

RECLAMATION

Managing Water in the West

High Flow Experiments (HFEs)

Adaptive Management Work Group Meeting

August 22-23, 2018



U.S. Department of the Interior
Bureau of Reclamation



Presentation Purpose

- DOI follow up on commitment to AMWG members to evaluate the design and implementation flexibilities in LTEMP ROD and HFE protocol

LTEMP ROD

- Provides framework for implementing Spring and Fall HFEs
- Identifies the purpose, goals and objectives for HFEs

Areas Considered

- Accounting windows
- HFE timing
- HFE “deferral”
- Decision making process
- Modeling
 - Sediment input estimates
 - Future sediment input estimate
 - Existing sediment considerations

Accounting windows

- LTEMP ROD:
 - *Depending on the cumulative amount of sediment input from the Paria River during the spring (December 1 through June 30) or fall (July 1 through November 30) accounting periods and the expected accumulation of sand, the maximum possible magnitude and duration of HFE that would achieve a positive sand mass balance in Marble Canyon, as determined by modeling, will be implemented. (LTEMP ROD, B-18)*

HFE timing

- The timing of seasonal HFEs was explicitly considered during the evaluation of the LTEMP FEIS alternatives.
- The timing of HFEs for the selected alternative:
 - sediment-triggered spring HFEs in March or April;
 - proactive spring HFEs in April, May, or June; and
 - sediment-triggered fall HFEs in October or November.(LTEMP ROD (C5-C6))

HFE “deferral”

- The decision of whether or not to conduct a HFE is made after considering the modeled sediment conditions and the current status of resources which may include a qualitative consideration of existing sediment in the system.

HFE Decision Making Process

1. Planning Component

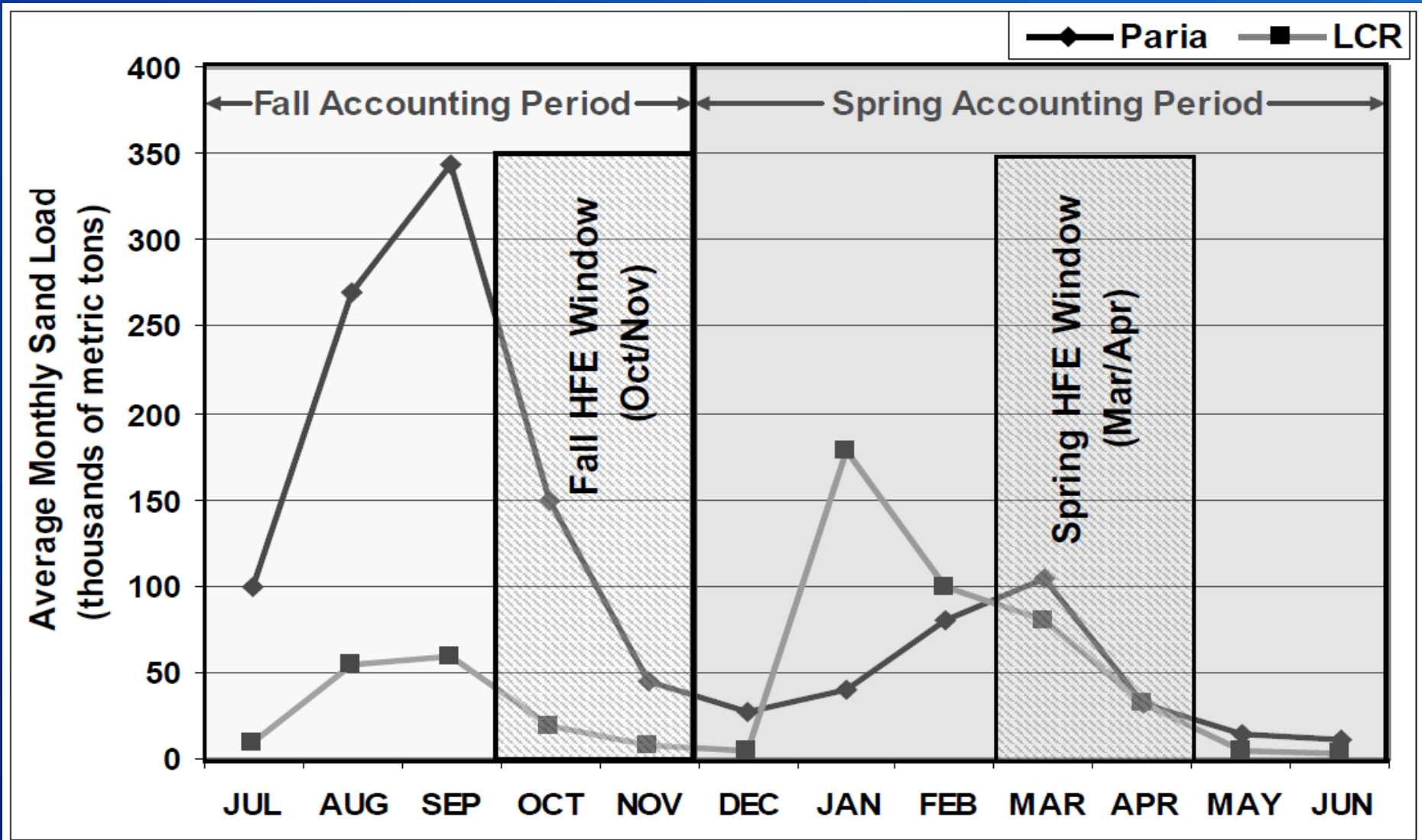
- Annual resource status assessment
- Annual Agency Reporting
- GCDAMP Budget and Work Plan Process

2. Modeling Component

3. Decision and Implementation Component

- Review Modeling Component
- Review Status of Resources
- Consultation with agencies and tribes, AMWG and TWG input
- Staff Recommendation/DOI GCD Leadership Team Recommendation
- DOI Decision

Modeling Component

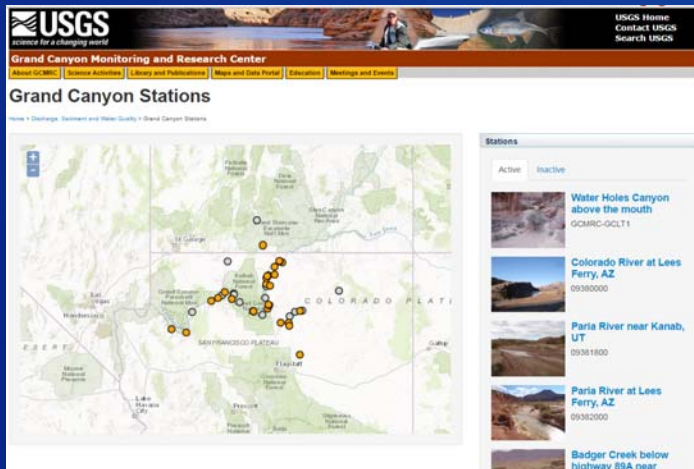


Modeling Considerations

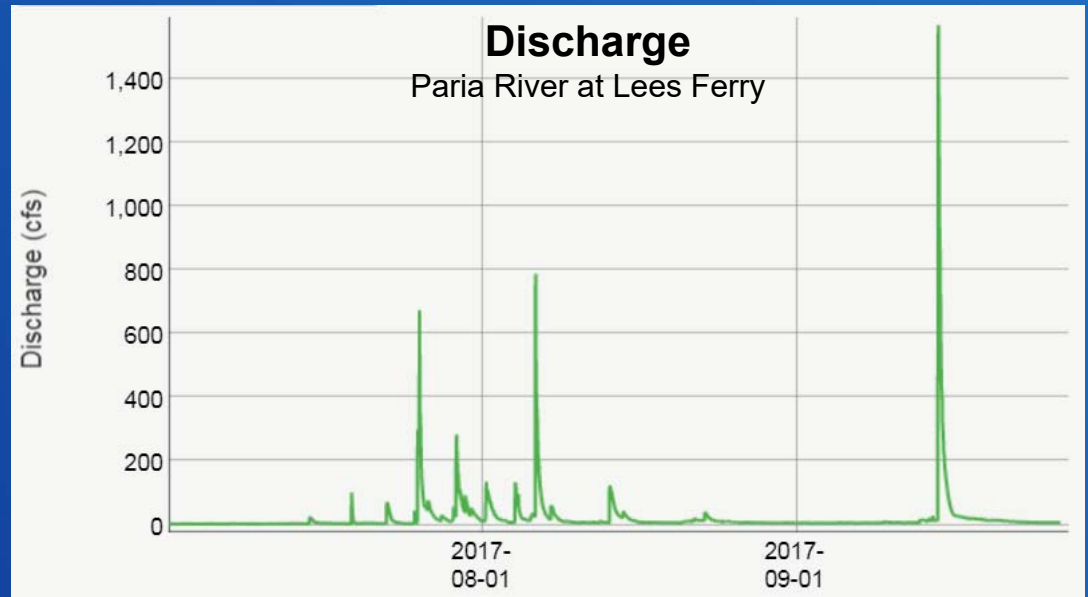
- Cumulative sand load estimate
- Future sediment input estimate
- Existing sediment considerations

Discharge and Sediment conditions

from the GCMRC web page

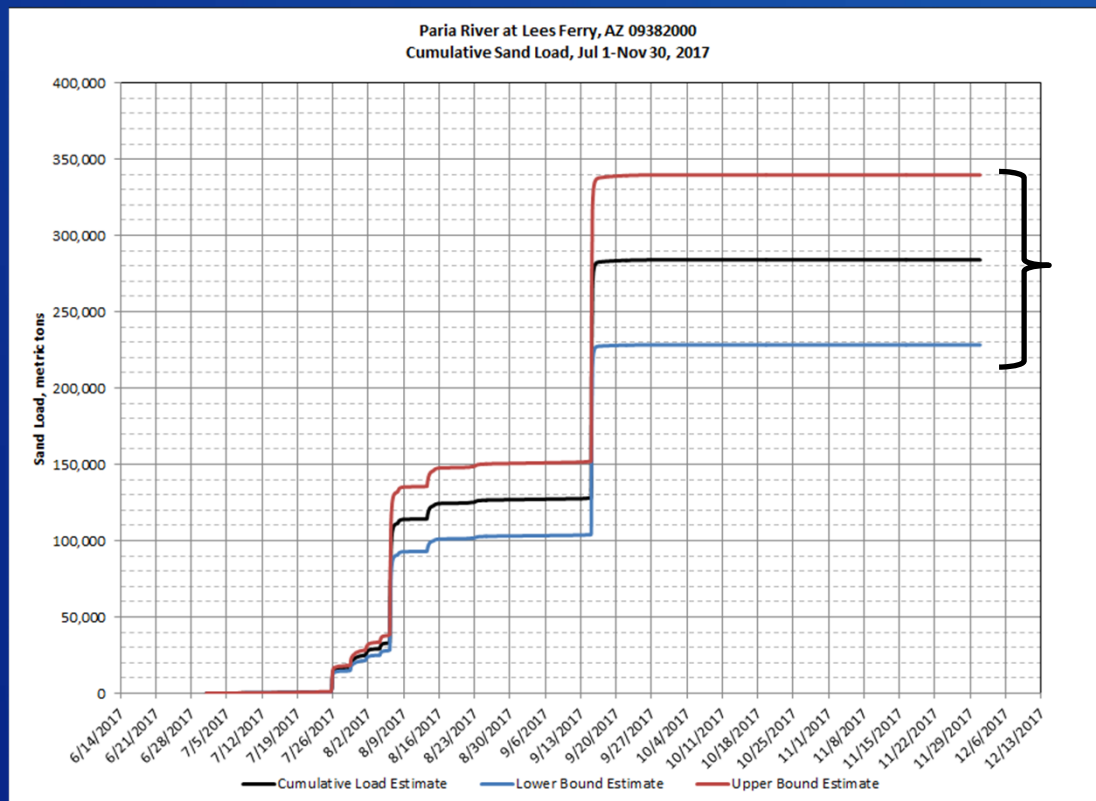


http://cida.usgs.gov/gcmrc/discharge_qw_sediment/stations/GCDAMP



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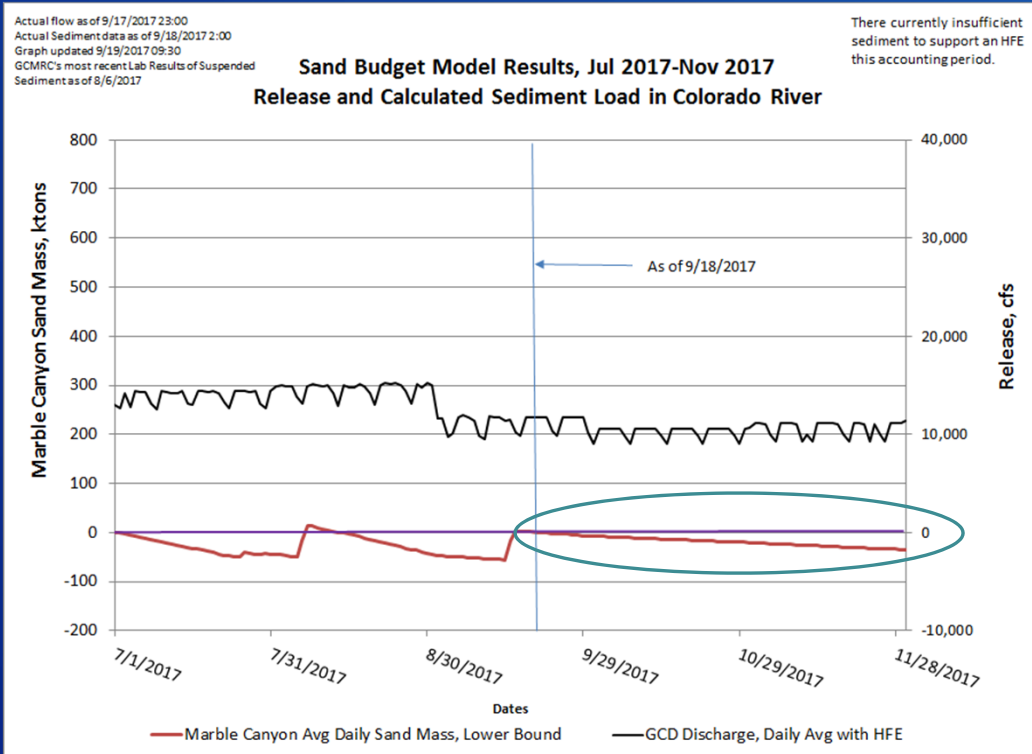
Cumulative Sand Load Estimate



- Uncertainty in sand load
- High, Med, Low estimates
- In past years, have used the low sand load estimate as a conservative approach
- Could use Hi, Med, or Low

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Future sediment input

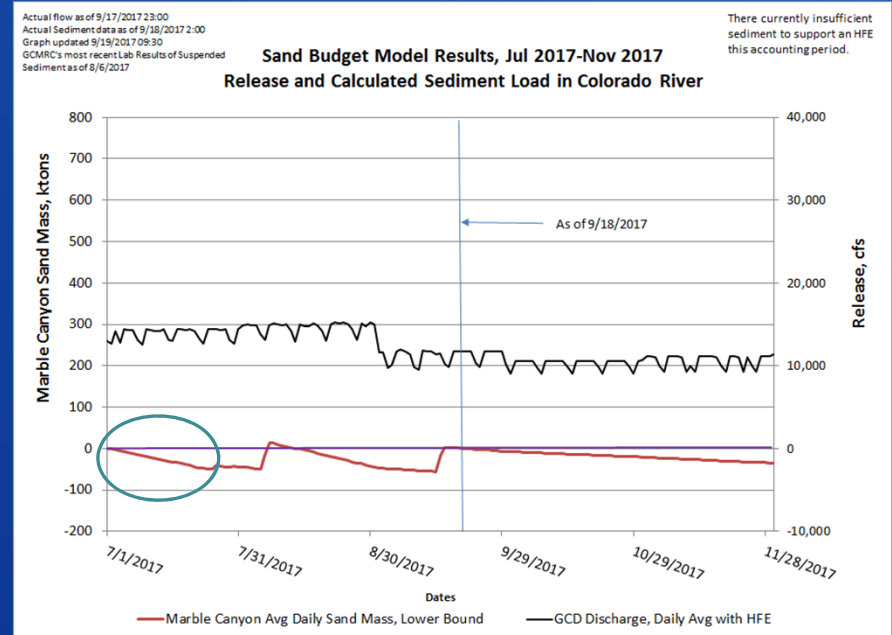


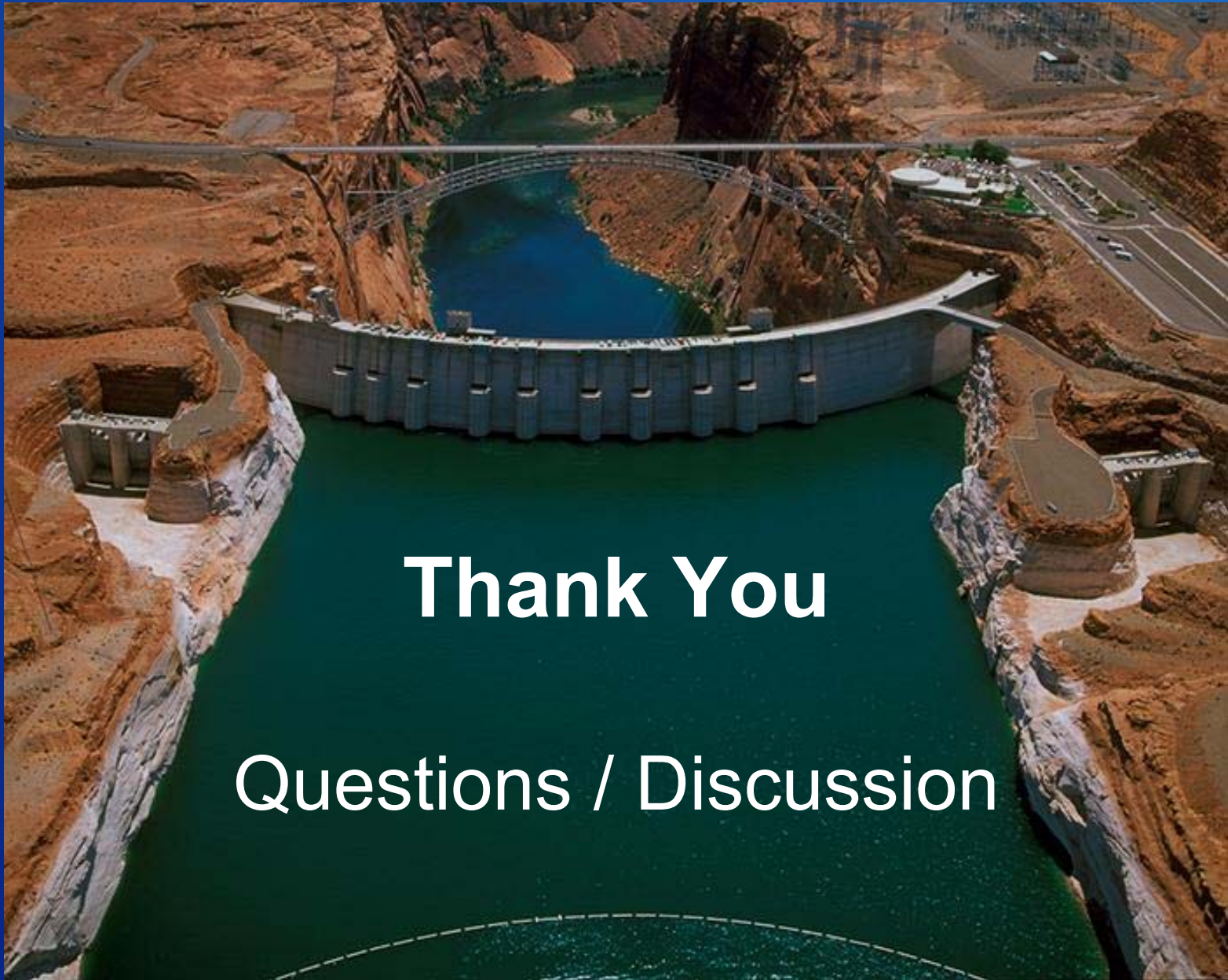
- Uncertainty in future sediment inputs
- Typically assume zero future sediment inputs
- Can we project inputs for the remainder of the sediment accounting window?
- Spring time has longer period of assumed future inputs (mid-Mar – June 30th) compared with fall (mid-Oct – Nov 30th)

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Existing Sediment Considerations

- Initial conditions: Sediment accounting window starts with baseline of zero at the start of each window
- If observations and field data suggest there is additional sediment availability, information could be included:
 - via modeling assumptions (e.g. use less conservative current / future sand load estimates)
 - via HFE decision-making process
- Important to ensure that sand budget will not be negative at end of experiment





Thank You

Questions / Discussion

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- Slides presented at Feb 2018 AMWG follow

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HFE Decision Making Process

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- Annual resource status assessment
 - Annual Agency Reporting
 - GCDAMP Budget and Work Plan Process

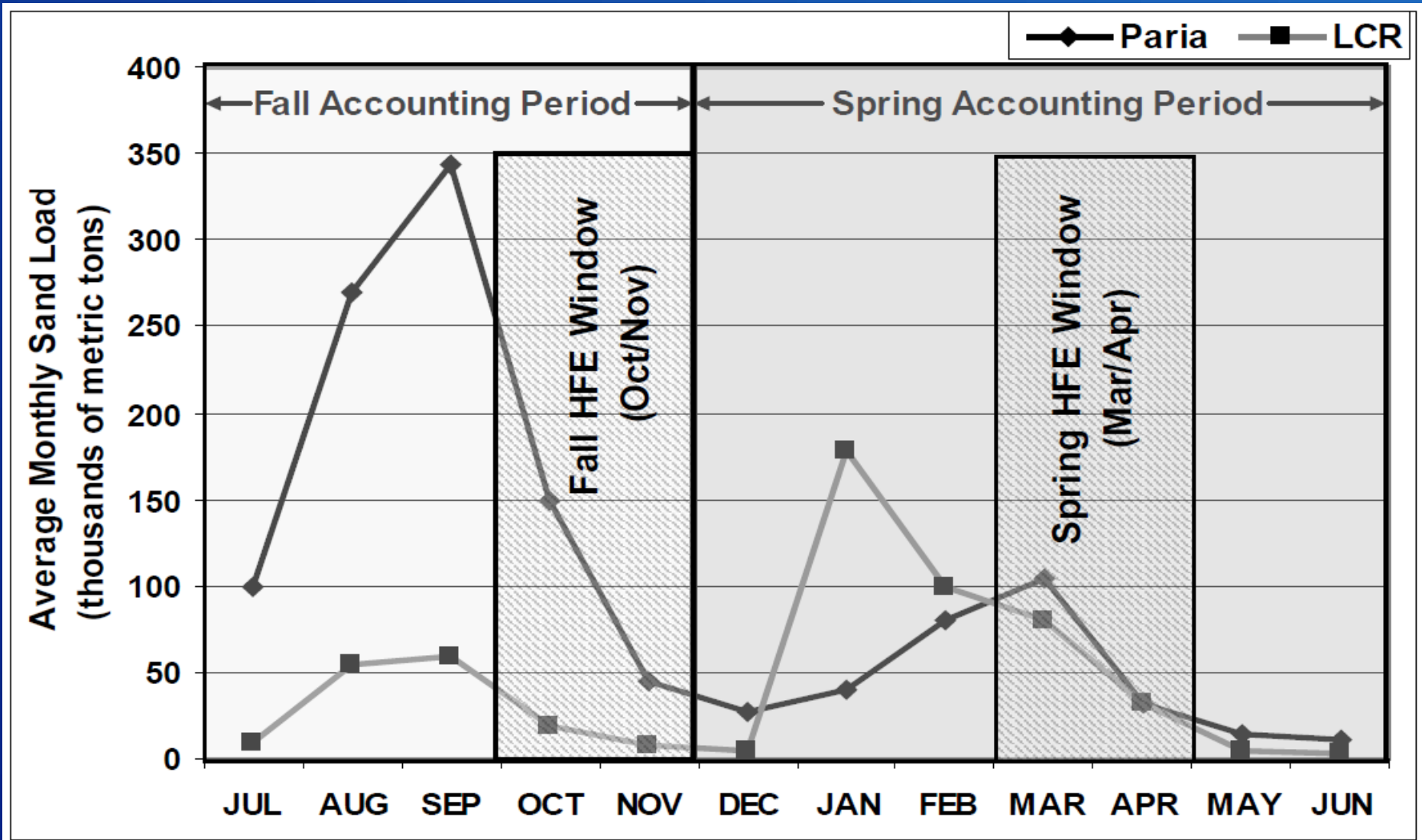
2. Modeling Component

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Modeling Component



Two Types of Spring HFEs

TABLE 4 Implementation Criteria for Experimental Treatments of Alternative D

Experimental Treatment	Trigger ^a and Primary Objective	Replicates	Duration	Annual Implementation Considerations ^b	Long-Term Off-Ramp Conditions ^c	Action if Successful
<i>Sediment-Related Experiments^d</i>						
Spring HFE up to 45,000 cfs in Mar. or Apr.	Trigger: Sufficient Paria River sediment input in spring accounting period (Dec.–Jun.) to achieve a positive sand mass balance in Marble Canyon with implementation of an HFE Objective: Rebuild sandbars	Not conducted during first 2 years of LTEMP, otherwise implement in each year triggered, dependent on resource condition and response	≤96 hr	Potential short-term unacceptable impacts on resources listed in Section 1.3; unacceptable cumulative effects of sequential HFEs; sediment-triggered spring HFEs will not occur in the same water year as an extended-duration (>96 hr) fall HFE	Sediment-triggered spring HFEs are not effective in building sandbars; or long-term unacceptable adverse impacts on the resources listed in Section 1.3 are observed	Implement as adaptive treatment when triggered and existing resource conditions allow
Proactive spring HFE up to 45,000 cfs (Apr., May, or Jun.)	Trigger: High-volume year with planned equalization releases (≥10 maf) Objective: Protect sand supply from equalization releases	Not conducted during first 2 years of LTEMP, otherwise implement in each year triggered, dependent on resource condition and response	First test 24 hr; subsequent tests could be shorter, but not longer, depending on results of first tests	Potential short-term unacceptable impacts on resources listed in Section 1.3; unacceptable cumulative effects of sequential HFEs; will not be implemented in the same water year as a sediment-triggered spring HFE or extended-duration fall HFE	Proactive spring HFEs are not effective in building sandbars; or long-term unacceptable adverse impacts on the resources listed in Section 1.3 are observed	Implement as adaptive treatment when triggered and existing resource conditions allow

LTEMP ROD

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Sediment Triggered Spring HFE

- **Objective**: rebuild sandbars
- **Trigger**: Paria River sand input (Dec-Jun), that results in positive sand mass balance in Marble Canyon
 - uncertainty bounds, future inputs assumption
- **Timing**: Mar-April, starting in 2020, if triggered
- **Magnitude**: up to 45,000 cfs (powerplant capacity + full bypass)
- **Duration**: up to 96 hrs
- **Considerations**: status of resources, stakeholder input

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Proactive Spring HFE

- **Objective**: Protect sand supply from equalization releases
- **Trigger**: Projected annual release ≥ 10 maf
 - 24-Month Study model projected annual release
- **Timing**: April, May, Jun starting in 2020, if triggered
- **Magnitude**: up to 45,000 cfs (powerplant capacity + full bypass)
- **Duration**: 24 hrs first test (≤ 24 hrs, subsequent)
- **Considerations**: status of resources, stakeholder input

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LTEMP EIS projected # of HFEs in 20-year LTEMP period

# Fall HFEs	# Spring HFEs	Total HFEs
14.7	5.7	20.4

Planning Considerations

- Follow similar process for fall HFEs
- Decision: ~middle of month prior to implementation (e.g., mid-March for April HFE)
 - hydropower marketing
- Convene tech team in ~3 months prior
 - e.g., Dec-Mar for April HFE
- Tribal consultations, TWG/AMWG input

Planning Considerations (cont'd)

- Coordinate maintenance scheduling ~2 yrs out
 - maximize unit availability for possible HFEs (e.g., a week in late April for sed. triggered, and a couple days in May/June for proactive)
- Research and monitoring prior to, during, and after a spring HFE to get at key science questions
 - FY18-20 Workplan
- Other?

Glen Canyon Power Plant Planned Unit Outage Schedule for Water Year 2019

Unit Number	Oct 2018	Nov 2018	Dec 2018	Jan 2019	Feb 2019	Mar 2019	Apr 2019	May 2019	Jun 2019	Jul 2019	Aug 2019	Sep 2019	
1		Possible HFE	[Red bar]										[Red bar]
2			[Red bar]										[Red bar]
3							[Red bar]						
4							[Red bar]						
5	[Red bar]												
6	[Red bar]								[Red bar]				
7								[Red bar]					
8								[Red bar]					
Units Available	6	8	6	6	6	4/6	6	7	8	8	8	6	
Capacity (cfs)	20,600	28,100	20,500	20,500	20,500	13,100	20,500	24,600	28,100	28,100	28,100	20,500	
Capacity (kaf/month)	1,350	1,670	1,290	1,260	1,140	1,220	1,280	1,590	1,670	1,730	1,730	1,260	
Max (kaf) ¹	640	640	720	1,170	1,030	1,100	980	970	1,020	1,150	1,230	924	
Most (kaf) ²	640	640	720	860	750	800	710	710	750	850	900	670	
Min (kaf) ¹	640	640	720	860	750	800	710	710	750	850	850	639	

¹ Projected release, based on Jan 2018 Min and Max Probable Inflow Projections and 24-Month Study model runs
² Projected release, based on Feb 2018 Most Probable Inflow Projections and 24-Month Study model runs
 (updated 2-13-2018)

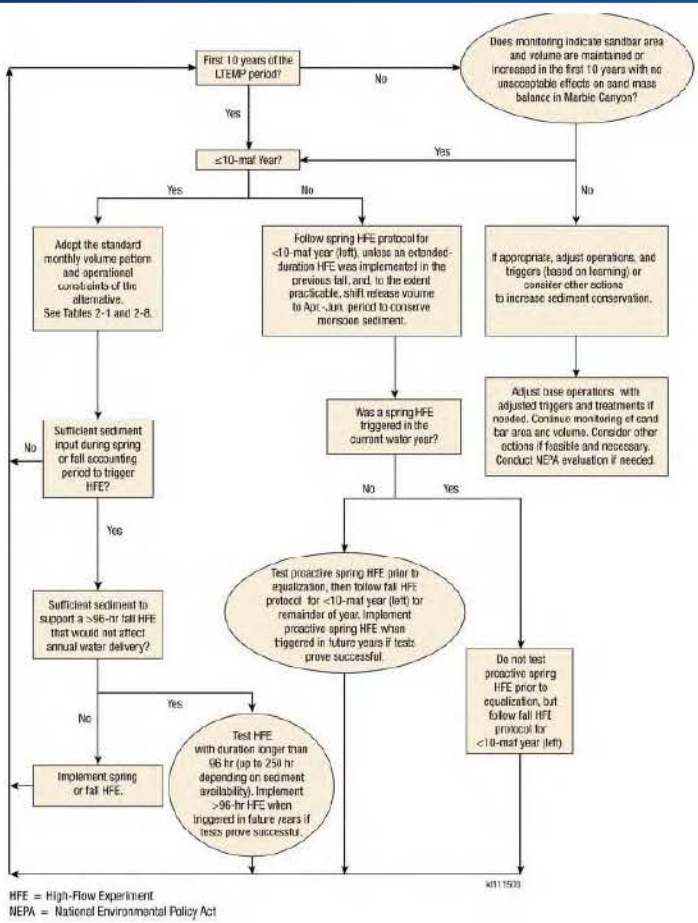


FIGURE 4 Decision Tree for Implementation of Sediment-Related Experimental Treatments under Alternative D (Implementation will be conditional on annual considerations presented in Section 1.3. If off-ramp conditions listed in Table 4 exist, related experimental treatments will be suspended.)