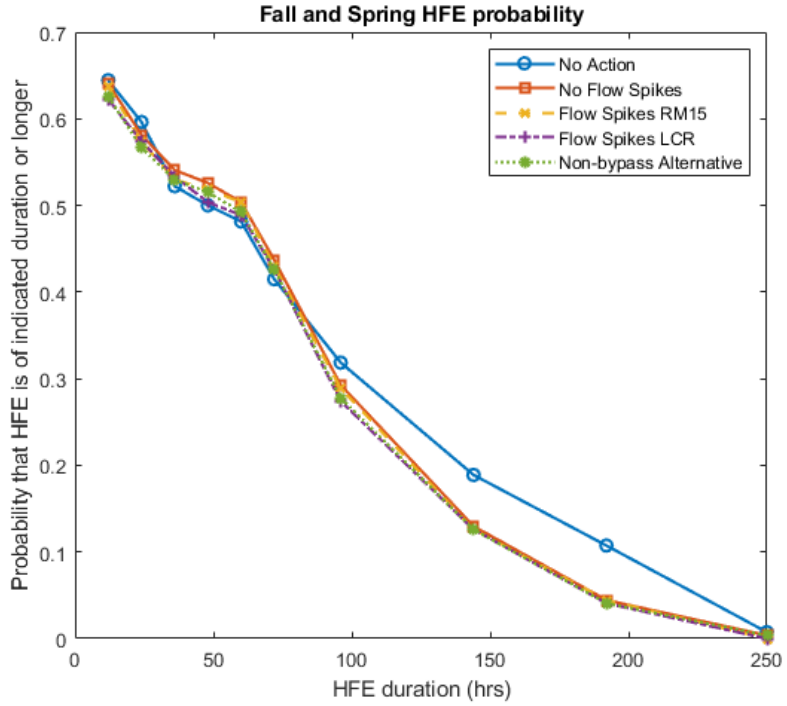
Issue Areas:

- Sediment transport
- Erosion
- Deposition
- Beach-building conditions

Geomorphology and Sediment – Section 3.4







Geomorphology and Sediment – Section 3.4

Flow Spike Alternatives

- In some years, flow spikes would cause sand export in the lead up to HFE implementation, which would reduce the resulting HFE duration.
- Flow spikes would decrease mass balance at Marble Canyon to a slightly greater extent relative to the alternatives without flow spikes, while contributing slightly more volume to sandbars.

Aquatic Resources & Status Species Section 3.5, 3.7, 3.8

Issue Areas:

- Fish
- Threatened and Endangered species
- State and Tribal sensitive species
- Foodbase

Aquatic Resources & Status Species (Fish)
Section 3.5, 3.7, 3.8

No-Action Alternative

- Under lower Lake Powell elevations Smallmouth bass would likely continue to pass through the dam and temperatures below the dam would be suitable for spawning increasing the risk of predation on native fish.

Cold Water Alternatives

- Cool temperatures could delay or disrupt maturation and spawning by smallmouth bass
- Other fish species and the aquatic food base have experienced cool releases; therefore, they are not expected to be negatively affected.

Non-Bypass Alternative

- The Non-Bypass Alternative could disrupt smallmouth bass spawning by changing the water velocity.
- This could lead to nest abandonment and mortality of smallmouth bass eggs and larvae.

Aquatic Resources & Status Species (Fish)
Section 3.5, 3.7, 3.8

No Action: 17% of traces show smallmouth bass population growth through 2027.

Cool Mix: 0% of traces show smallmouth bass population growth through 2027.

Cool Mix with Flow Spike: 0% of traces show smallmouth bass population growth through 2027.

Cold Shock: 10% of traces show smallmouth bass population growth through 2027.

Cold Shock with Flow Spike: 10% of traces show smallmouth bass population growth by 2027.

Non-Bypass: 17% of traces show smallmouth bass population growth by 2027, however growth is smaller compared to no action.

Aquatic Resources & Status Species (Aquatic Foodbase) Section 3.5, 3.7, 3.8

All Cold-Water Alternatives

- The cooler temperatures are not expected to negatively affect the aquatic food base.
- Short-term spike flows would scour the benthos, but the food base reduction would be temporary.

Non-Bypass Alternative

- High flows within the powerplant's capacity are not expected to negatively affect the food base in the Lees Ferry reach or farther downstream. However, weekend flows of 2,000 cfs would desiccate much of the river bottom.

Tribal Resources – Section 3.13

Issue Areas:

- Mortality of fish, which are contributing elements to traditional cultural properties (TCPs)
- Exposure and increased visitation to sacred sites and archaeological sites
- Changes in vegetation important to Tribes

Tribal Resources – Section 3.13

No Action Alternative

- Operations at Glen Canyon Dam would not change; no change in fish mortality.
- No additional impacts on archaeological or sacred sites.
- Riparian vegetation would follow current trends.

All Cold-Water Alternatives

- No additional impacts on archaeological or sacred sites.

All Action Alternatives

- Differences in vegetation communities would be minor.

Tribal Resources – Section 3.13

Cool Mix Alternative

- Would not result in fish mortality.

Cool Mix with Spike Flow Alternative

- May result in fish mortality.

Cold Shock and Cold Shock with Flow Spike Alternatives

- May result in egg or larval fish mortality.

Non-Bypass Alternative

- Would result in the loss of life of eggs and fry.
- Low flows could result in the exposure of archaeological sites or sacred sites.

Cultural Resources – Section 3.12

Issue Areas:

- Exposure of and increased visitation to resources (historic properties) as river levels fluctuate
- Sediment availability for wind-borne transport to protect resources downstream of the dam.

Cultural Resources – Section 3.12

No Action and All Action Alternatives

- No additional positive or negative impacts beyond those analyzed in the LTEMP FEIS for archaeological sites; no changes to available sediment for aeolian deposits on archaeological sites.

Non-Bypass Alternative

- Low flows may expose previously inundated historic properties.

Environmental Justice – Section 3.16

Issue Area:

- Disproportionate effects on minority and low-income populations

Environmental Justice – Section 3.16

No Action Alternative

- Operations at Glen Canyon Dam would not change; no impacts on environmental justice communities because of changes to power generation.

All Cold-Water Alternatives

- Reduced energy generation and increased replacement energy would result in financial impacts, changes to air quality, changes to tribal resources, changes to regional economic activity, and changes to use and nonuse values.

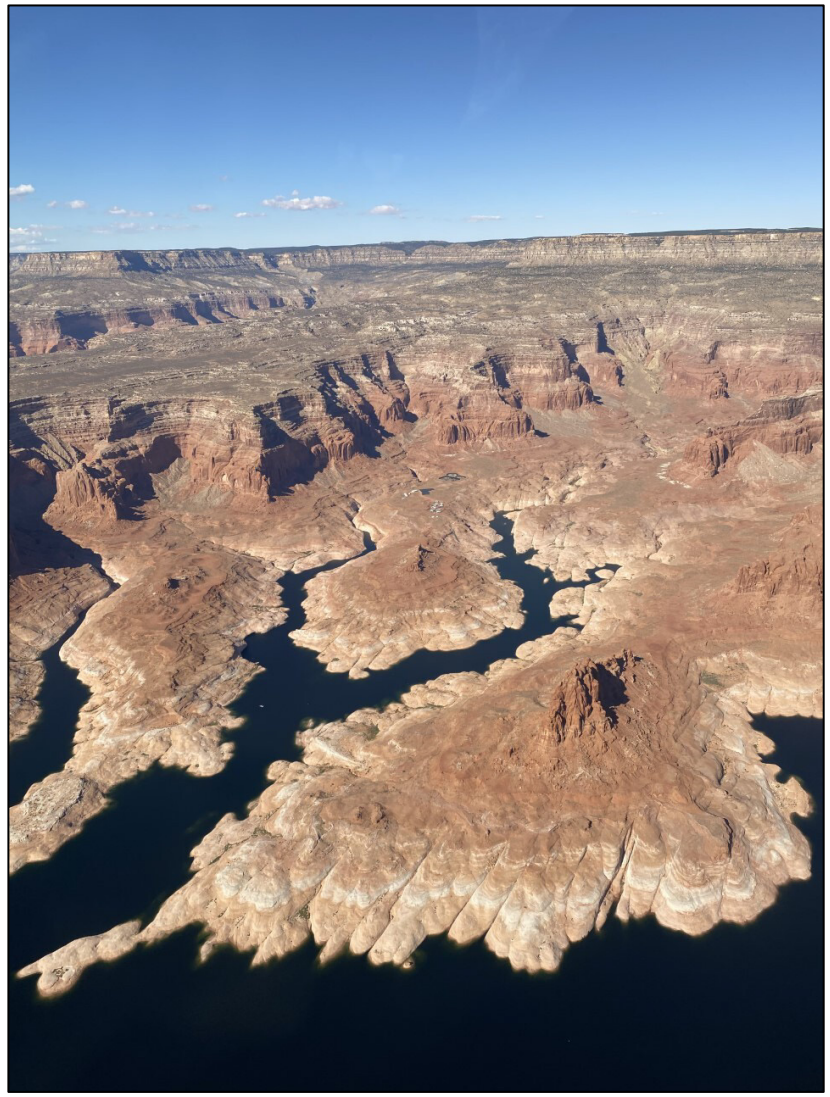
Non-Bypass Alternative

- Least impacts on hydropower generation and the least financial impacts.
- Gain in economic value of electric power that could benefit communities, including environmental justice communities.
- Most potential impacts on recreation and Tribal resources (through fish mortalities); a potential disproportionate adverse impacts for environmental justice communities.

Hydrologic Resources – Section 3.2

Issue Areas:

- Reservoir elevations
- Reservoir releases
- River flows



Hydrologic Resources – Section 3.2

No Action Alternative

- Operations at Glen Canyon Dam would not change; there would be no changes to the hydrology. Reservoir elevations and release volumes would follow current trends.

Cool Mix and Cold Shock Alternatives

- Hydrology impacts (reservoir elevations, releases, river flows) would be temporary and would not exceed the cumulative impacts on water resources as identified in the LTEMP FEIS.

Hydrologic Resources – Section 3.2

Cool Mix and Cold Shock with Flow Spike Alternative

- Increased flow rates from the flow spikes would temporarily decrease water surface elevations in Lake Powell.
- No long-term impacts on hydrology are anticipated.

Non-Bypass Alternative

- The minimum and maximum proposed flows would exceed the maximum daily range as developed in the LTEMP ROD.
- Monthly and annual release volumes would be the same as those under the cold-water alternatives.

Climate – Section 3.17

Issue Area:

- Greenhouse gas (GHG) emissions from alternative power sources

Climate – Section 3.17

No Action Alternative

- Operations at Glen Canyon Dam would not change hydropower generation; no change in climate trends as a result of GHG emissions that would occur from replacing any portion of electric generation with power generated from sources that emit GHGs (for example, coal, oil, and natural gas).

All Cold-Water Alternatives

- Hydropower generated at the Glen Canyon Dam Powerplant would be reduced and need to be replaced by other sources within the 11-state Western Interconnection region.
- Replacement sources, including higher-cost sources such as coal, natural gas, and oil, would result in increased GHG emissions.
- Cool Mix shows largest increase and Cold Shock with Flow Spike shows lowest increase.

Socioeconomics – Section 3.15

Issue Areas:

- Net value from recreation activities
- Environmental nonuse value

Socioeconomics – Section 3.15

No Action Alternative

Recreation Value: Estimated net value for 50-month analysis period calculated at $366.76 million for whitewater boaters and $19.03 million for anglers.

Nonmarket Values may differ for different groups.

- Humpback chub: non-market value decrease in the long term.
- Sandbars: HFE releases could continue to impact sandbar development and the associated values.

All Cold-Water Alternatives

Recreation Value: Impacts vary by alternative; from minimal changes to small increases in the net value for anglers and whitewater boaters for all reaches.

Nonmarket Values Potential for benefits to long term values associated with humpback chub existence and environmental values associated with sandbars.

Socioeconomics – Section 3.15

Non-Bypass Alternative

Recreation Value

- Short-term impacts for angler satisfaction.
- The high and low fluctuations of water could impact the boater experience in both the Glen Canyon and Grand Canyon reaches. This could adversely impact the associated value.

Non-Market Value

- Short-term impacts on humpback chub juveniles from flow changes; however, the effect of these high flows is expected to be minimal; no long-term changes.
- Trends in sandbar building similar to other action alternatives.
- Trends in sandbar building would be similar to those produced under other action alternatives. As a result, no long-term changes to associated values are anticipated.

Recreation – Section 3.14

Issue Areas:

- Whitewater boating
- Fishing

Recreation – Section 3.14

Whitewater Boating

No Action and All Action Alternatives

- Disruption of Glen Canyon rafting opportunities for concessionaire rafting visitors.
- HFE releases would result in a potential increase in camping areas for boaters in the Grand Canyon.

Flow Spike Alternatives

- Likely improve whitewater boating conditions in the Grand Canyon but could temporarily limit beach usability for camping during implementation.
- Flow spikes have the highest potential to increase camping areas in the Grand Canyon.

Non-Bypass Alternative

- The low flows could limit the ability of boats to freely navigate in the Glen Canyon reach, which would adversely impact boating and the rafting concessionaire in the short term.
- In the Grand Canyon, minimum flows would be below the safe whitewater minimum, which would adversely affect whitewater boating

Recreation – Section 3.14

Fishing

No Action - Implementation of HFE releases would continue to result in reduced short-term angler satisfaction in Glen Canyon

Cool Mix - Reduced water temperatures would improve water quality for rainbow trout.

Cold shock – Likely adverse impacts on fry and early juveniles; Cooler water temperatures would likely improve the water quality for rainbow trout in the long term.

Flow Spikes - Reduced water temperatures would improve water quality for rainbow trout; reduced catchability during the peak fishing months.

Non-Bypass - Fry and juveniles would be negatively affected by both the high and low flows; rapid fluctuations in water levels could disrupt fishing; less likely to benefit the rainbow trout fishery by reducing water temperatures as compared with the cold-water alternatives.

Ways to Comment

Send an email: **LTEMPSEIS@usbr.gov**

By mail to:

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

45-day comment period closes March 25, 2024

Need Information?

Project Website: https://www.usbr.gov/uc/progact/amp/index.html

- Slide Presentation available on the Project Website

Send questions to: LTEMPSEIS@usbr.gov

Kathleen Callister, Adaptive Management and Water Quality Division Manager, Bureau of Reclamation: (801) 524–3867

Question and Answer Session

BUREAU OF RECLAMATION

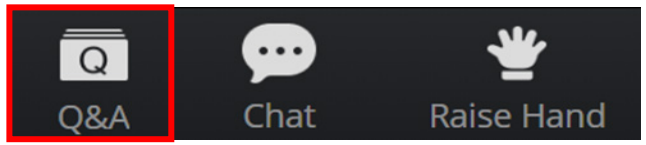
Question and Answer Guidelines

- This is a period to ask **clarifying questions** about the presentation. Questions are not part of the official record.
- Please keep questions as focused and brief as possible so we have time to answer as many questions as we can.
- Please speak respectfully and remember that this virtual event is designed to be viewed in homes across the country in real time.
- Profanity is not acceptable.

Question and Answer

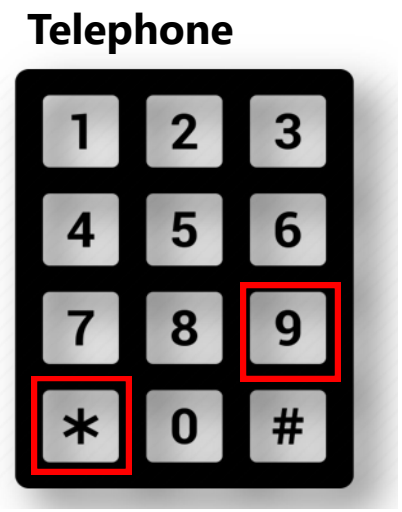
To ask a WRITTEN question

- Click the Q&A button
- A box will pop up
- Type your question
- Click send
- Question may be responded to live or in the Q&A box



To ask a VERBAL question

- If joining by phone, press *9 to raise your hand to ask a verbal question
- Facilitator will call your name
- Click unmute to speak



Additional Questions?

Send questions to: LTEMPSEIS@usbr.gov

Kathleen Callister, Adaptive Management and Water Quality Division Manager, Bureau of Reclamation: (801) 524–3867

Or attend a future Public Meeting:

Tues, February 20, 2024, 5:30 p.m. – 7:00 p.m. Mountain time

Thurs, February 22, 2024, 12:00 p.m. – 1:30 p.m. Mountain time

Closing Remarks

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