



Stuck in the Mud: Sediment Stories Revealed from the Glen Canyon Dam ‘Experiment’



Returning Rapids

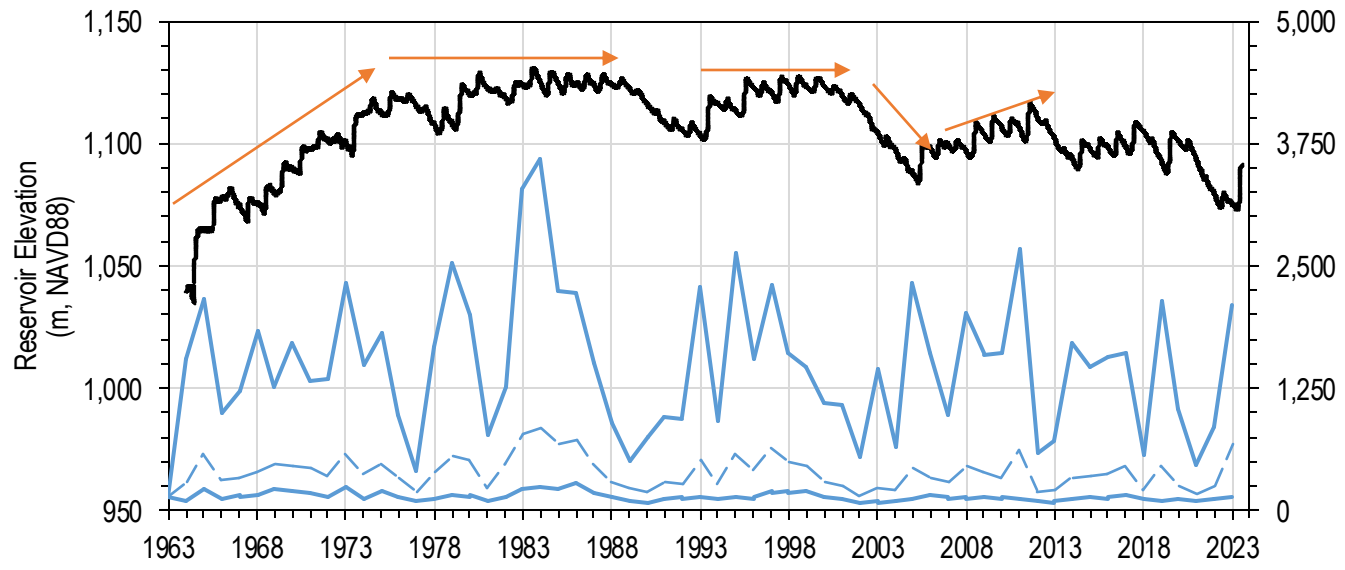
Project



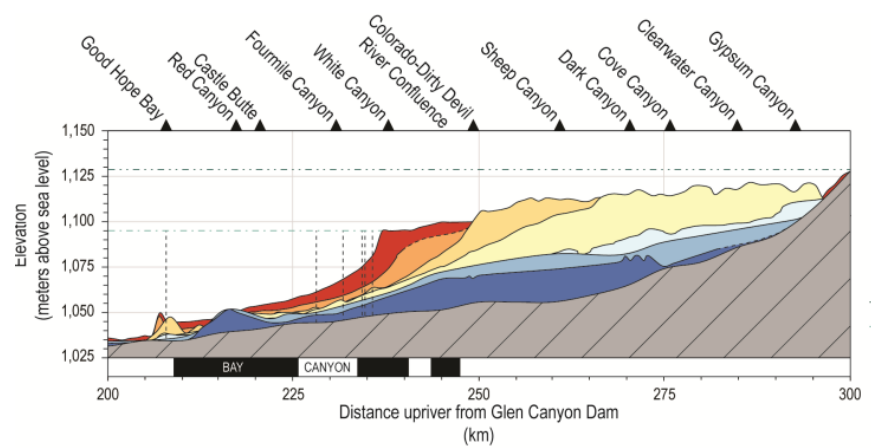
Cari Johnson, University of Utah

Glen Canyon Dam 'Experiment'

Modern → Ancient



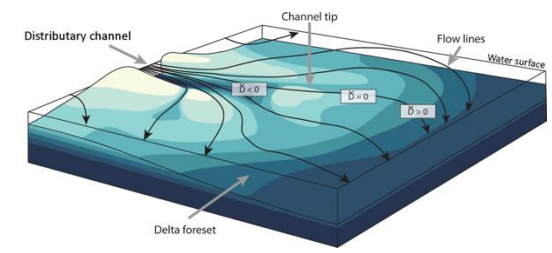
Large flume model of the Mississippi River delta at LSU



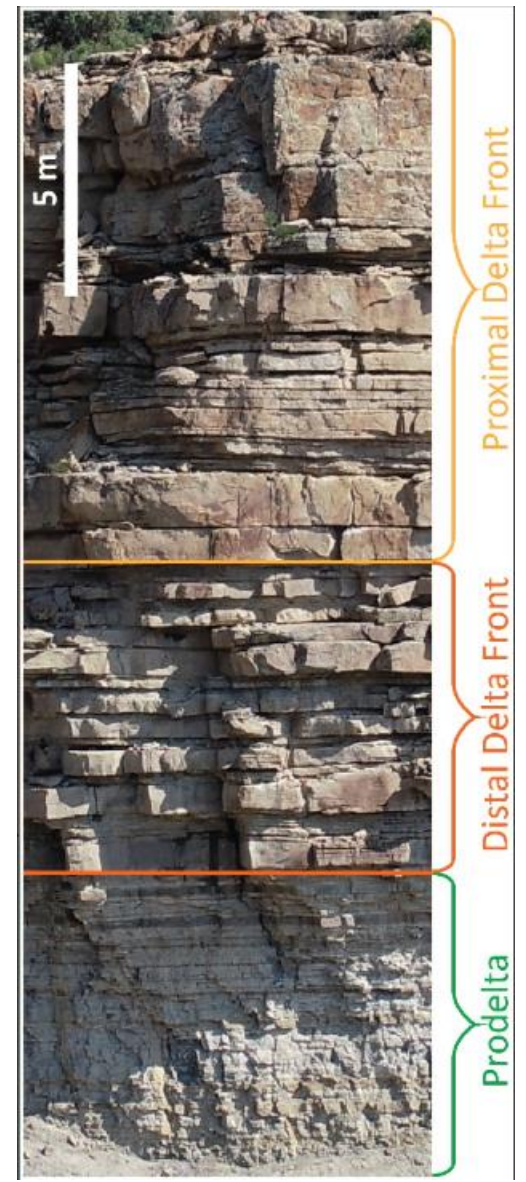
J.C. Root, USGS



M. Dehoff, RRP



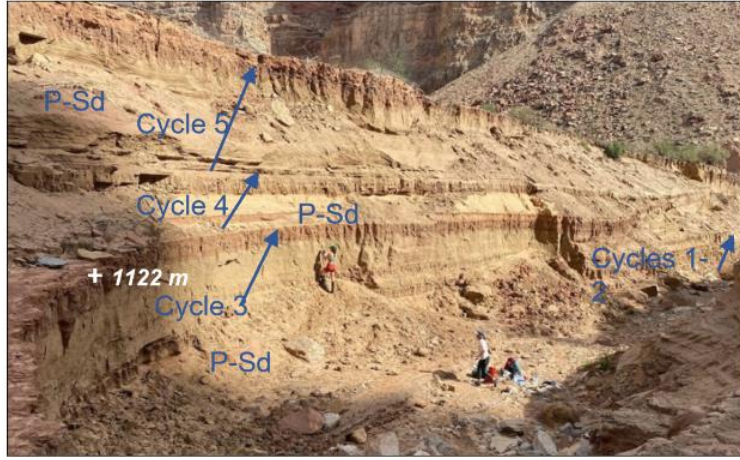
Numerical delta model, Shaw et al., 2018



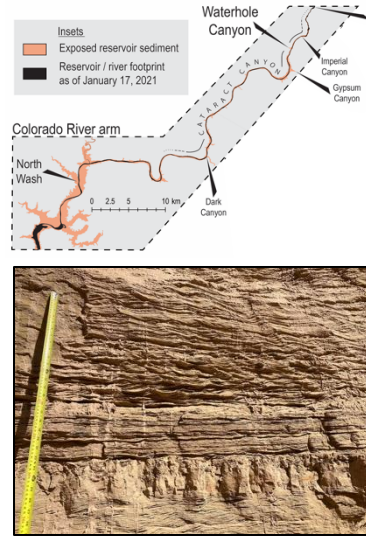
Cretaceous delta, UT

Previous Research Highlights: Upstream → Downstream

- Exposed Dominy Formation

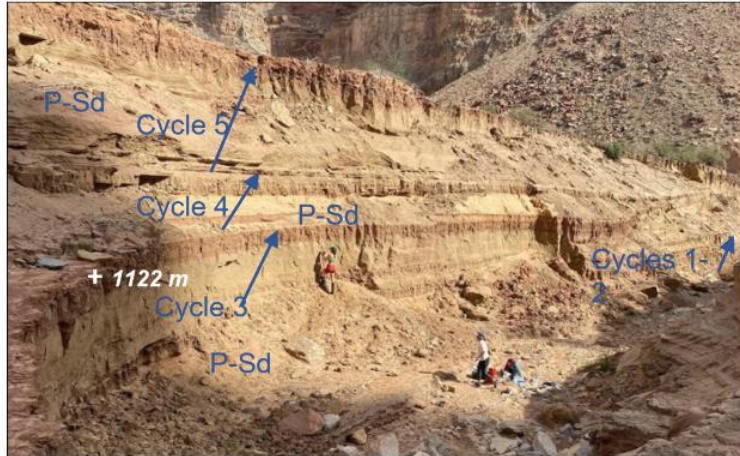


Johnson et al., 2022

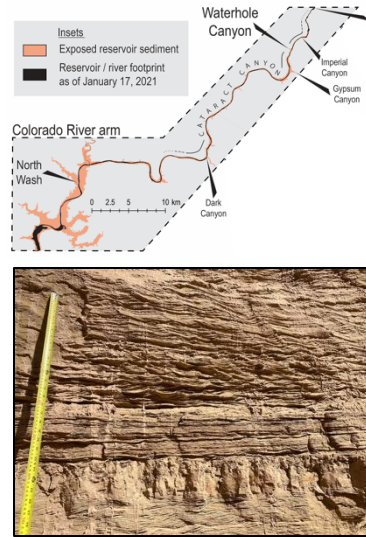


Previous Research Highlights: Upstream → Downstream

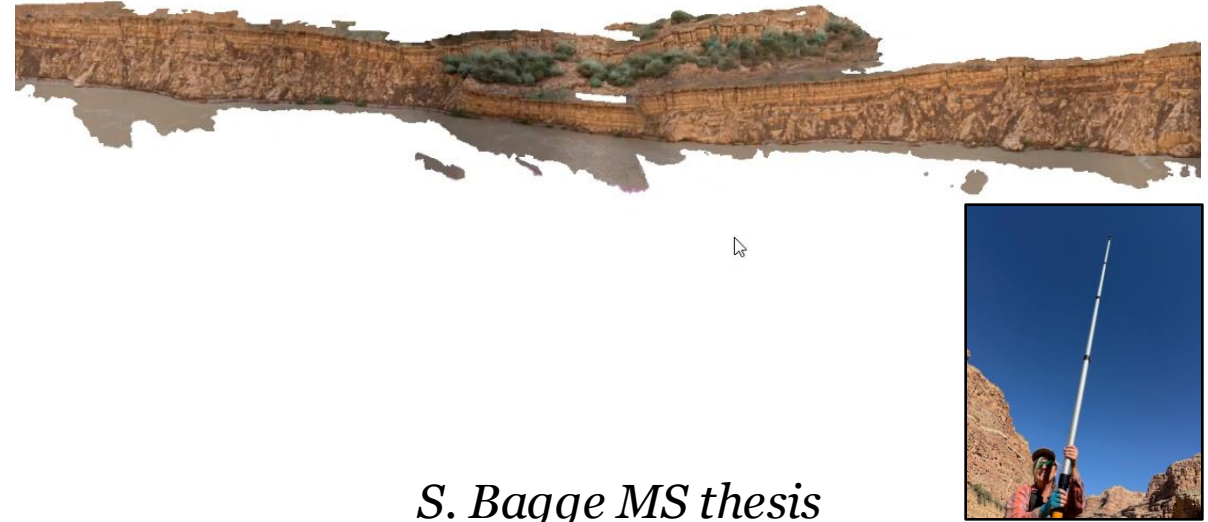
- Exposed Dominy Formation



Johnson et al., 2022

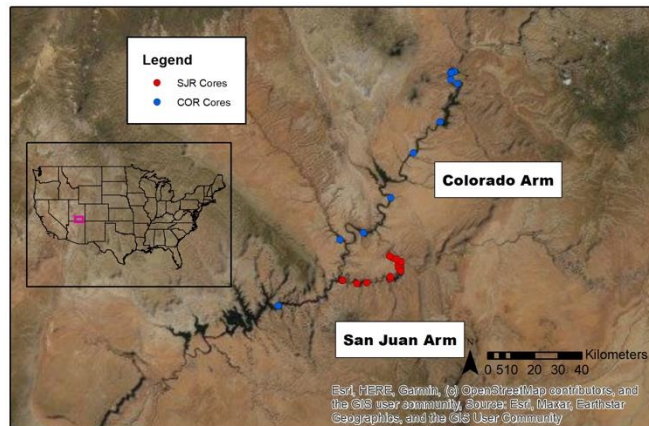


- Slumps and Sediment Remobilization

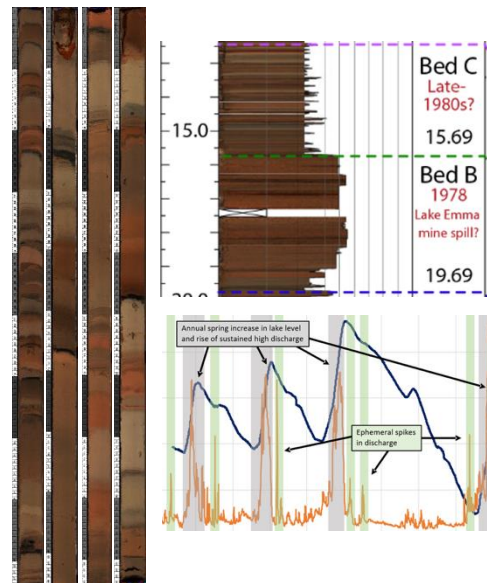


S. Bagge MS thesis

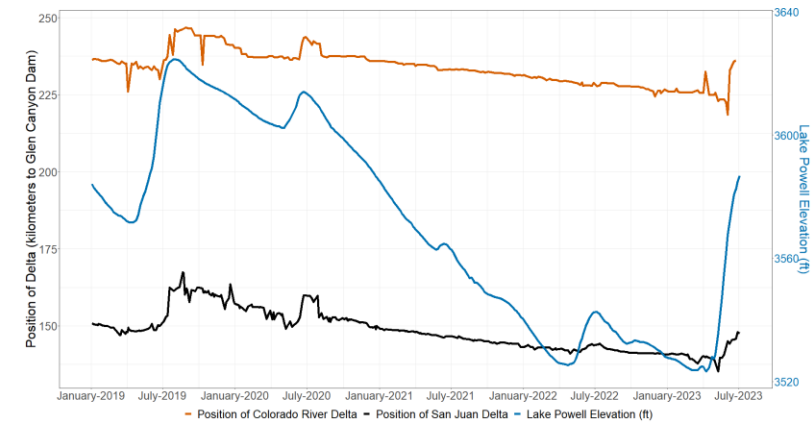
- USGS Sediment Cores



H. Hartley, MS thesis



- Delta Mapping

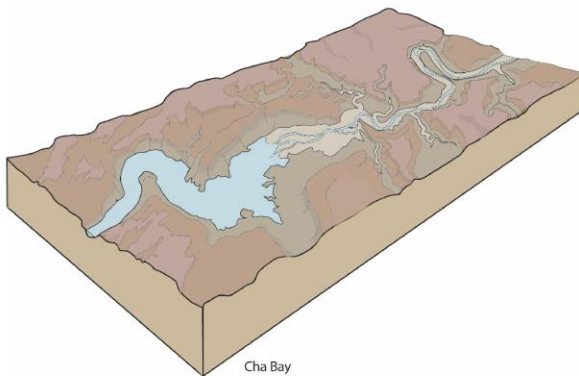


H. Baggs and K. Wilson, MSSST theses

Deltas 101

Images by Liz Mahon

Upper/mid bay delta

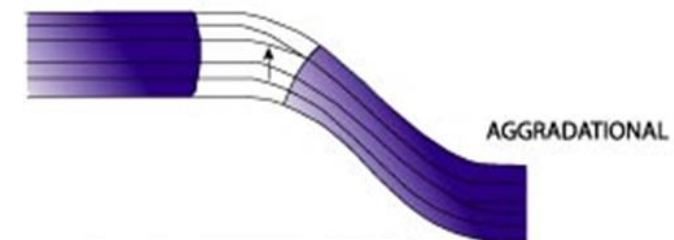
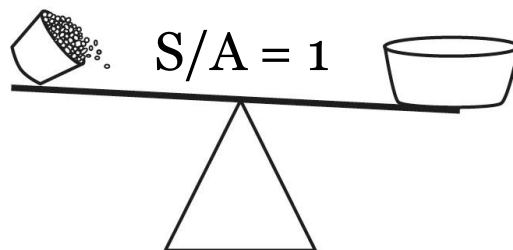


Sediment Supply

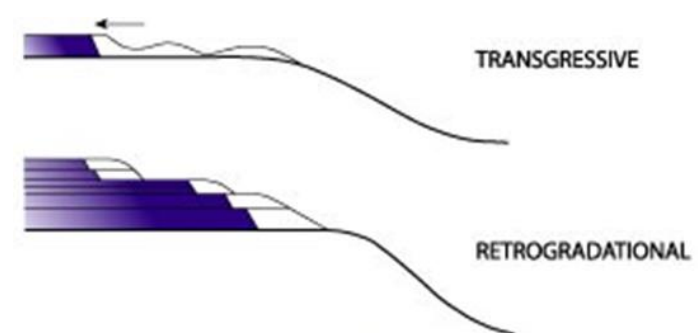
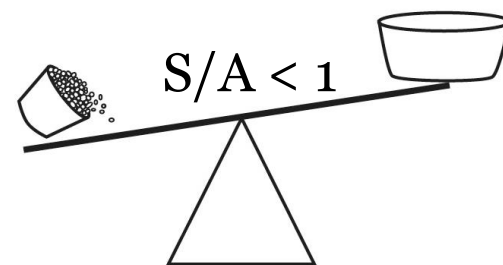
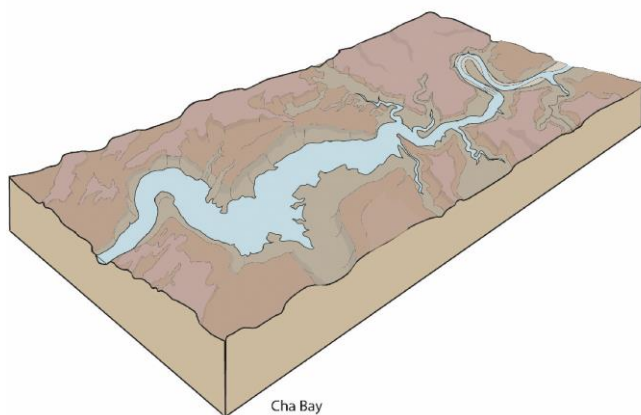
Accommodation

(S)

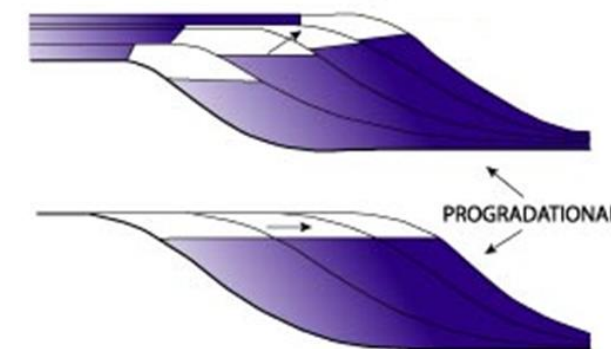
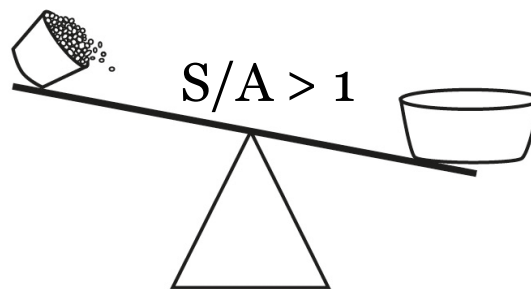
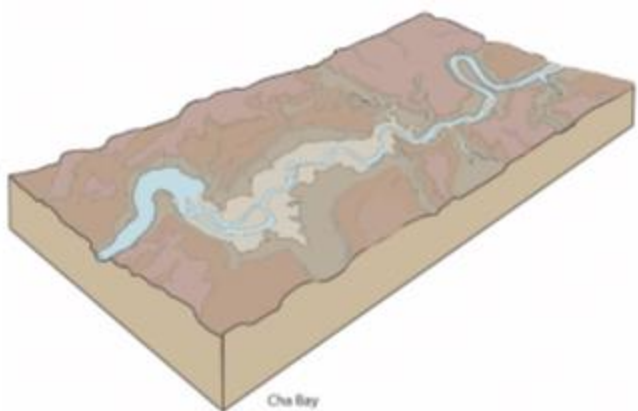
(A)



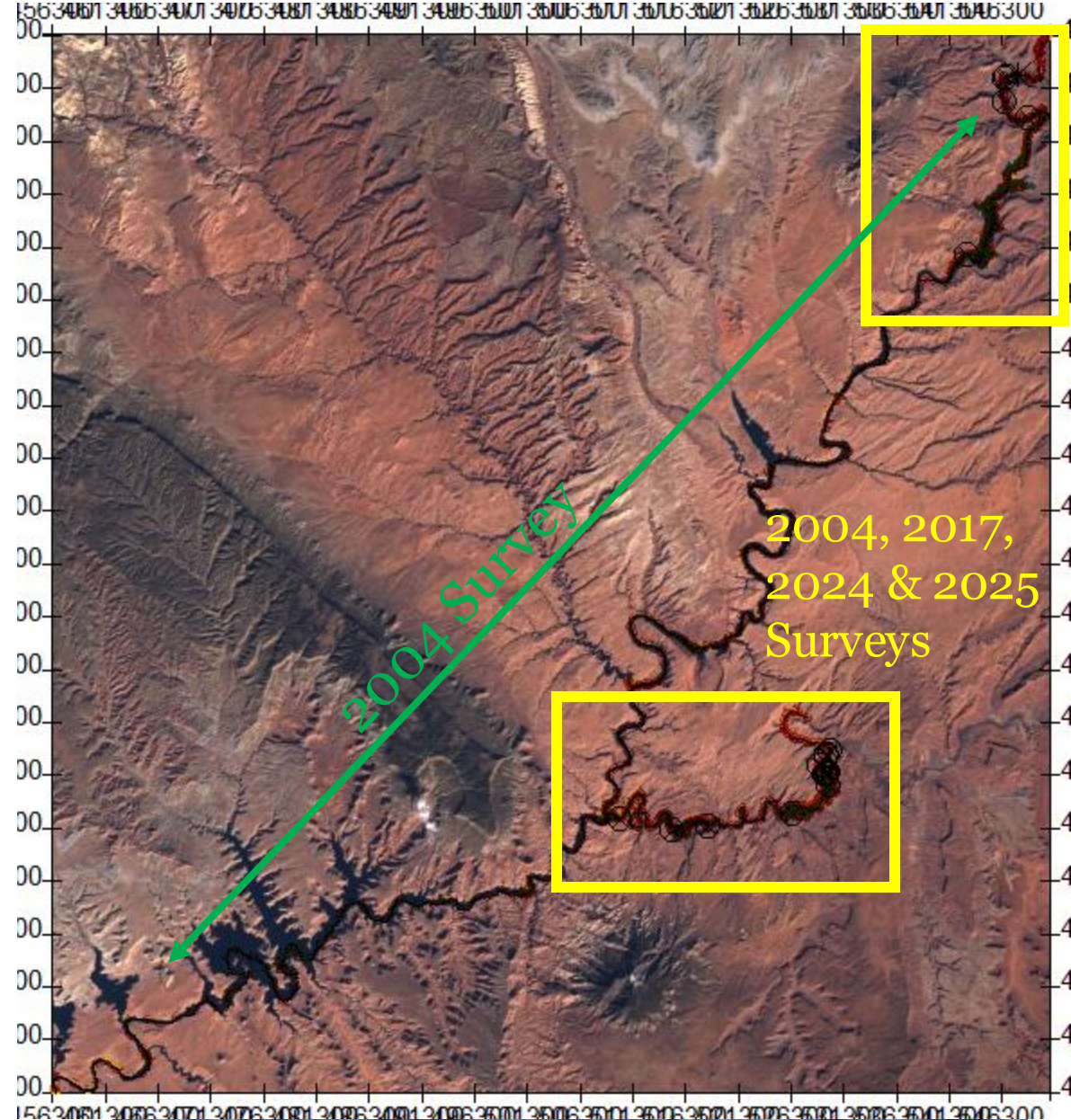
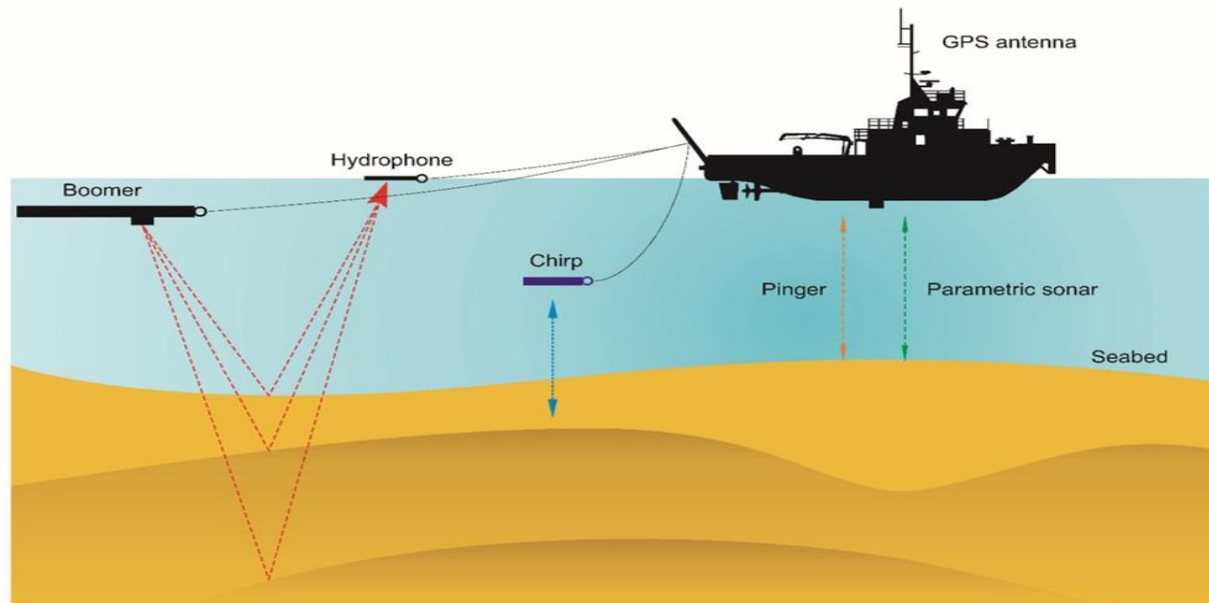
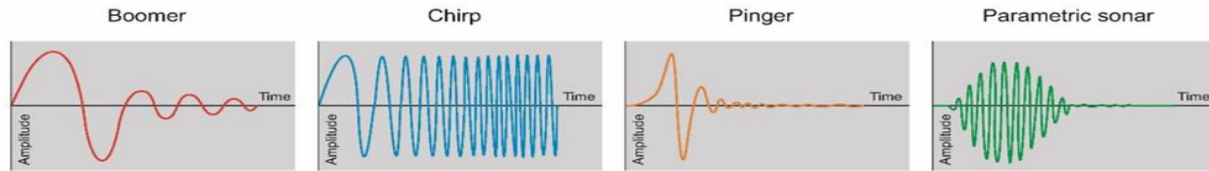
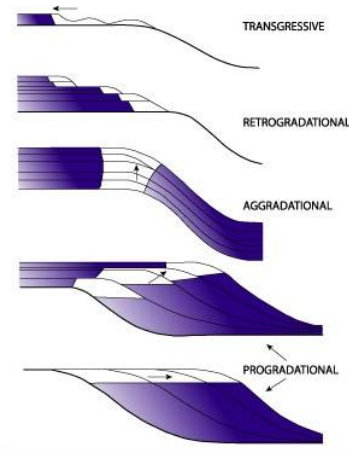
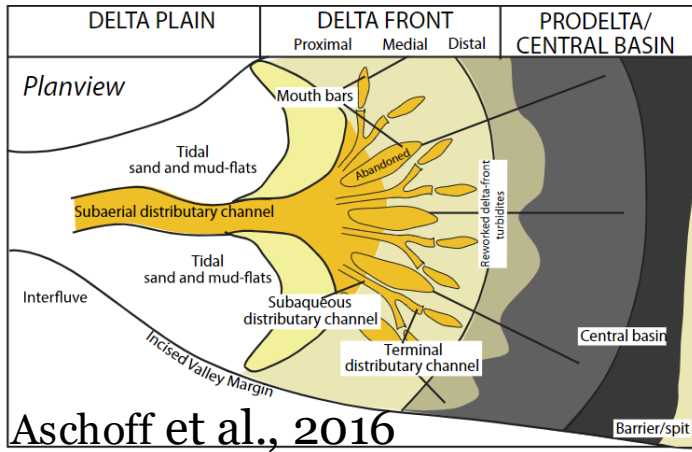
Confined river delta



Lower bay delta

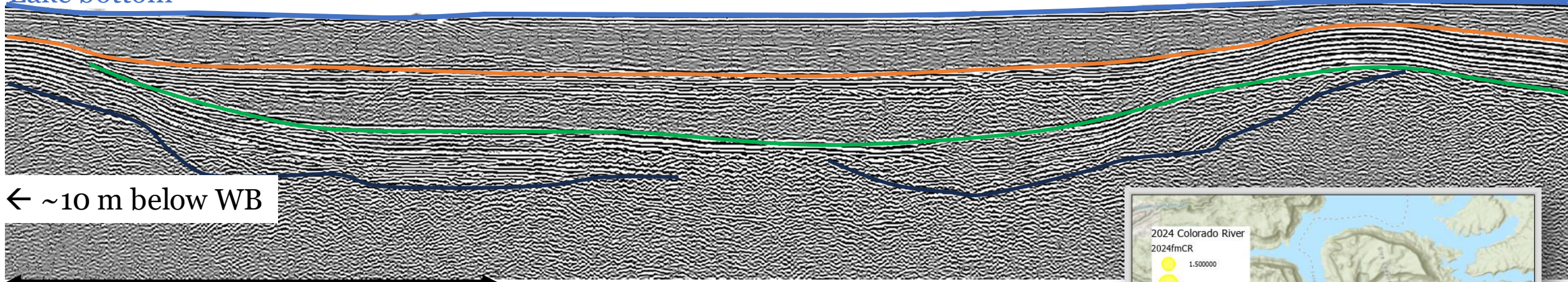


Bathymetry & Subbottom Surveys

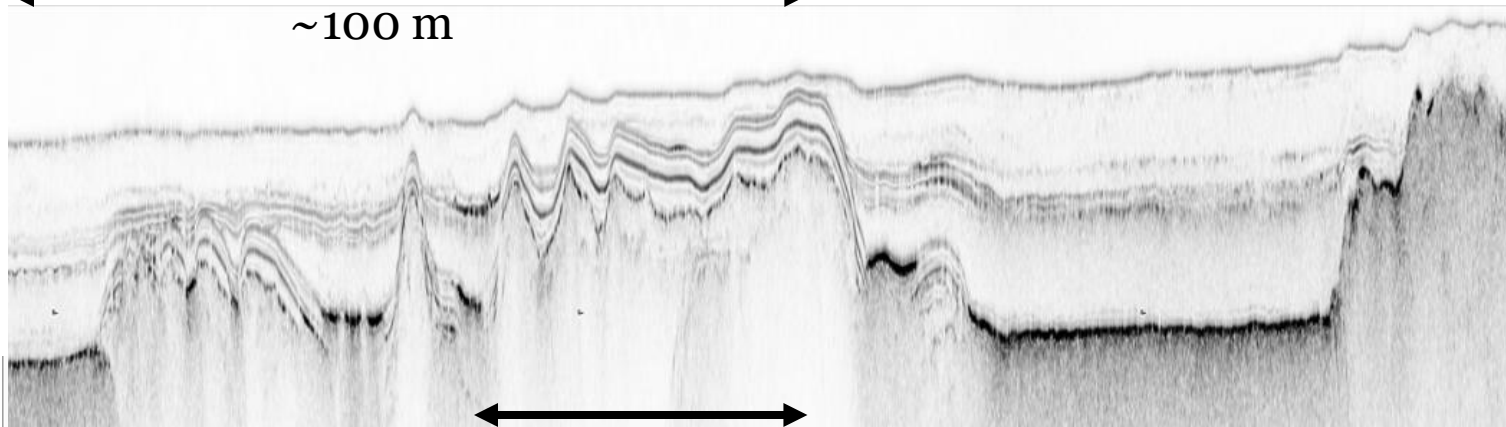


Subbottom Imaging

Lake bottom

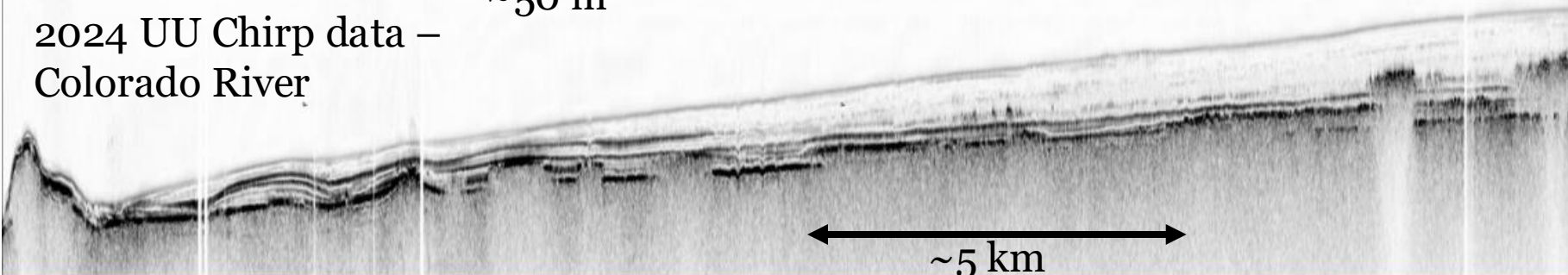


~100 m

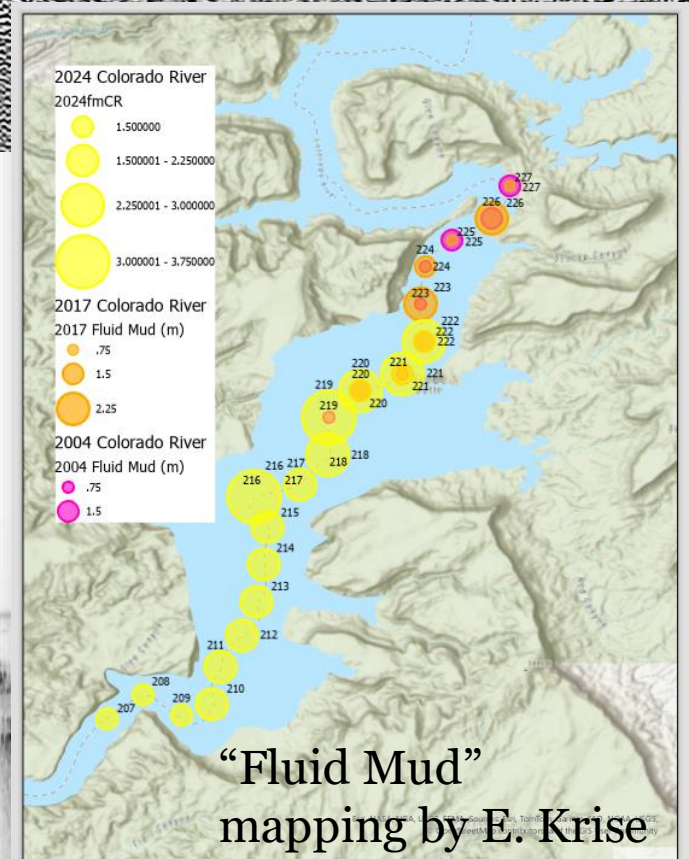


~50 m

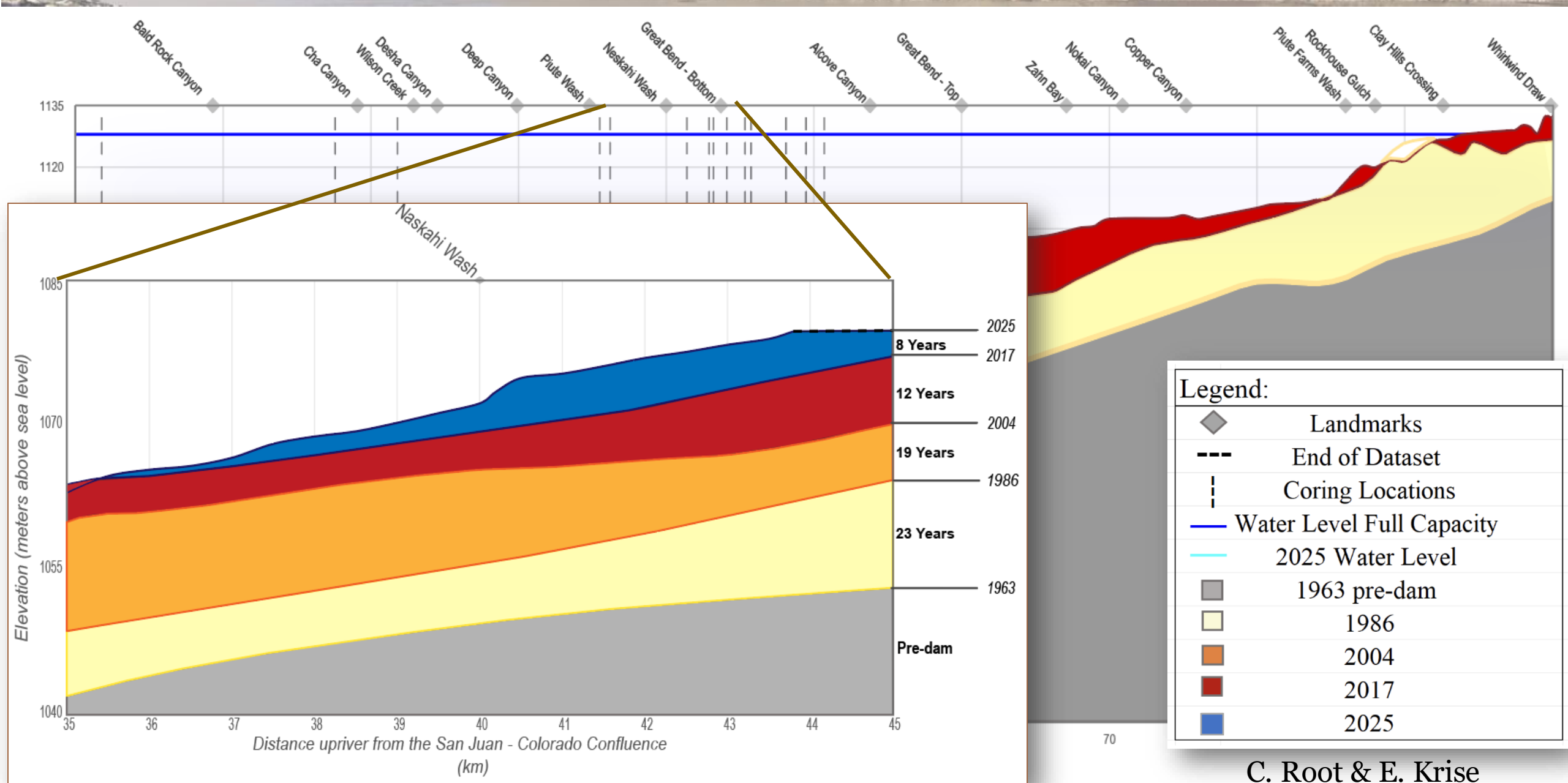
2024 UU Chirp data –
Colorado River



~5 km

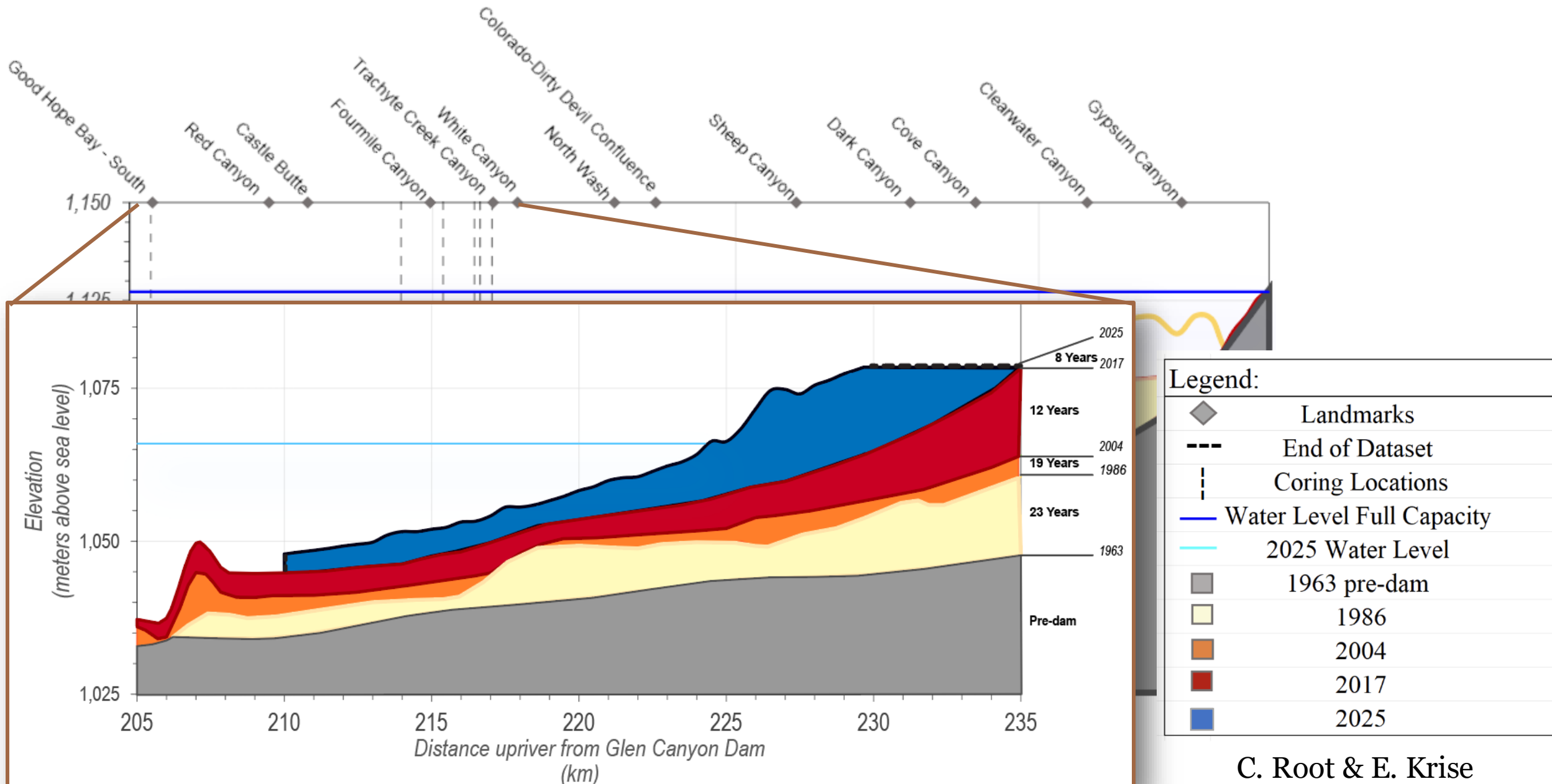


2025 Multibeam Bathymetry



C. Root & E. Krise

2025 Multibeam Bathymetry



Summary and Conclusions

San Juan River Delta



Repeat bathymetric and subbottom surveys suggest *increasing* sedimentation rates and decreasing accommodation on the Colorado and San Juan River deltas.

Increased sediment supply is likely intra-basinal, interpreted to signal *remobilization* of previously deposited reservoir sediment.

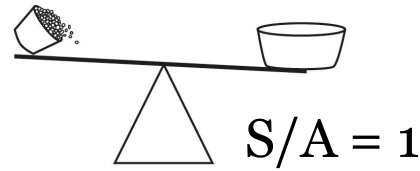
Next Steps: We need sediment gages and numerical modeling efforts; repeat (regular) bathymetric surveys; real time monitoring of slumps and sediment redistribution (including fluid mud).

→ Implications for reservoir sediment management

Summary and Conclusions

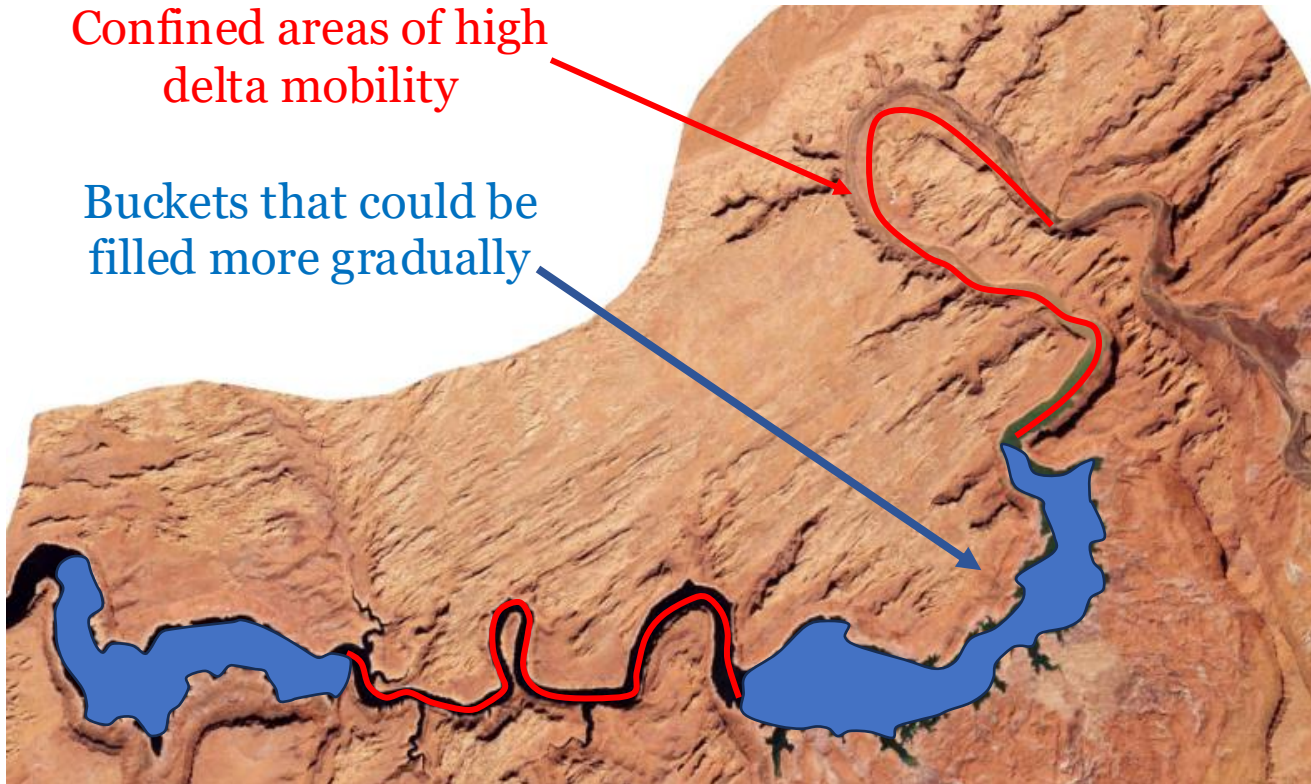
Movement of the exposed delta top (and its backwater zone) seem to have major effects on vegetation, bank stability, and more.

Operation Park the Deltas (?)



Confined areas of high delta mobility

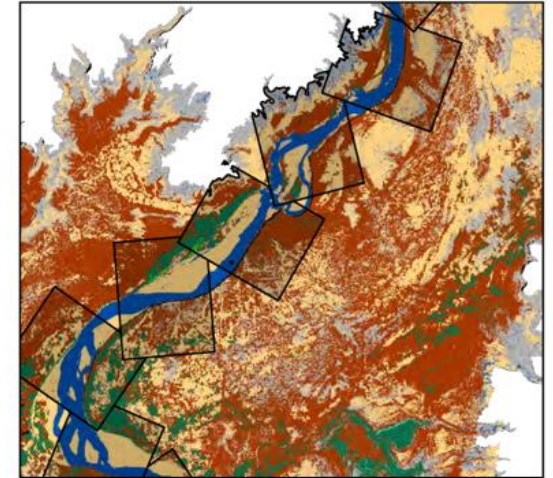
Buckets that could be filled more gradually



2021 NAIP



2021 SVM



^ Kasprak et al. (under revision), SJR backwater vegetation classification.

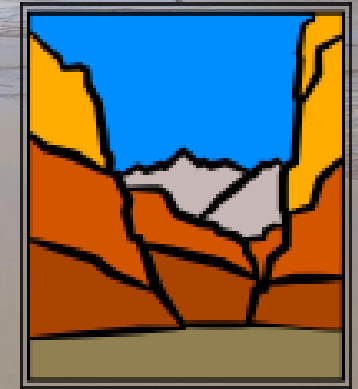


Thank you! and Thanks to...

Let's talk mud! cari.johnson@utah.edu



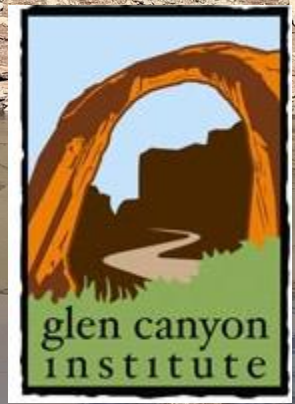
Returning Rapids



Project



CSD Facility
Continental Scientific Drilling



THE WILKES CENTER
FOR CLIMATE
SCIENCE & POLICY



Global Change & Sustainability Center
THE UNIVERSITY OF UTAH



THE GEOLOGICAL SOCIETY
OF AMERICA®

Brenda Bowen, Sam Bagge, Hannah Baggs, Challis Connally, Helen Farrar, Hannah Hartley, Emma Krise, Liz Mahon, Mary Roalstad, Kelly Wilson – U. Utah; Jack Schmidt - Utah State University; Alan Kasprak, Gary Gianniny, Cynthia Dott – Fort Lewis College; Casey Root, Scott Hynek – U.S. Geological Survey (Utah Water Science Center); Mike DeHoff, Meg Flynn & crew– The Returning Rapids Project; Paul Liu, NCSU; Wayne Baldwin, USGS; Glen Canyon National Recreation Area (permits and access)