



Public Meeting on Preliminary Alternative Concepts for Glen Canyon Dam Long-Term Experimental and Management Plan Environmental Impact Statement (LTEMP EIS)

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Agenda for April 4th Meeting

- Welcome, Introductions, Agenda Review, and Meeting Overview
- Project Background
- Presentation of Preliminary Alternative Concepts
- Continued Presentation of Preliminary Alternative Concepts
- Presentation of Additional Suggested Alternative Concepts
 - *Living Rivers, Glen Canyon Institute, John Jordan (Recreational Fishing), Grand Canyon Private Boaters Association*
- Closing

Lunch will occur at 12:00 and we will take two breaks (am and pm)



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Agenda for April 5th Meeting

- Welcome and Agenda Review
- Continued Presentation of Additional Suggested Alternative Concepts
- Breakouts on Alternative Concepts
- Plenary to Debrief Breakouts
- Closing

Lunch will occur at 12:00 and we will take two breaks (am and pm)



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MEETING OVERVIEW



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What to Expect from the Meeting?

Meeting Objectives

- Present the preliminary alternative concepts to the public and stakeholders
- Provide the opportunity for stakeholders to provide meaningful input on the preliminary alternative concepts
- Listen to and consider suggested alternative concepts from stakeholders



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What to Expect from the Meeting?

- This is not an additional formal public comment period
- This is an additional step, not required by NEPA, to increase public involvement and transparency
- These are *preliminary* alternative concepts – extensive analysis has not been performed and many details do not yet exist
- This workshop is for the team to listen, decisions will not be made at this meeting



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PROJECT BACKGROUND

Purpose

To identify dam operations, management actions, and experimental options that will provide a framework for adaptively managing Glen Canyon Dam over the next 15 to 20 years consistent with the Grand Canyon Protection Act (GCPA) and other provisions of applicable federal law.

The proposed action is to develop a plan that will determine specific options for dam operations, non-flow actions, and appropriate experimental and management actions that will meet the GCPA's requirements and minimize impacts to resources, including those of importance to Indian Tribes.





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Need

The proposed action is needed to incorporate scientific information developed since the 1996 Record of Decision to better inform Department of the Interior decisions on dam operations and other management and experimental actions so that the Secretary continues to meet statutory responsibilities for protecting and improving Glen Canyon National Recreation Area and Grand Canyon National Park resources and values for future generations, conserving ESA-listed and other native species, respecting Indian Tribal interests, meeting water delivery obligations, and generating hydroelectric power.



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Objectives

- Develop an operating plan for Glen Canyon Dam in accordance with the Grand Canyon Protection Act 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, and in such a manner as is fully consistent with and subject to the Colorado River Compact, the Upper Colorado River Basin Compact, the Water Treaty of 1944 with Mexico, the decree of the Supreme Court in *Arizona v. California*, and the provisions of the Colorado River Storage Project Act of 1956 and the Colorado River Basin Project Act of 1968 that govern allocation, appropriation, development, and exportation of the waters of the Colorado River Basin.
- Ensure water delivery to the communities and agriculture that depend on Colorado River water.



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Objectives (cont)

- Consider potential future modifications to Glen Canyon Dam operations and other flow and non-flow actions to protect and improve downstream resources, particularly fine sediment retention and endangered fish in Grand Canyon National Park, and the recreational experience, including the trout fishery in Glen Canyon National Recreation Area.
- Maintain and increase Glen Canyon Dam capacity and energy generation to produce the greatest practicable amount of power and energy, consistent with recovery and long-term sustainability of downstream resources.
- Respect the interests and perspectives of the Indian Tribes.



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Objectives (cont)

- Make use of the latest science considering all relevant studies, especially those conducted since 1996.
- Determine the appropriate experimental framework that allows for a range of programs and actions including ongoing and necessary research, studies, and management actions in keeping with the adaptive management process.
- Determine whether to establish a Recovery Implementation Program for endangered fish species below Glen Canyon Dam.
- Ensure Glen Canyon Dam operations are consistent with the GCPA, Endangered Species Act, National Historic Preservation Act, and other applicable federal laws.



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Sideboards

Will the removal of Glen Canyon Dam be considered as an LTEMP alternative?

No, dam removal will not be considered because it does not fit the purpose and need of the LTEMP and would be beyond the scope of the EIS.

Will the LTEMP EIS consider effects on water availability for communities or agriculture or on water levels in Lake Powell or Lake Mead?

The LTEMP will not affect the annual amount of water that moves between Lake Powell and Lake Mead, as that is determined by the "Law of the River" and the 2007 "Colorado River Interim Guidelines for Lower Basin Shortages and the Coordinated Operations for Lake Powell and Lake Mead." The same amount of water will still be available annually for communities and agriculture. However, potential changes to the timing of the water flow between Lake Powell and Lake Mead may be considered. Nothing in this process will affect water allocation among the basin states or the Secretary of Interior's responsibility for water deliveries.



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Alternatives Must Be Reasonable

- Meet the purpose, need and objectives
- Technically feasible
- Economically feasible
- Display common sense
- Not necessarily the cheapest or easiest solution
- Regulations on handout



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Elements Common to All

- Consider high flow releases
- Consider non-native fish control
- Consider native fish conservation measures
- Determine whether to establish a recovery implementation plan for humpback chub
- Continue adaptive management
- Implement non-flow mitigation actions, which may include vegetation control, native plant restoration, Kanab ambersnail monitoring, and cultural resource monitoring and mitigation



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PRELIMINARY ALTERNATIVE CONCEPTS



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Presenting the Alternatives

- Each preliminary alternative concept will be presented
- After each alternative concept, members of the public can ask questions and provide feedback. This is your opportunity to:
 - Ask clarifying questions about the overall concept
 - Questions or ideas about details are best saved for small groups on day 2



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Alternative Concepts *(not listed in order of priority)*

- No action
- Native ecosystem focus
- Native ecosystem focus with emphasis on cultural resource preservation and tribal values
- Experimental design to resolve biological uncertainties
- Hydropower focus without new infrastructure
- Hydropower focus with new infrastructure
- Naturally patterned flow regime
- Recreational resources focus
- Sediment focus
- Sediment focus with maximum retention
- Structured adaptive management with condition-dependent decision-tree



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No Action

- Continue operation of Glen Canyon Dam as guided by the 1996 Record of Decision (ROD), i.e., modified low-fluctuating flow alternative, continue Glen Canyon Dam Adaptive Management Program activities and implement the 2007 ROD for the Interim Guidelines EIS.
- The alternative also includes continued implementation of NPS activities including: the Colorado River Management Plan, vegetation management plan, tamarisk leaf beetle action plan, Grand Canyon National Park backcountry management plan, Glen Canyon National Recreation Area Colorado River riparian revegetation activities, and fish management plan (if implemented).



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No Action

- High flows

- Beach-habitat building flows, habitat maintenance flows, High Flow Experimental Protocol (if implemented)

- Intervening flows

- Fluctuating, same as current operations
 - Flow min/max (cfs): 5,000 to 25,000
 - Ramp rates (cfs/hr): Ascending: 4,000
Descending: 1,500
 - Daily range (cfs): 5,000 to 8,000

- Other actions

- Trout and other fish management, Non-native Fish Control (if implemented)



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Native Ecosystem Focus

- Restore, to the extent practical, ecological patterns and processes, including a diverse biotic community dominated by native species, and that include rare, endemic, and sensitive species.
- Low, relatively steady flows would be provided from July through October to benefit the aquatic foodbase and native fishes including humpback chub.
- Fluctuations would occur during the winter-early spring period (December-April), when adverse impacts to ecological resources from higher fluctuating flows would be lower.
- In April or May, at the beginning of the growing season, a series of relatively high flows would be provided to increase soil moisture at higher elevations occupied by native vegetation and reduce the size of the annual cohort of trout.
- This alternative would include consideration of a temperature control device (TCD) and sediment augmentation.



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Native Ecosystem Focus

- High flows
 - Sediment-triggered high flows
- Intervening flows
 - Flow pattern: low steady flows Jul-Oct; fluctuating, same as current operations (Dec-Apr)
 - Minimum flow: same as current
 - Maximum flow: same as current Dec-Jun; lower otherwise
 - Ramping rates: same as current
 - Daily range: same as current during periods of fluctuations
- Other actions
 - Ponding flows
 - Spring native vegetation watering flows and trout recruitment inhibition flows
 - Temperature control device
 - Trout and other fish management
 - Consider sediment augmentation



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Native Ecosystem With Focus on Cultural Resource Preservation and Tribal Values

- Provide flows that promote seasonal disturbance regimes tied to natural ecological processes.
- Low summer flows with minor fluctuations in July through October to benefit native fish
- Higher flows with moderate fluctuations in November through February to accommodate winter power generation needs, a high flow in March if sediment conditions warrant followed by 1.5-2 months of low flows with minor fluctuations to enhance sandbar exposure for sediment redistribution by wind, and 1.5 months of higher volume with moderate to high fluctuations to provide for power generation, provide water to higher elevation vegetation, restore a disturbance regime to new high water zone.
- Non-flow actions would include actions in the NPS fish management plan (if implemented), consideration of sediment augmentation to increase turbidity, and consideration of implementing a TCD.



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Native Ecosystem Focus With Focus on Cultural Resource Preservation and Tribal Values

- High flows
 - Sediment-triggered high flows
- Intervening flows
 - Flow pattern: low steady flows (late Mar-mid May, Jul-Sep; fluctuating, same as current operations (Nov-Feb, May-Jul 4))
 - Minimum flow: same as current
 - Maximum flow: Same as current Nov-Feb and May- Jul 4; lower otherwise
 - Ramping rates: same as current
 - Daily range: same as current during periods of fluctuations
- Other actions
 - Trout and other fish management
 - Consider sediment augmentation and TCD



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Experimental Design to Resolve Biological Uncertainties

- Design an experimental program (potentially multi-year experimental manipulations) to resolve biological uncertainties in keeping with the adaptive management process.
- Provide for continuation of research and experimentation necessary to inform management on how to better operate Glen Canyon Dam and protect, mitigate adverse impacts to, and improve resources.
- Key uncertainties that would be addressed include: (1) trout-humpback chub interactions; (2) effects of flows on trout; (3) impact of flow and non-flow actions on the quality of the trout fishery and protection of native fish from increased trout recruitment; (4) important drivers of the aquatic foodbase; (5) conditions that allow humpback chub to complete their life cycle in the mainstem; and (6) the efficacy of suppression flows for trout population control.
- Further details of this alternative cannot be determined until the experimental design has been identified.



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Experimental Design to Resolve Biological Uncertainties

- Specific flows and actions will depend on experimental design, but not known at this time



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Increased Hydropower Without New Infrastructure

- Maintain and increase Glen Canyon Dam capacity and energy generation, relative to current operations, to produce the greatest practicable amount of power and energy, by considering options such as relaxed ramping rate restrictions and allowing for a wider range of daily flows depending on hydrologic conditions, while using existing infrastructure and proposed management actions to mitigate adverse effects.



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Increased Hydropower Without New Infrastructure

- High flows
 - Consider releases greater than bypass capacity; rapid response
- Intervening flows
 - Flow pattern: fluctuating, increased range depending on hydrology
 - Minimum flow: same as current
 - Maximum flow: increased depending on hydrology
 - Ramping rates: relaxed ramping restrictions
 - Daily range: increased depending on hydrology
- Other actions
 - Ponding flows, summer stranding flows, redd exposure flows
 - Trout and other fish management



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Lunch



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Hydropower Focus with New Infrastructure

- Maintain and increase Glen Canyon Dam hydropower capacity and energy generation, relative to current operations, and produce the greatest practicable amount of power and energy, consistent with recovery and long-term sustainability of downstream resources.
- Adverse effects of hydropower generation on other resources would be mitigated through infrastructure additions and modifications and a variety of non-flow actions while allowing for continued or increased load following.
- Mitigation of adverse effects would occur through (1) implementing high flow releases using rapid response to tributary sediment inputs, (2) providing higher flows (greater than bypass tube capacity) if possible for the purpose of conserving sediment in critical reaches; (3) developing sediment augmentation infrastructure; and (4) developing a TCD.
- The alternative would also include consideration of the possibility of adding hydropower capacity to bypass tubes; relaxing ramping rate restrictions; allowing for higher fluctuations at certain times of the year; and allowing for a wider daily range of flows depending on hydrologic conditions.



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Increased Hydropower With New Infrastructure

- High flows
 - Consider releases greater than bypass capacity; rapid response
- Intervening flows
 - Flow pattern: fluctuating, increased range depending on hydrology
 - Minimum flow: same as current
 - Maximum flow: increased depending on hydrology
 - Ramping rates: relaxed ramping restrictions
 - Daily range: increased depending on hydrology
- Other actions
 - Ponding flows, summer stranding flows, redd exposure flows
 - Trout and other fish management
 - Sediment augmentation
 - Temperature control device
 - Consider bypass generation



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Naturally Patterned Flow Regime

- Provide flows that mimic a naturally patterned flow regime based on historic monthly averages.
- Flows would be scaled to ensure annual water delivery requirements, but would vary month to month in conformance with the historic flow pattern, and would not include daily fluctuations.
- Minimum flows could be lower than the current minimum, and maximum flows as high as full bypass, scaled for the annual hydrologic condition.
- Transitions between months would be relatively smooth with established limitations on the rate of change between days.
- The highest flows would be sediment triggered, but timing would be adjusted to historic flood timing and could be higher than full bypass capacity.
- Sediment augmentation and a TCD would be used to provide for more natural sediment supplies and water temperatures.



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Naturally Patterned Flow Regime

- High flows
 - Consider releases greater than bypass capacity; peak release to approximate natural spring peak
- Intervening flows
 - Flow pattern: steady (no within-day fluctuations), approximate natural seasonal pattern
 - Minimum flow: approximate natural seasonal pattern
 - Maximum flow: Up to full bypass capacity to approximate natural seasonal pattern
 - Ramping rates: none
 - Daily range: none
- Other actions
 - Trout and other fish management
 - Sediment augmentation
 - Temperature control device



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Recreational Resources Focus

- Protect, mitigate adverse impacts to, and improve the recreational experience of park visitors.
- Range of flows consistent with current operations but a higher minimum flow would be targeted and flow stage changes would be greatly restricted.
- Monthly volume adjustments would be made to mimic more natural patterns (i.e., lower in the summer and higher in the spring).
- Non-flow options could include active vegetation management and stabilization to optimize campsites, active management of rainbow trout based on the NPS fishery management plan, minimize non-recreational river trips, consider a TCD to manage for warmer water temperatures in summer, and consider sediment augmentation.



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Recreational Resources Focus

- High flows
 - Sediment-triggered high flows
- Intervening flows
 - Flow pattern: fluctuating flows reduced year-round to limit stage changes
 - Minimum flow: higher than current based on recreational experience
 - Maximum flow: same as current maximum
 - Ramping rates: same as current
 - Daily range: decreased to limit stage changes
- Other actions
 - Trout and other fish management
 - Consider ponding flows, sediment augmentation, and TCD



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Sediment Focus

- Dynamically and sustainably increase and maintain sandbars and beaches in the Glen, Marble, and Grand Canyon reaches above the elevation of the average base flow for ecological, cultural, and recreational purposes.
- An annual operating scenario that preserves sediment and sand between high flow releases would be determined. Additionally, releases above full bypass capacity when conditions allow (i.e., abundant sediment inputs and a full reservoir) would be made.
- For three months after each high flow release, fluctuating flows would be moderated to reduce sediment transport and preserve sandbars and beaches that have been created by higher flows.
- An additional component of this alternative would be to manage vegetation to increase campable areas and increase wind-blown transport of sediment.



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Sediment Focus

- High flows
 - Consider releases greater than bypass capacity
- Intervening flows
 - Flow pattern: fluctuating flows reduced for 3 months after high flows, same as current otherwise
 - Minimum flow: same as current
 - Maximum flow: same as current maximum, but reduced for 3 months after high flow releases
 - Ramping rates: same as current
 - Daily range: could increase if had sediment augmentation
- Other actions
 - Trout and other fish management
 - Consider sediment augmentation



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Sediment Focus with Maximum Retention

- Maximize the amount of sediment conserved in Marble Canyon and Eastern Grand Canyon reaches of the Colorado River.
- Provide year-round steady flows
- Expected to result in an accumulation of sand below the normal water level. High flow releases every 1-3 years would redistribute sediment above this level.
- This alternative has the potential to result in an accumulation of sediment in the canyon.



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Sediment Focus with Maximum Retention

- High flows
 - Consider releases greater than bypass capacity; rapid response
- Intervening flows
 - Flow pattern: year-round steady
 - Minimum flow: higher than current based on annual volume
 - Maximum flow: lower than current based on annual volume
 - Ramping rates: none
 - Daily range: none
- Other actions
 - Trout and other fish management



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Structured Adaptive Management with Condition-Dependent Decision-Tree

- Implement a structured adaptive management framework that uses a condition-dependent decision tree to maximize benefits to a wide range of resources.
- Biological and physical resources would be monitored annually, and management actions appropriate for existing conditions would be implemented. Responses could include changes to monthly and daily flows, water release temperatures, and turbidity.
- Conditions that would be monitored and used to determine annual operations include: (1) annual operating volume (inflows and reservoir levels), (2) sediment conditions (sandbar condition and tributary inputs of sediment), and (3) biological conditions (e.g., status of native fish populations, exotic fish populations, and vegetation conditions).
- The alternative would provide a high degree of flexibility in response to annual conditions rather than a static prescription for all years.
- High flows in excess of full bypass capacity, a TCD, and sediment augmentation are potential options for this alternative.



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Structured Adaptive Management

- High flows
 - Adjust criteria based on beach condition and other resources and time since the last flood
- Intervening flows
 - Flow pattern: current operations adjusted per conditions; steady flows Jun-Sep if native fish conditions call for it
 - Minimum flow: same as current
 - Maximum flow: same as current most of year; reduced for 3 months after high flow releases
 - Ramping rates: same as current
 - Daily range: could increase with sediment augmentation
- Other actions
 - Spring native vegetation watering flows and trout recruitment inhibition flows (depending on conditions)
 - Summer stranding flows (depending on conditions)
 - Redd exposure flows (depending on conditions)
 - Trout and other fish management
 - Consider sediment augmentation and TCD



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ADDITIONAL SUGGESTIONS FOR ALTERNATIVE CONCEPTS



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Presenters on Alternative Concepts

- Living Rivers
- Grand Canyon Private Boaters Association
- John Jordan (Recreational Fishing)
- Glen Canyon Institute



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Presenting the Alternatives

- Each presenter will have 15 minutes to present their alternative concept
- After each alternative, members of the public have 10 minutes to ask questions and provide feedback . This is your opportunity to:
 - Ask clarifying questions about the overall concept
 - Questions or ideas about details are best saved for small groups on day 2



Day One Closing



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Agenda for April 5th Meeting

- Welcome and Agenda Review
- Continuation of Presentation of Additional Suggested Alternative Concepts
 - Glen Canyon Institute
 - John Jordan (Recreational Fishing)
- Breakouts on Alternative-Related Content Areas
- Plenary to Debrief Breakouts
- Closing

Lunch will occur at 12:00 and we will take two breaks (am and pm)



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CONTINUATION OF ADDITIONAL SUGGESTIONS FOR ALTERNATIVE CONCEPTS



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Presenters of Alternative Concepts

- Glen Canyon Institute
- John Jordan (Recreational Fishing)



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Presenting the Alternatives

- Each presenter will have 15 minutes to present their alternative concept
- After each alternative, members of the public have 10 minutes to ask questions and provide feedback . This is your opportunity to:
 - Ask clarifying questions
 - Provide feedback regarding the strengths of an alternative
 - Provide feedback regarding the gaps or weaknesses of an alternative



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BREAK



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BREAKOUTS ON ALTERNATIVE-RELATED CONTENT AREAS: ROUND ONE



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Before Lunch: Breakout Groups

- Please go to your breakout group at the end of the break
- Alternative Concept Groups to Choose From
 - 1. Native Ecosystem Focus (John)
 - 2. Experimental Design to resolve biological uncertainties (Glen)
 - 3. Hydropower focus without new infrastructure (MM)
 - 4. Naturally patterned flow regime (Irene)
 - 5. Sediment focus (Joan)
- Each group has a designated note taker and presenter when we get back together. These notes will not record who said any comment, as the notes will represent the group's discussion.



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Before Lunch: Breakout Groups

- Goal is to
 - 1) brainstorm on modifications to the concept WITH reasons why
 - 2) build understanding, not to come to a group consensus on the items to present to the full group.
 - Address the following:
 - What are the strengths of this alternatives?
 - What are your concerns about this alternatives?
 - Do you have additional suggestions for an alternative or alternative elements?
- Please be back in the ballroom at 11:00 to debrief



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LUNCH



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After Lunch: Breakout Groups

- Alternative Concept Groups to Choose From
 - 1. Native Ecosystem Focus with emphasis on cultural resources, preservation and tribal values (John)
 - 2. Hydropower focus with new infrastructure (MM)
 - 3. Recreational resources focus (Irene)
 - 4. Sediment focus with maximum retention (Joan)
 - 5. Structured adaptive management (Glen)
- Each group has a designated note taker and presenter when we get back together. These notes will not record who said any comment, as the notes will represent the group's discussion.



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After Lunch: Breakout Groups

- Goal is to
 - 1) brainstorm on modifications to the concept WITH reasons why
 - 2) build understanding, not to come to a group consensus on the items to present to the full group.
 - Address the following:
 - What are the strengths of this alternatives?
 - What are your concerns about this alternatives?
 - Do you have additional suggestions for an alternative or alternative elements?
- Please take a break at 3:15 and be back in the ballroom at 3:30 to debrief



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BREAKOUTS ON ALTERNATIVE-RELATED CONTENT AREAS: ROUND TWO



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After Lunch: Breakout Groups

- Please go to a breakout group when you return from lunch
- Consider switching groups
- Groups to Choose From
- Each group has a designated note taker
- The note taker will provide a five minute overview of the discussion of the group that met before lunch
- Goal is to address the following:
 - What are the strengths of the alternatives in this category?
 - What are your concerns about the alternatives in this category?
 - Do you have additional suggestions for an alternative or alternative element in this category?



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PLENARY TO DEBRIEF BREAKOUT DISCUSSIONS



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Plenary

- Present/Review each group's results
- Is there an adequate range of alternatives?
- Are the alternatives sufficiently different?
- Do they all meet the purpose and need?
- Do they largely address the objectives and goals?
- Are there any major alternative ideas not represented?
- Additional comments and questions



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CLOSING