BUREAU OF RECLAMATION

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Lee Traynham
US Bureau of Reclamation

Michael Moran
US Geological Survey

LTEMP Flow Experiments

August AMWG Meeting

August 19, 2021

LTEMP Experiments

"The overall approach attempts to strike a balance between identifying specific experiments and providing flexibility to implement those experiments when resource conditions are appropriate."

"...rather than proposing a prescriptive approach to experimentation, an adaptive management-based approach that is responsive and flexible will be used to adapt to changing environmental and resource conditions..."

--2016 LTEMP ROD, p. B-9

LTEMP Process for Experiments

- Annual Reporting and TWG meetings
- Notification and Consultation to Tribes & PA Parties
- Implementation / Planning Team Recommendation
- DOI decision

1.4 COMMUNICATION AND CONSULTATION PROCESS FOR ALTERNATIVE D

To determine whether conditions are suitable for implementing or discontinuing experimental treatments or management actions, the DOI will schedule implementation/planning meetings or calls with the DOI bureaus (USGS, NPS, FWS, BIA, and Reclamation), WAPA, AZGFD, and one liaison from each Basin State and from the UCRC, as needed or requested by the participants. The implementation/planning group will strive to develop a consensus recommendation to bring forth to the DOI regarding resource issues as detailed at the beginning of this section, as well as including WAPA's assessment of the status of the Basin Fund. The Secretary of the Interior will consider the consensus recommendations of the implementation/planning group, but retains sole discretion to decide how best to accomplish operations and experiments in any given year pursuant to the ROD and other binding obligations.

Resource Considerations

1. Water quality and water delivery
2. Humpback Chub
3. Sediment
4. Riparian Ecosystems
5. Historic properties and traditional cultural properties
6. Tribal Concerns
7. Hydropower production and WAPA's assessment of the status of the Basin Fund
8. Rainbow Trout Fishery
9. Recreation
10. Other Resources

Reference: 2016 LTEMP ROD, p. B-8,

Section 1.3 Implementation Process for Experiments Under Alternative

Potential LTEMP Flow Experiments

GCD Experimental Flow	Duration	Implementation Window
Fall HFE	up to 96 hours	October - November
Extended Duration Fall HFE	97- 192* or 97-250 hours***	October - November
Spring HFE$^{\Delta}$	up to 96 hours	March – April
Proactive Spring HFE$^{\Delta\lozenge}$	24 hours**	April – June
Trout Management Flows	up to 3 cycles/month for 4 months	May – August
Macroinvertebrate Flows	target 2-3 replicates	May – August

* First test not to exceed 192 hours
** First test 24 hours
*** After first test, up to 250 hours

Δ no Spring HFE in same WY as extended duration Fall HFE
◊ no proactive Spring HFE in same WY as sediment-driven Spring HFE

WY 2021 Research Flows :

- Apron Repair + Spring Disturbance Flow Test (March)
- Release reduction for Overflight (steady 8,000 cfs for 7 days in May)

Research Flows Implemented In FY21

USGS

Spring Disturbance Flow

What?

- Low flow for dam maintenance (4k cfs) for 5 days and then high flow (20k cfs) at power-plant capacity for 6 days

When?

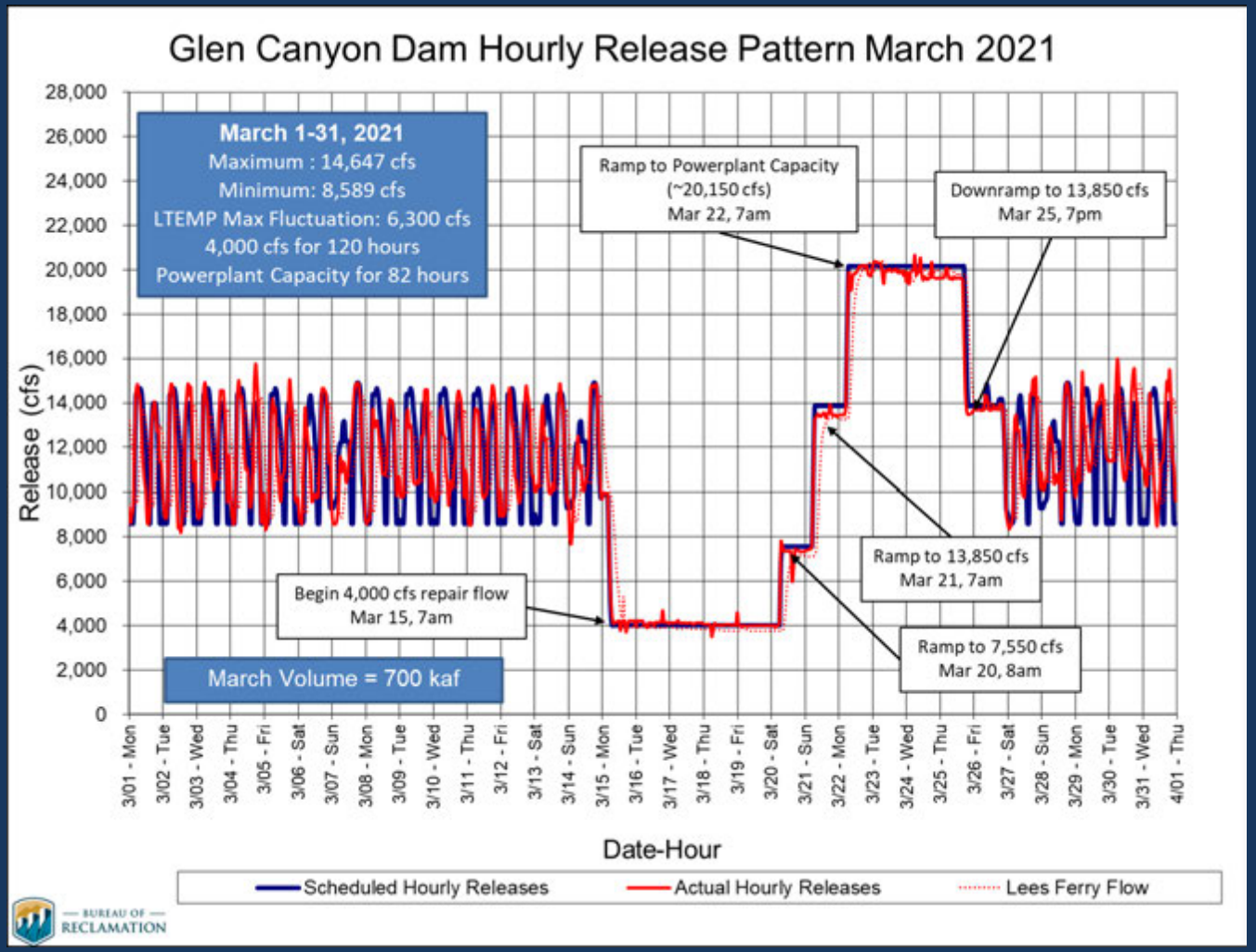
- March 15-25, 2021

Why?

- Study ecosystem disturbance effects of spring low flow followed by high flow

USGS

Spring Disturbance Flow – Hydrograph



Source: US Bureau of Reclamation, 2021

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Spring Disturbance Flow – Preliminary Results Fish

- Small numbers of fish caught in isolated pools
  - < 5 fish/pool; often none caught
  - stranded fish usually small (<30 mm TL)
  - more non-natives than natives caught

- No humpback chub found in pools
- No evidence of widespread stranding

USGS

Spring Disturbance Flow – Preliminary Results Bugs

- Benthic sampling showed increased *Hydropsychid* abundance starting at Parashant (RM 199)
- ~ 0 abundance prior to 2018
- Future light trap data may or may not be good indicator of abundance

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Data Collection Efforts In FY21

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Remote Sensing Overflight

What?

- Orthorectified imagery with 20 cm resolution
- Digital elevation model with a 1-meter resolution

Where?

- Glen Canyon Dam to Pearce Ferry Rapid

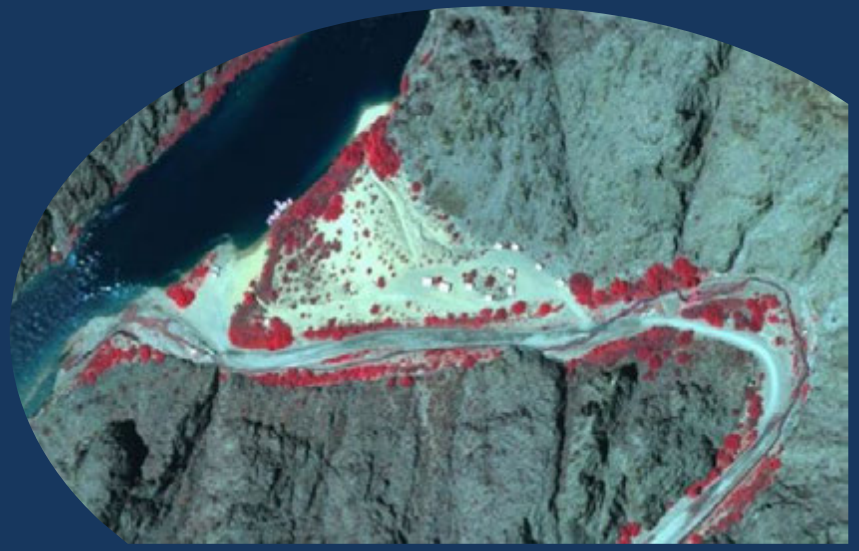
Why?

- Critical for GCMRC's ability to implement LTEMP requirements of tracking decadal-scale changes to ecosystem resources

USGS

Remote Sensing Overflight - Operations

- USGS requested steady 8000 cfs release from dam for 7 days; May 29 – June 6
- Fugro Earth Data Inc. acquired imagery from two airplanes daily during the steady discharge
- Challenging weather conditions required extension of flight window 1 hour each day and 1 extra day of steady releases



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Remote Sensing Overflight - Summary

- Mission was a success
- The data are very high quality and will be of great use to the GCDAMP for management and science in the Colorado River and Grand Canyon
- Data will be available for use by GCMRC scientists and stakeholders before end of year

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Experiments Potentially Occurring in FY22

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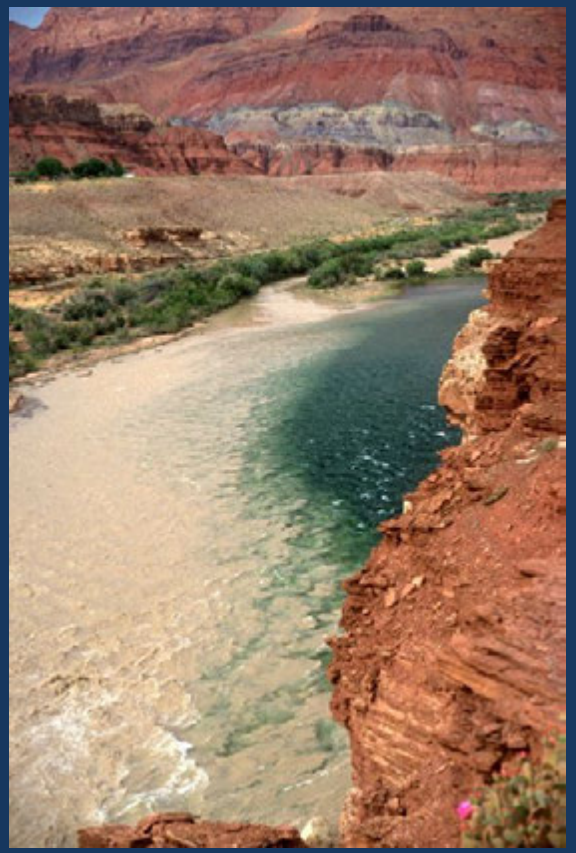
Potential Fall HFE - FY22

- Currently within Fall accounting window
- Monsoonal flows in Paria started this year around third week of July
- Sand inputs from Paria significant to date



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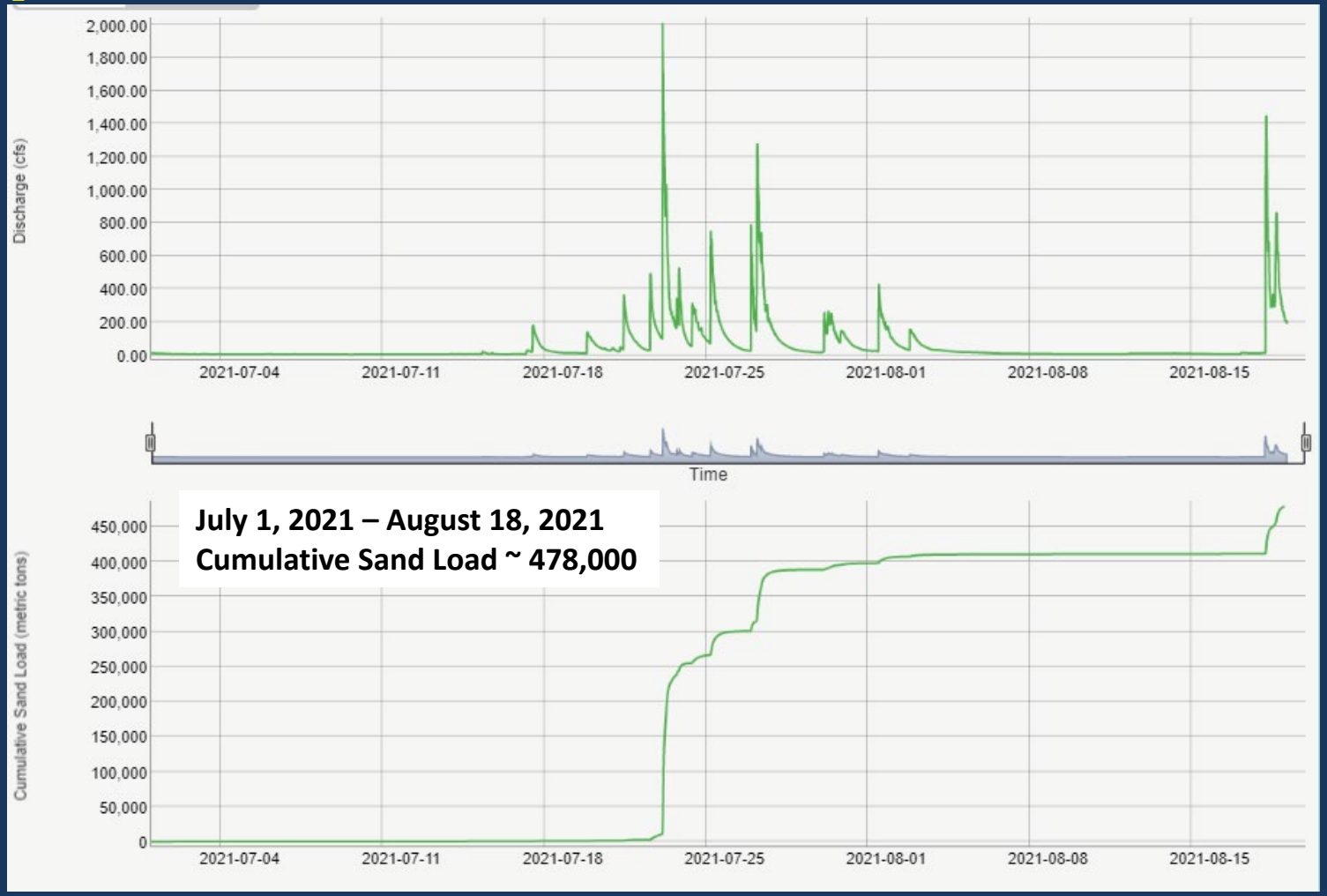
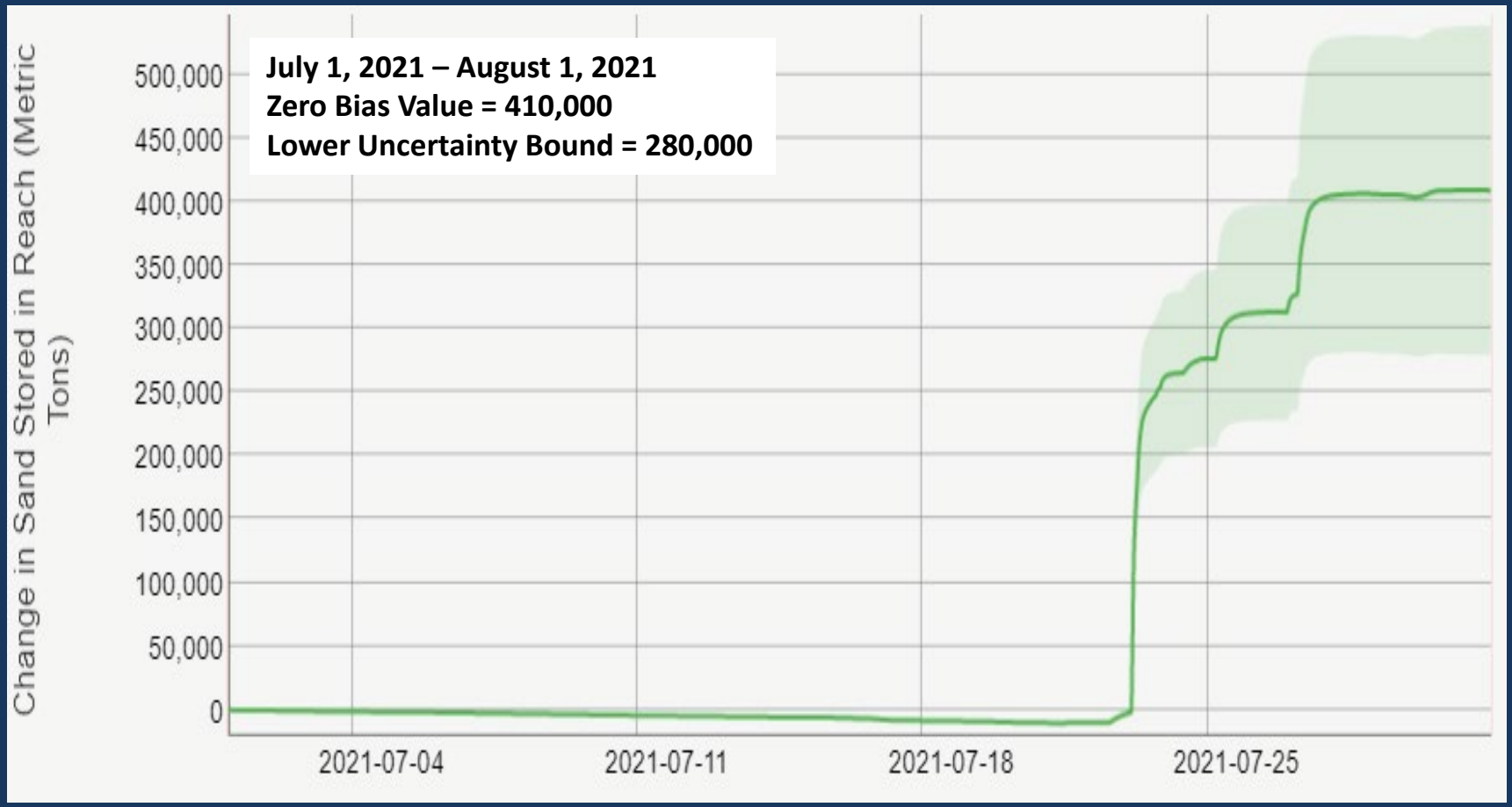
Paria River Discharge and Sand Inputs



USGS Preliminary Data, 2021. Do Not Cite.
(https://www.gcmrc.gov/discharge_qw_sediment/station/GCDAMP/09382000)

USGS

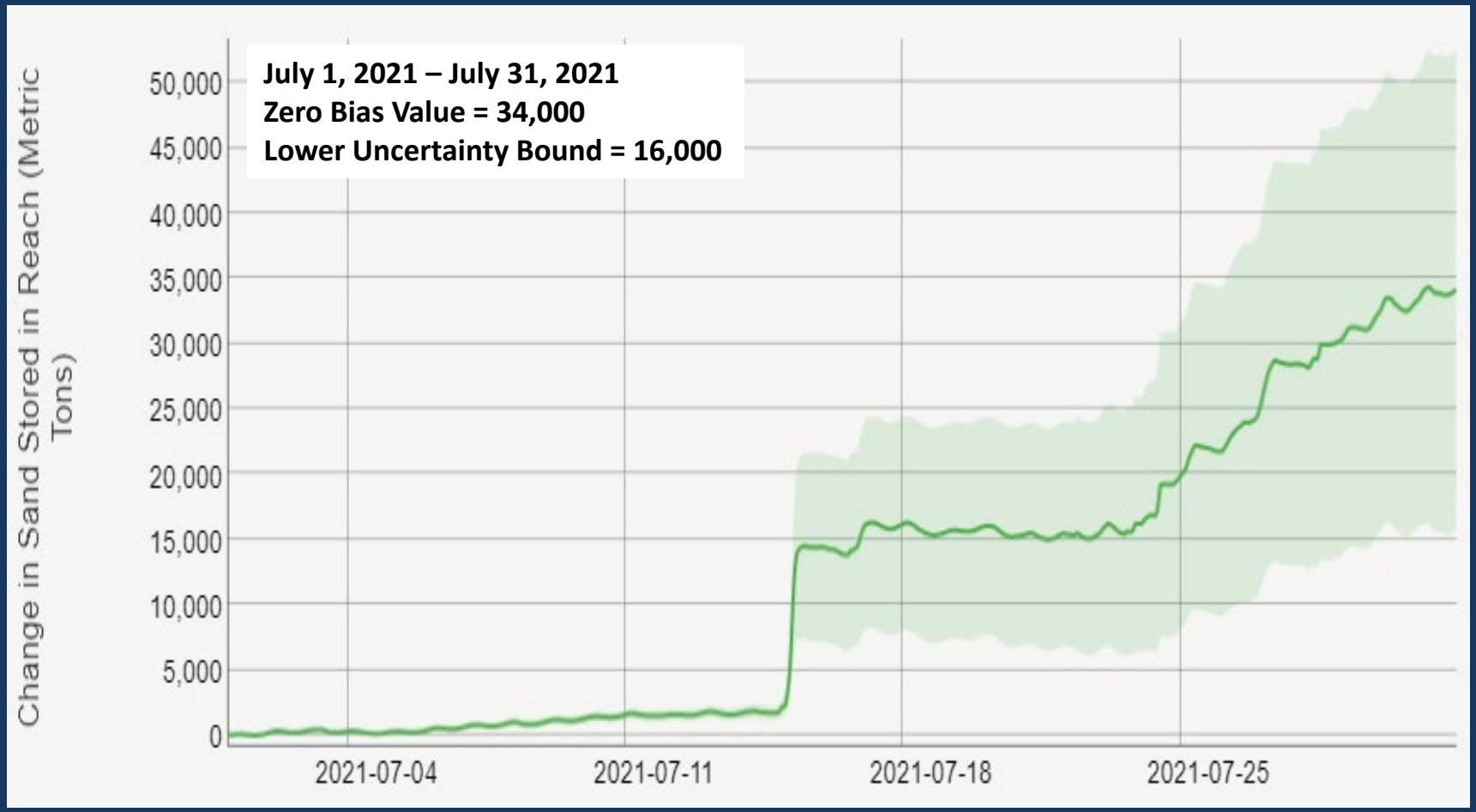
Upper Marble Canyon Sand Mass Balance



USGS Preliminary Data, 2021. Do Not Cite.
(https://www.gcmrc.gov/discharge_qw_sediment/reach/GCDAMP/09380000/09383050)

USGS

Lower Marble Canyon Sand Mass Balance



USGS Preliminary Data, 2021. Do Not Cite.
(https://www.gcmrc.gov/discharge_qw_sediment/reach/GCDAMP/09383050/09383100)

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LCR Discharge

USGS Preliminary Data, 2021. Do Not Cite.
(https://www.gcmrc.gov/discharge_qw_sediment/station/GCDAMP/09402300#)

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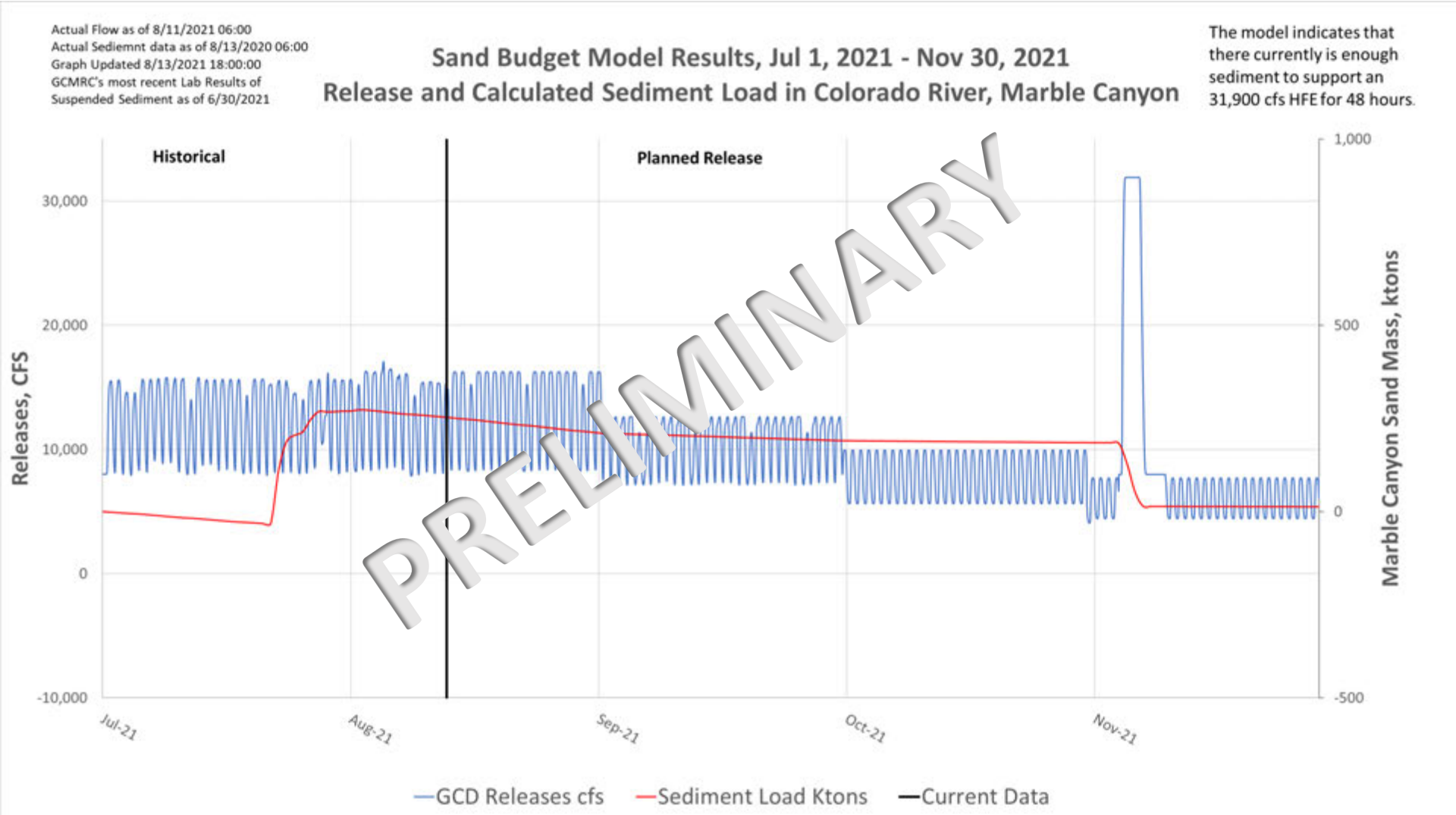
Sand Budget Model Results



Next Steps

- Spring Disturbance Flow
  - Dec 2021 – GCMRC documents findings in Annual Report
  - Jan 2022 – ARM, TWG Review and Discussion
- Bug Flows
  - Oct 2021 – GCMRC Draft Synthesis Report & WAPA assessment of purchase power costs
  - Dec 2021 – Science Advisors Review
  - Jan 2022 – ARM, TWG Review and Discussion
- Trout Management Flows
  - Fall 2021 – Consultation w/ Tribes
  - Dec 2021 – GCMRC Literature Review
  - 2022 – BOR White Paper
  - 2022 – Potential lab-based or small-scale studies
  - 2022 – Review of Upper Basin spike flow experiment

Questions?