Summary of Sediment Synthesis

Support of Ad Hoc Desired Future Conditions

Technical Workgroup Meeting

December 4, 2007

Grand Canyon Monitoring & Research Center, Flagstaff

USGS

Summary of Sediment Synthesis

Synthesis Research Conducted 1998-2004

Schmidt and others, 2004 (available at www.gcmrc.gov)

- Sandbar Area Declined an average of 25% in the upper 1/3 of CRE between 1984 and 2000 (areas mapped from imagery captured at 5,000 & 8,000 cfs),

-Highly Variable Sandbar Loss – in some areas the percent lost was 0% change, but in other areas loss was as much as -55%,

-Average annual sandbar erosion is difficult to quantify,

-During the 1990s, 55 of 57 cross-sections monitored by the USGS lost sand, and the volume of sand in the sandbars below 8,000 cfs and in the main-channel pools decreased by over 25% at the sites monitored by NAU in the upper 1/3 of CRE

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Summary of Sediment Synthesis

Geomorphic Research Reports

Grams and others, 2004 & Grams and others 2007 – describes the Geomorphic channel changes in the Lees Ferry reach (rm -16 to 0)

- Most of the channel changes occurred during highest dam releases in June 1965 and during spills and high releases of 1983-85

- Sediment eroded from the tailwaters reach included large volumes of both sand and gravel

- The channel has incised and altered the stage/discharge curves in the upper part of the reach, but changes are less downstream

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Summary of Sediment Synthesis

Some Other Related Reports

Topping and others, 2000a and 2000b – Two *Water Resources Research* articles describing sand-transport characteristics of the Colorado in the pre-dam era – documented flows associated with sand accumulation

Topping and others, 2003 - "Computation and Analysis of the Instantaneous Discharge Record for the Colorado River at Lees Ferry, Arizona - May 8, 1921, through September 30, 2000"

Topping and others, 2005 - "Regulation of sand transport in the Colorado River by changes in the surface grain size of eddy sandbars over multi-year timescales "

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Review of Suspended Sand Data

How do GCD Operations Relate to the Downstream Transport of New Sand Supplies From Tributary Sources over Monthly and Annual Timescales?

Rapid Changes in both Sediment Grain Size & Discharge Must be Considered in Modeling Efforts

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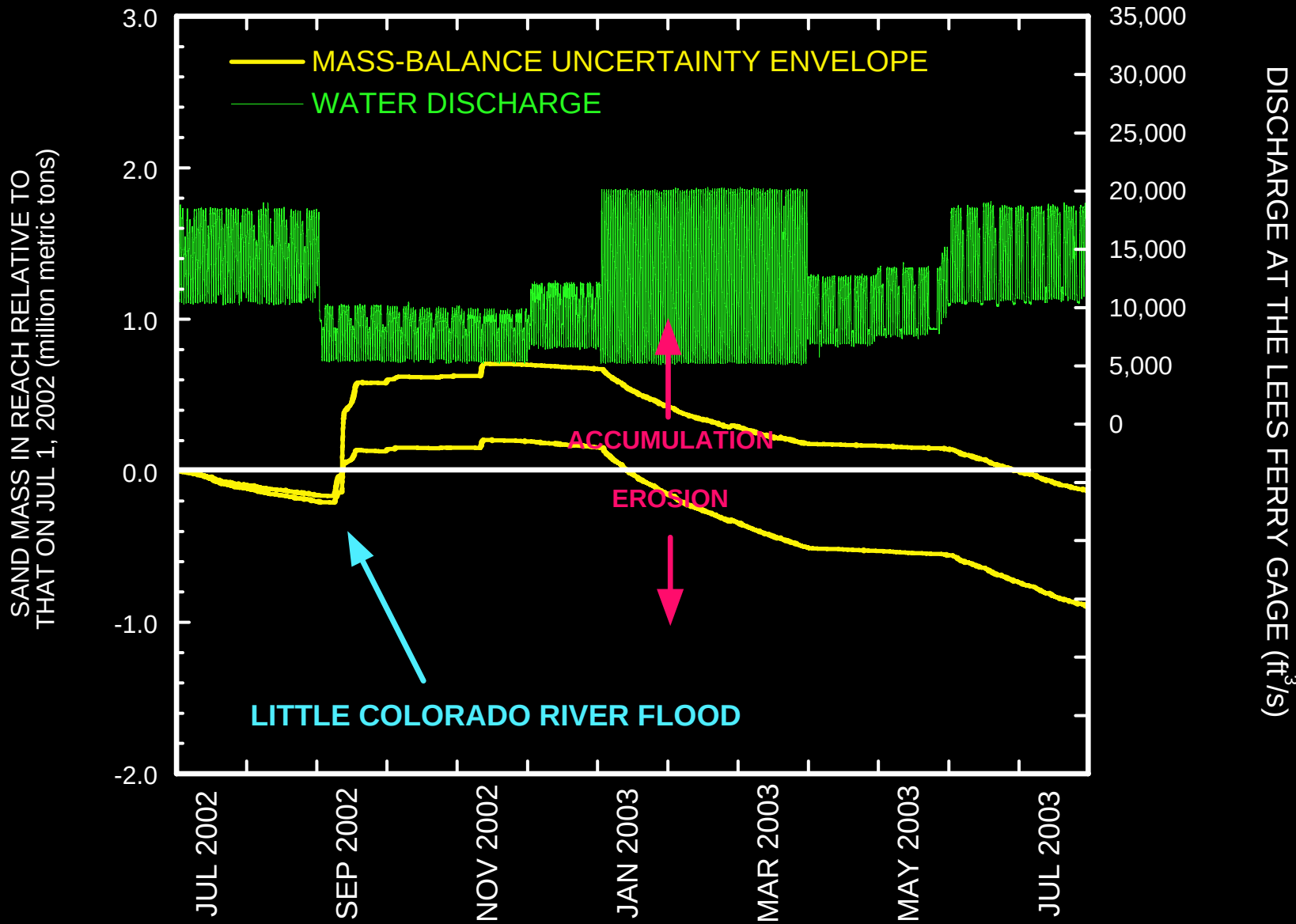
SEDIMENT-YEAR 2003 MASS-BALANCE SAND BUDGET BETWEEN LEES FERRY AND THE GRAND CANYON GAGE



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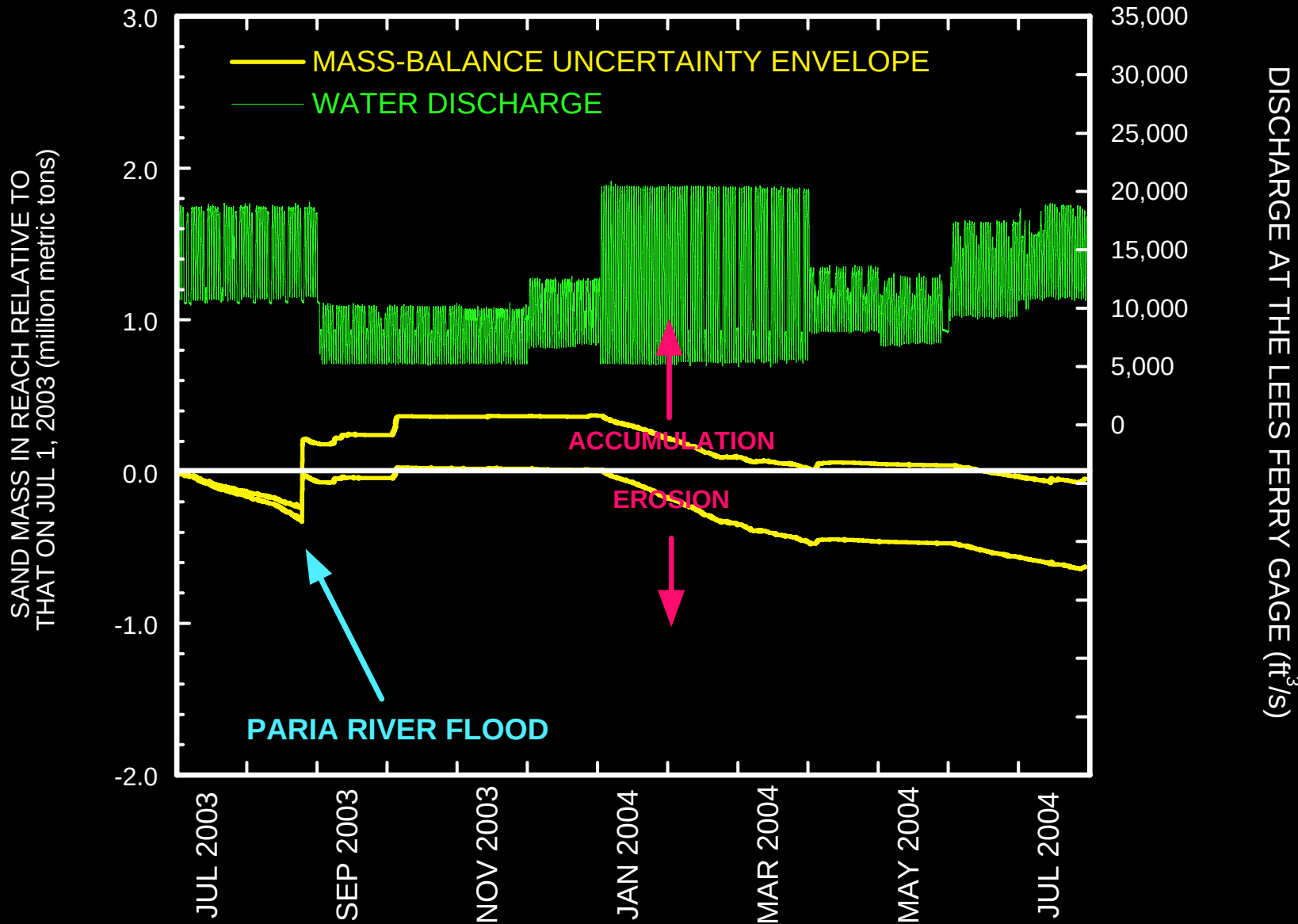

Summary – Flows and Sand Transport

Flow Regime	Months	Volume (TAF)	Inputs	Export	Average retained
5 – 10	9	490	1.6 ± 0.40	0.2 ± 0.02	82 – 91%
7 – 13	18	610	1.3 ± 0.33	0.4 ± 0.04	55 – 78%
11 – 18	23	850	1.0 ± 0.25	2.4 ± 0.24	- (73 – 250)%

Based on data from August 1999 – February 2006

Low to moderate volumes/peaks retained sand.
High volumes/peaks exported more sand than came in.

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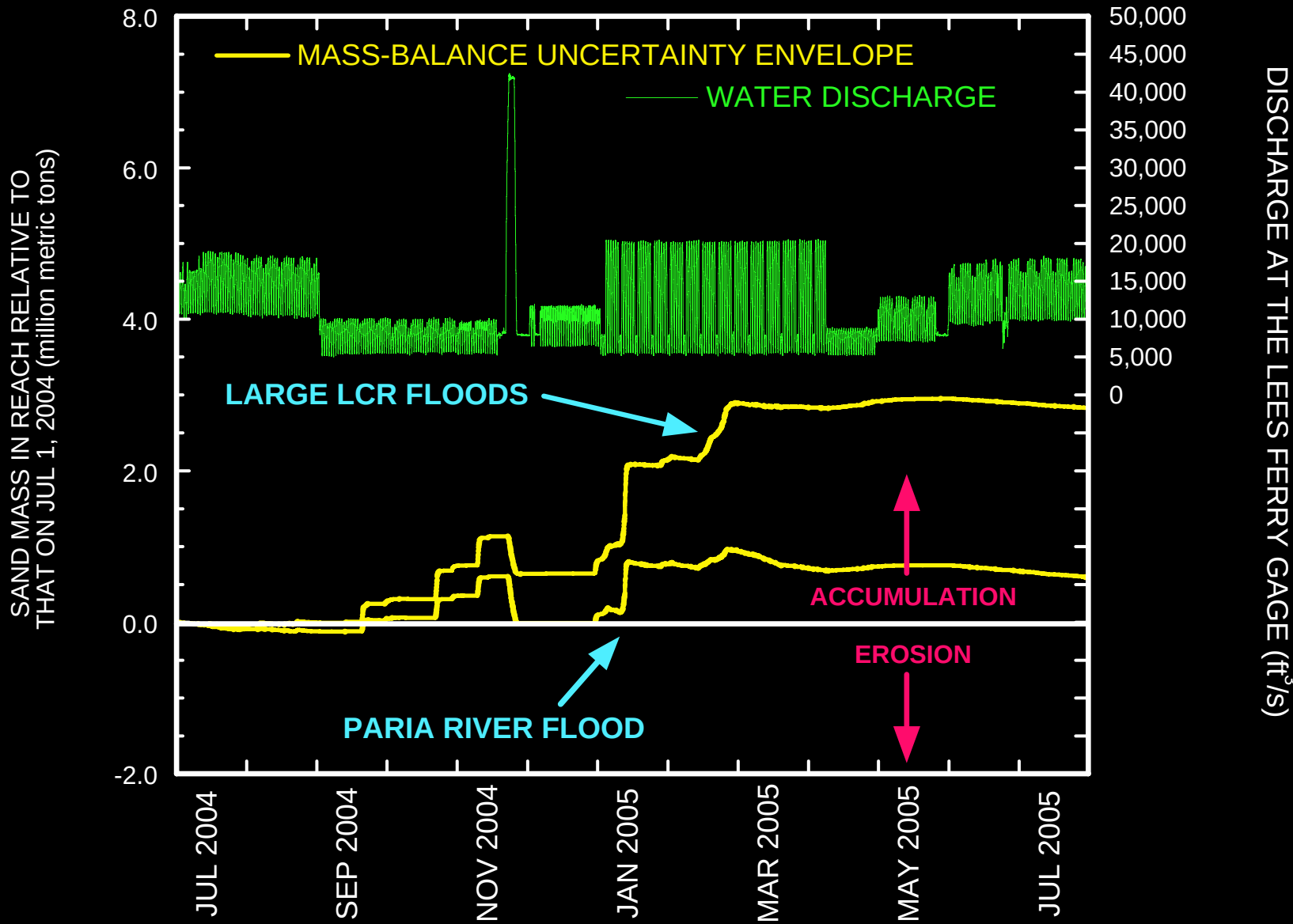
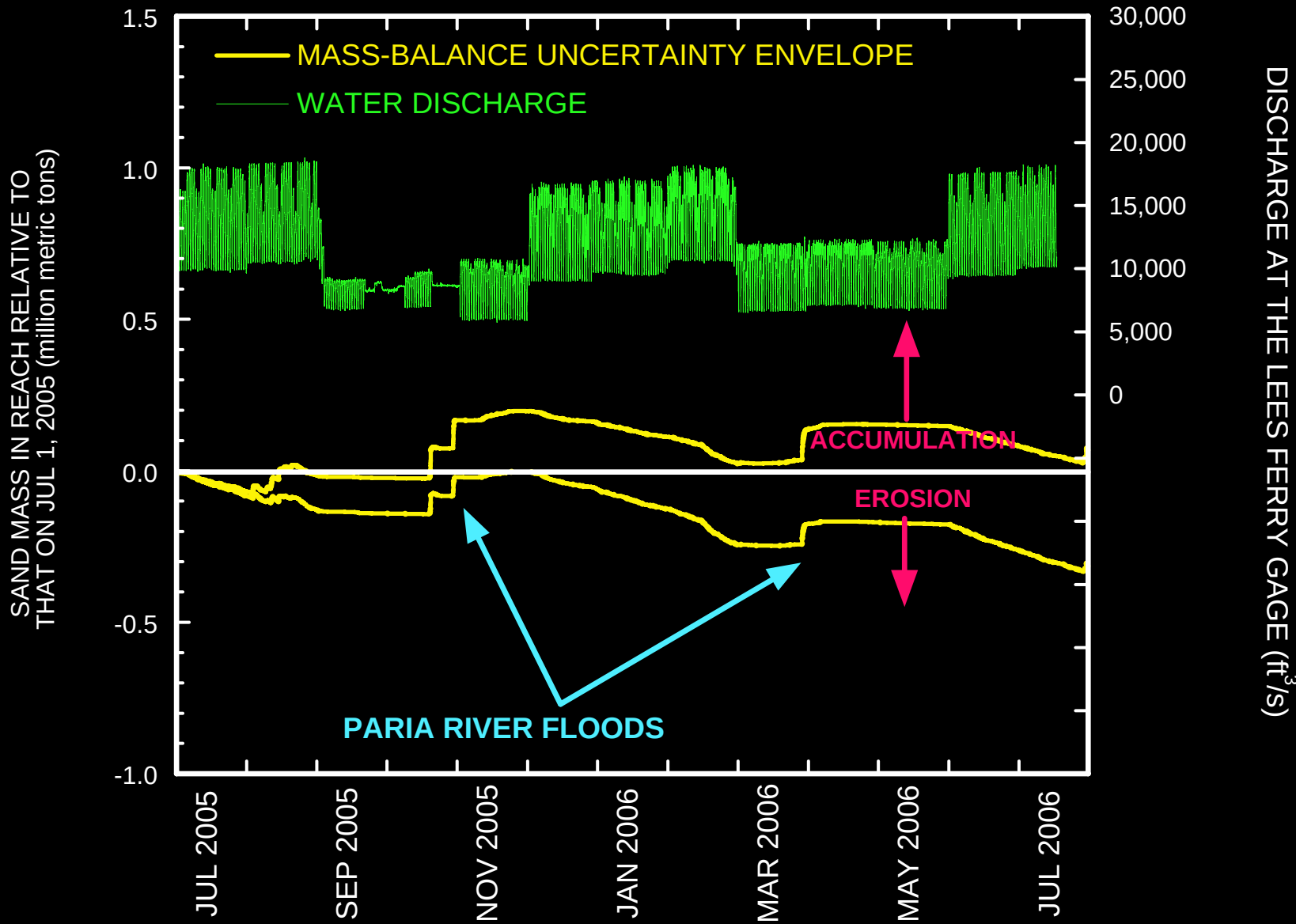
Preliminary data subject to review and revision

SEDIMENT-YEAR 2005 MASS-BALANCE SAND BUDGET BETWEEN LEES FERRY AND THE GRAND CANYON GAGE



SEDIMENT-YEAR 2006 MASS-BALANCE SAND BUDGET BETWEEN LEES FERRY AND THE GRAND CANYON GAGE



Monitoring Sand Transport

Between 2000 and 2004 – UCRB hydrology was characterized by drought and GCD releases were 8.23 MAF – sand inputs were below average and were exported downstream by higher summer/winter peaks

From 2005 to Present – Sand inputs have been above average, while dam Releases have remained 8.23 MAF – only under these ongoing conditions have new sand inputs accumulated

Sand Transport under 8.23 MAF & MLFF – Largest export months are typically December, January, July and August

Current Modeling Capabilities – Sand Export can only be crudely estimated Owing to variable boundary conditions and predicting sand input from tributaries is not possible

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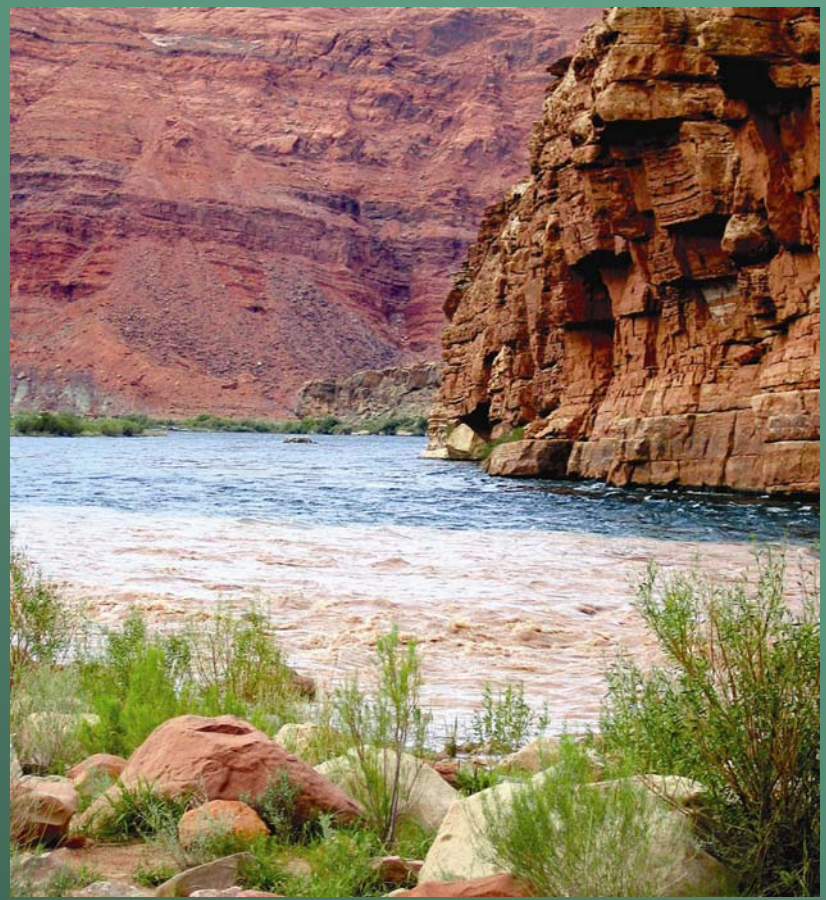
Thank You

Questions?



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