Glen Canyon Dam Technical Work Group
Agenda Item Information
June 24-25, 2014

Agenda Item

Long-Term Experimental and Management Plan (LTEMP) EIS Update

Action Requested

✓ Information item only.

Presenter

Glen Knowles, Bureau of Reclamation (Reclamation)

Previous Action Taken

✓ Other

December 2009: Secretary of the Interior Ken Salazar announced that the development of a Long-Term Experimental and Management Plan (LTEMP) for Glen Canyon Dam was needed. The Secretary emphasized the inclusion of stakeholders, particularly those in the Glen Canyon Dam Adaptive Management Program (GDAMP), in the development of the LTEMP.

November 2011: Public scoping meetings were held in Phoenix, Flagstaff, Page, Salt Lake City, Las Vegas, and Denver. A webcast was also held to capture participation from those that could not attend in person.

April 4-5, 2012: A public workshop was held in Flagstaff, AZ to receive feedback on the preliminary alternative concepts.

April 30, 2012: The Secretary of the Interior responded to a recommendation from the AMWG by stating, "With respect to the report of the Socioeconomic Ad Hoc Group, I appreciate the comprehensive nature of the program and plan proposed, and the support of the AMWG for the implementation of these socioeconomic impact assessment studies. I am directing the interagency team for the Department of the Interior to communicate to the AMWG the specific studies and activities that should be prioritized for utilization as part of the ongoing National Environmental Policy Act process to develop a Long Term Experimental and Management Plan (LTEMP) for Glen Canyon Dam. The Technical Work Group can then identify information needs and research priorities not addressed through the LTEMP process so that the [Grand] Canyon Monitoring and Research Center can refine and develop a work plan."

August 30, 2012: Motion (moved by Larry Stevens and seconded by Ted Rampton): AMWG requests that the February 2013 AMWG meeting agenda include a detailed description of the LTEMP alternatives; time for discussion and identification of issues, questions, and concerns; and possible development of a recommendation from non-DOI AMWG members.

Relevant Science

Science and research completed since the GCDAMP was established will be used in the development of the EIS and assessment of impacts.

Background Information

The Department of the Interior (Department), through Reclamation and NPS, is preparing a draft EIS for adoption of the LTEMP for the operation of Glen Canyon Dam. The purpose of the proposed LTEMP is to utilize current, and develop additional, scientific information to better inform Departmental decisions and to operate the dam in such a manner as to improve and protect important downstream resources while maintaining compliance with the GCPA, the Law of the River, and the Endangered Species Act, among others, and to fully evaluate dam operations and identify 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 GCPA and other provisions of applicable Federal law.

The presentation will review progress made since the last AMWG meeting in May 2014 including a review of the current set of draft alternatives, development of a hybrid alternative, and the schedule for completion of the LTEMP Draft EIS.

Glen Canyon Dam
LTEMP EIS Update

Glen Knowles
GCDAMP Technical Work Group
June 24, 2014

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Overview

- Alternatives
- Modeling and SDM
- Emerging Hybrid Alternative
- Experimental Design
- Schedule

Alternatives Being Analyzed in EIS

1. No-Action Alternative (NA)
2. Balanced Resource Alternative (BR)
3. Condition-Dependent Adaptive Strategy (CDA)
4. Resource Targeted Condition-Dependent Alternative (RTCD)
5. Seasonally Adjusted Steady Flows (SASF)
6. Year-Round Steady Flows (YRSF)

- *Note that BR, CDA & RTCD were modeled with several sub versions with various options turned on or off.*

Completion of Modeling and Structured Decision Analysis

- **The majority of the modeling for the LTEMP Draft EIS has been completed**, but interpretation, quality checking and peer review continues as well as other qualitative and quantitative analysis.
- **Structured decision making process has been completed** and has provided input both to stakeholder views and to the value of information for experimental design.
- **A decision regarding a preferred alternative has not and will not be made based solely on the structured decision analysis** or the modeling results, but will also use the information gathered in the context of many other important sources of information such as public comments, additional modeling results, empirical data review, qualitative analysis, and legal and policy analysis.

Multi-criteria Decision Analysis

		Stakeholder												
		Federal		State					Tribe			NGO		
		JL	USFWS	AZDWR	AZGFD	SRP	UAMPS	CREDA	Hopi	Hualapai	Navajo	IFFF	NPCA	GCRG
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Balanced Resource	BR1	0.485	0.503	0.522	0.448	0.526	0.529	0.523	0.514	0.532	0.509	0.522	0.453	0.419
	BR2	0.460	0.441	0.470	0.408	0.536	0.550	0.542	0.470	0.482	0.470	0.521	0.405	0.374
CDAS	1	0.599	0.537	0.487	0.500	0.480	0.444	0.452	0.565	0.582	0.524	0.550	0.568	0.592
	2	0.590	0.514	0.473	0.512	0.456	0.418	0.441	0.566	0.577	0.521	0.560	0.555	0.589
	3	0.390	0.437	0.406	0.375	0.474	0.466	0.481	0.429	0.416	0.401	0.472	0.310	0.274
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	4	0.557	0.541	0.549	0.506	0.517	0.499	0.497	0.568	0.587	0.556	0.556	0.548	0.535
	5	0.412	0.483	0.499	0.411	0.489	0.494	0.485	0.476	0.485	0.465	0.484	0.366	0.313
	6	0.424	0.499	0.518	0.420	0.515	0.526	0.506	0.485	0.495	0.477	0.494	0.377	0.320
SASF		0.560	0.467	0.403	0.486	0.329	0.291	0.318	0.514	0.525	0.439	0.510	0.537	0.599
YRSF		0.565	0.539	0.449	0.506	0.434	0.370	0.395	0.528	0.547	0.498	0.495	0.580	0.601

Best performing alternative for this stakeholder's weightings
Alternative performs better than No Action
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Worst performing alternative for this stakeholder's weightings

Desired Characteristics of a Hybrid Alternative

- Performs well relative to all resource goals and objectives
- Meets humpback chub recovery goals
- Increase and retain sediment
- Maintain or increase the hydropower resource
- Performs well on recreation metrics
- Performs well on other resource metrics (cultural, vegetation, etc.)

Characteristics of an Emerging Hybrid Alternative

Component		Notes
Monthly volumes	RTCD	
Daily fluctuations	10x/9x with 8k cap	10x fluctuations Jun-Aug, 9x fluctuations in rest of year. Maximum daily range of 8,000 cfs.
Proactive spring HFEs	Yes	Test (only in >10 maf year)
Spring HFEs	Yes	Limit to 45 K for 96 hr
Fall HFEs	Yes	More flexibility in duration, up to 336 hr
Rapid response HFE	No	
Trout management flows	Yes	Test and continue if performs well
Low summer flows	Yes	Test in second 10 years if needed, adjust target to 14 or 15 C for Jul, Aug, Sep (only in years when temp is achievable based on release temps)
Mechanical removal of trout	Yes	Condition dependent
Load curtailment	Yes before, test after	Load curtailment post-HFE would occur for month of HFE only
Vegetation control	Yes	Adaptive vegetation restoration activities

Preliminary Results—Do Not Cite or Distribute

Review of Sediment Results

- Hydrology is biggest driver, as for all resources
- Frequency of HFEs and fluctuation levels are also important
- Low summer flows move water to April which causes greater sediment transport in the spring.
  - Low summer flows *do* transport less sediment in the summer but *do not* completely compensate for the sediment lost in Spring.
  - CDAS1 (w/o LSF) retains approximately 100 ktons more than CDAS2 (w/ LSF) at end of water year
  - Approximately the same difference in sediment transport between RTCD1 and RTCD2
- TMFs have little to no impact on SLI. There is little effect on SMBI, especially by end of year
- Load curtailment has increased SMBI by 9 kton (annual difference for RTCD)

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Screening Tool Estimates of Sediment Transport to Separate Fluctuation and Monthly Volume Effects

		Annual Sediment Transport (MT)		Annual Sediment Transport (%MLFF)	
Monthly Pattern	Fluctuation Level (high/low demand)	8.23 maf	12 maf	8.23 maf	12 maf
CDAS	7/7	321,111	1,944,581	89.6%	104.6%
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RTCD	10/9/8k cap	324,063	1,807,467	90.4%	97.3%
RTCD	12/10	361,083	2,065,655	100.8%	111.2%
MLFF	5K, 6K, 8K	358,266	1,858,317	100.0%	100.0%

Lower sediment transport than original CDAS and RTCD

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Review of Hydropower Results

- Differences can be tied to frequency of HFEs and fluctuation levels
- Value of Generation: RTCD1 produces $4M/year more energy value than CDAS1
- Value of Capacity: RTCD1 has $4.9M/year more capacity value than CDAS1
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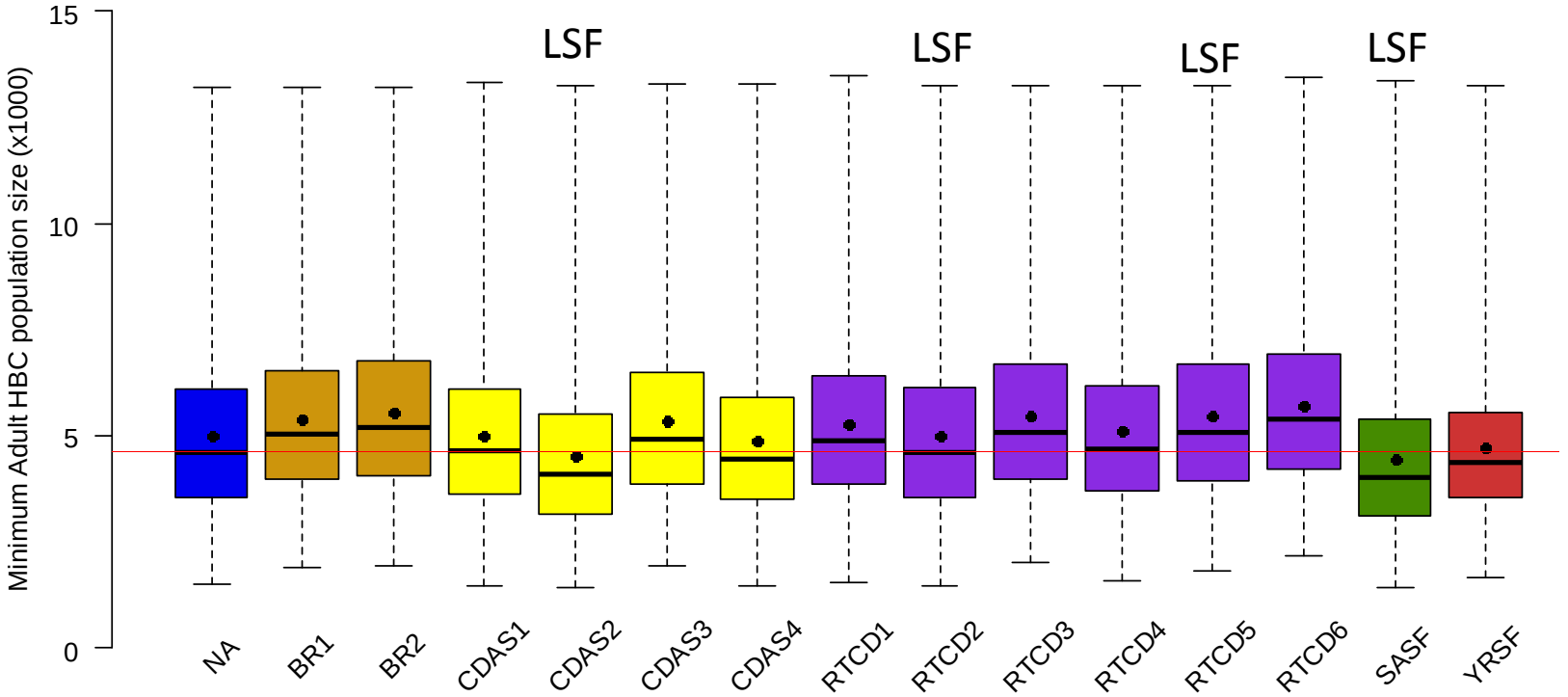
- Hydrology (wet vs. dry) makes more difference to trout production than does the differences between most alternatives
- Hybrid alternative should perform better for HBC than NA and comparable to CDAS1 and RTCD1. Performs better than SASF or YRSF for HBC

Lowest Adult HBC pop. (x1,000)



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Fluctuation levels

- 10x/9x/8k cap explanation

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  In a 700 kaf month, maximum daily change = 7000 cfs.

  This factor applies to June, July and August.

- 9 = a 9x factor for the other 9 months of the year

- 8k cap = a maximum daily change of 8000 cfs, which is the same as current MLFF constraint.

Comparison of RTCD 10/9 8k cap with MLFF

8.23 maf year

	RTCD with 10/9 with 8k max			MLFF			
	Monthly Volume (kaf)	Mean daily flow	Daily Change	Monthly Volume (kaf)	Mean daily flow	Daily Change	Differences in Daily Change (cfs)
October	643	10451	5783	600	9758	6000	-217
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May	672	10935	6052	600	9758	6000	52
June	704	11829	7039	650	10924	6000	1039
July	767	12471	7668	850	13824	8000	-332
August	659	10721	6592	900	14637	8000	-1408
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12 maf year

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March	1198	19484	8000	900	14637	8000	0
April	1067	17929	8000	1000	16806	8000	0
May	1104	17950	8000	1100	17890	8000	0
June	1155	19417	8000	1200	20167	8000	0
July	1259	20471	8000	1400	22769	8000	0
August	961	15632	8000	1500	24395	8000	0
September	839	14097	7549	1100	18486	8000	-451

Benefits of Hybrid Alternative Relative to Original Alternatives Considered

- Blends multiple alternatives that were weighted highly by a wide variety of stakeholders in structured decision analysis process
- Uses the monthly volume pattern of RTCD that more closely matches power demand to improve hydropower performance and sediment conservation
- Represents an improvement over CDAS and RTCD in terms of sediment transport and conservation
- Preserves beneficial effects of TMFs on humpback chub numbers
- Tests a variety of condition-dependent elements to improve sediment and humpback chub conservation
- Maintaining an 8000 cfs fluctuation cap has benefits for sediment and recreation

Preliminary Results—Do Not Cite or Distribute

Elements of an Experimental Design

- For all experiments, identify:
  - Hypotheses being tested
  - Design of monitoring component
  - Adaptive response to information generated by experiment that is flexible and easy to adapt to new information
  - Implementation of multiple tests and avoidance of confounding effects to the extent practicable
  - Focus is on management tools as a suite as opposed to a focus of separating out effects of individual treatments
  - Continued monitoring for unintended/unexpected results and appropriate off-ramps as needed

Timeline

- **Post Modeling Discussions**
  - Hybrid Alternative Components
  - Experimental Design
  - Peer Review
- **Preliminary Draft #1 to cooperators and tribes – end of July**
  - No preferred alternative
  - Tribes to provide input, others use as informational
- **Preliminary Draft #2 to cooperators, tribes and GCMRC – end of August**
  - Plan to have a preferred alternative
  - Will include tribal input
- **Public Draft – end of October**
  - Will include full hydropower and ratepayer analysis

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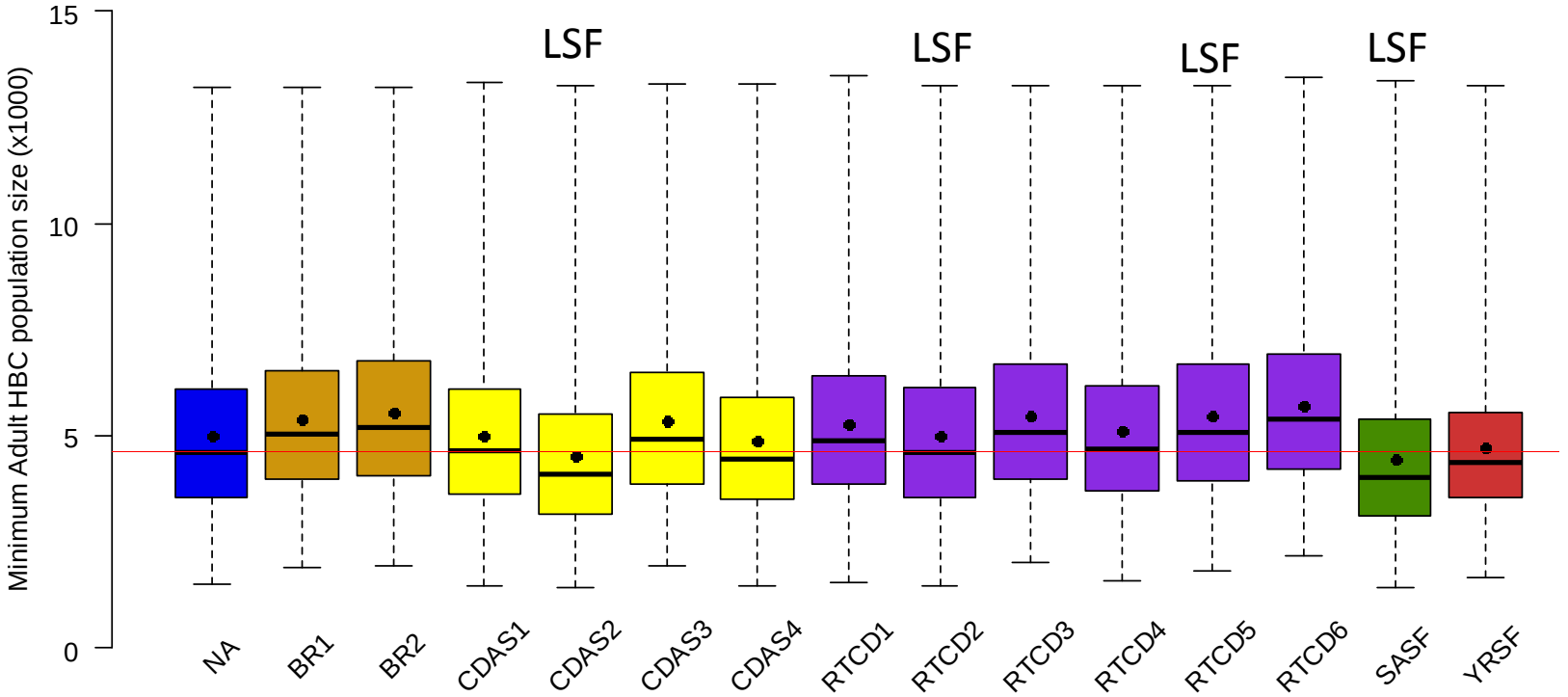

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September	839	14097	7549	1100	18486	8000	-451

Benefits of Hybrid Alternative Relative to Original Alternatives Considered

- Blends multiple alternatives that were weighted highly by a wide variety of stakeholders in structured decision analysis process
- Uses the monthly volume pattern of RTCD that more closely matches power demand to improve hydropower performance and sediment conservation
- Represents an improvement over CDAS and RTCD in terms of sediment transport and conservation
- Preserves beneficial effects of TMFs on humpback chub numbers
- Tests a variety of condition-dependent elements to improve sediment and humpback chub conservation
- Maintaining an 8000 cfs fluctuation cap has benefits for sediment and recreation

Preliminary Results—Do Not Cite or Distribute

Elements of an Experimental Design

- For all experiments, identify:
  - Hypotheses being tested
  - Design of monitoring component
  - Adaptive response to information generated by experiment that is flexible and easy to adapt to new information
  - Implementation of multiple tests and avoidance of confounding effects to the extent practicable
  - Focus is on management tools as a suite as opposed to a focus of separating out effects of individual treatments
  - Continued monitoring for unintended/unexpected results and appropriate off-ramps as needed

Timeline

- **Post Modeling Discussions**
  - Hybrid Alternative Components
  - Experimental Design
  - Peer Review
- **Preliminary Draft #1 to cooperators and tribes – end of July**
  - No preferred alternative
  - Tribes to provide input, others use as informational
- **Preliminary Draft #2 to cooperators, tribes and GCMRC – end of August**
  - Plan to have a preferred alternative
  - Will include tribal input
- **Public Draft – end of October**
  - Will include full hydropower and ratepayer analysis