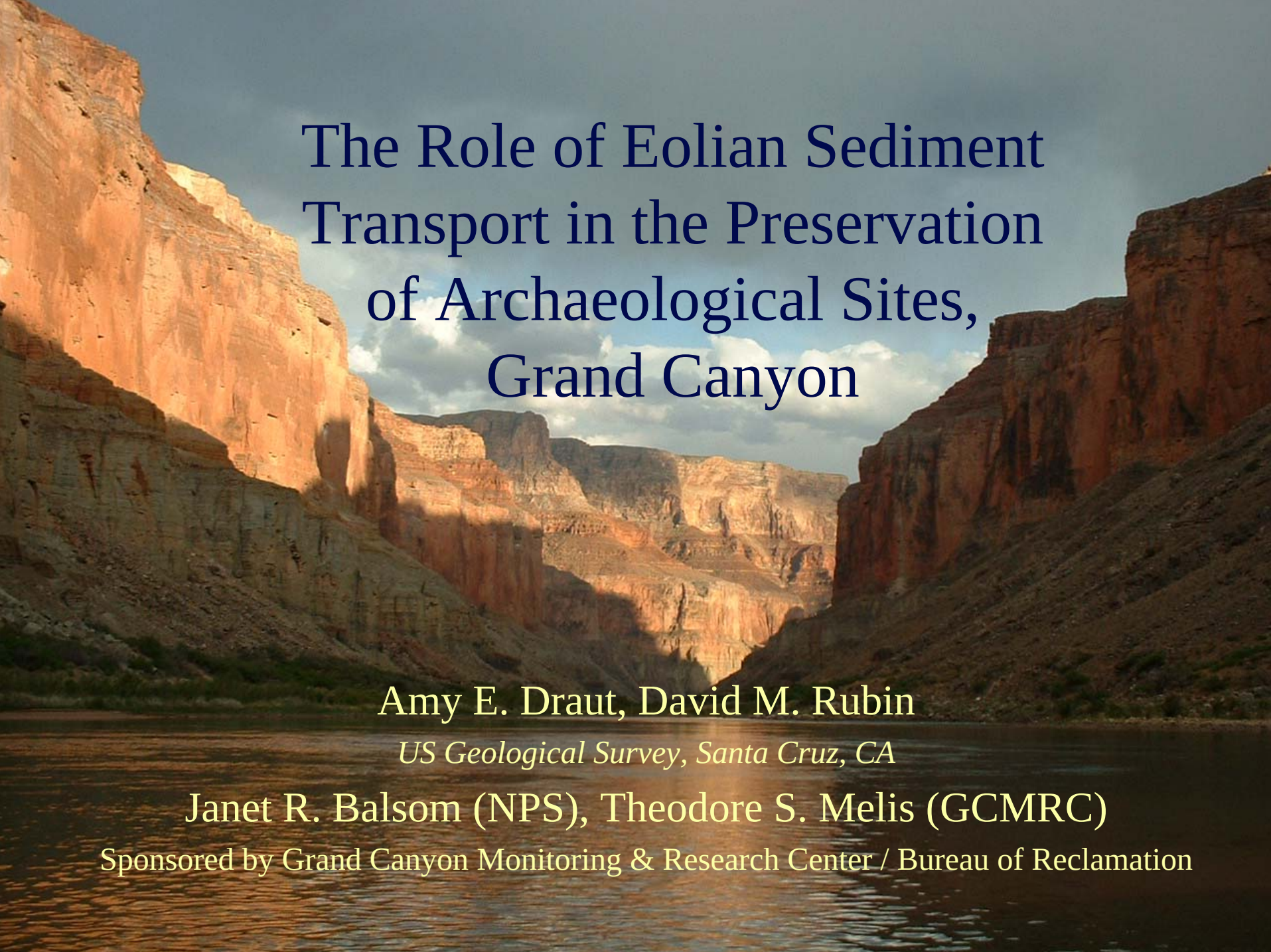

The Role of Eolian Sediment Transport in the Preservation of Archaeological Sites, Grand Canyon

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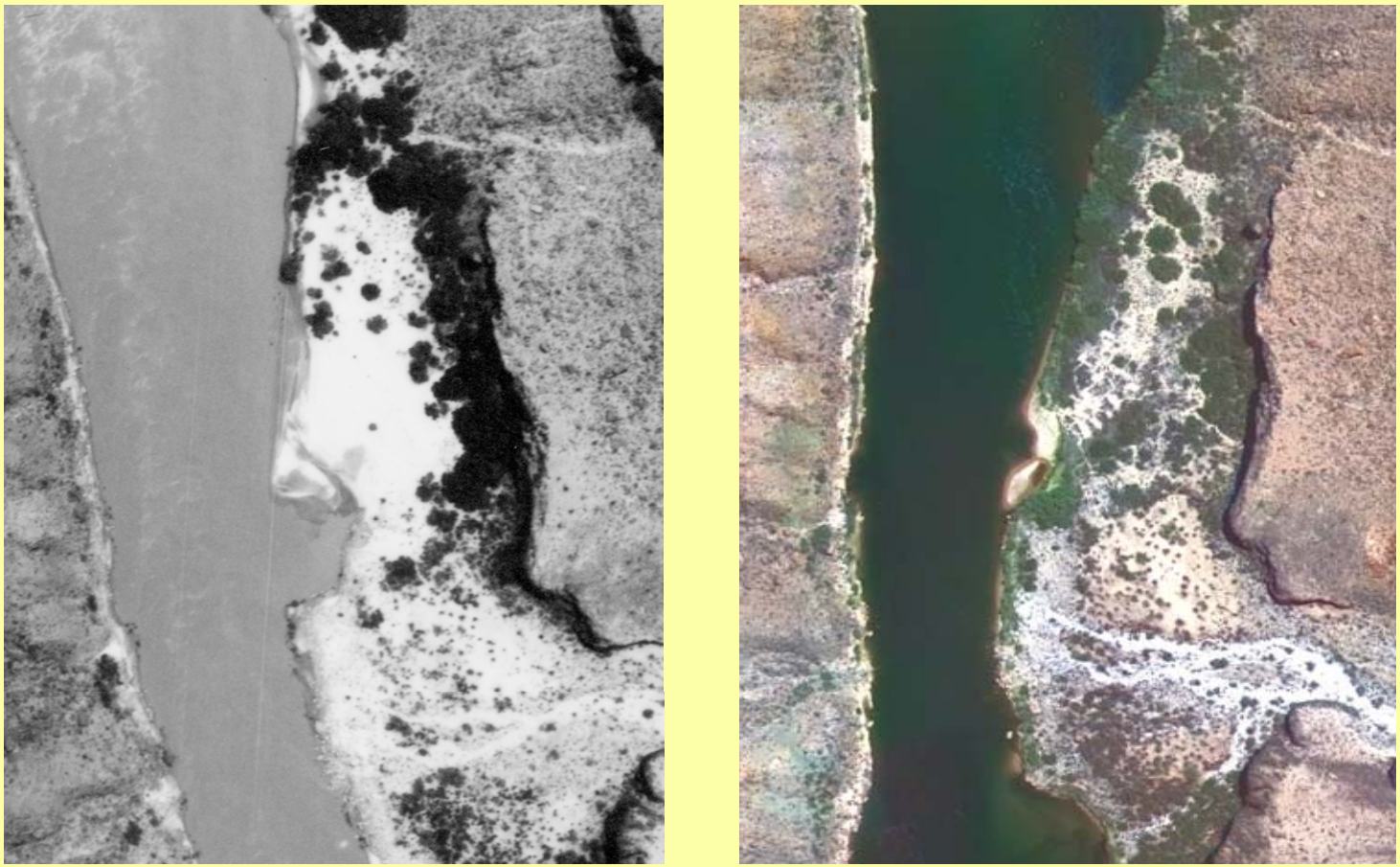
Sponsored by Grand Canyon Monitoring & Research Center / Bureau of Reclamation

Project Background

- Post-dam sediment ↓, riparian vegetation ↑
- Sand bars along river are source for eolian deposits: Wind blows sand to higher elevation
- Loss of open sand bar area → less sand supply for eolian deposits → deflation/erosion by wind

River-level sand bar

Sand dunes above river



1965 ~10 m 2002

Project Background

- Many archaeological sites located in eolian deposits
- Sites threatened by wind deflation, gully incision
- Accelerated erosion of cultural features may be tied to reduced sediment source available for transport by wind

Potsherds exposed by wind deflation

Gully undercutting roasting feature

Project Background

- When sufficient sediment is available, gullies likely heal by preferentially trapping wind-blown sand
- Gully incision / arroyo development inhibited?

Small gully filled with eolian sand

1 m

Hypothesis: Eolian deposition on archaeological sites would be enhanced if sand bars (sources) were larger, more abundant, finer-grained, drier, and less vegetated.

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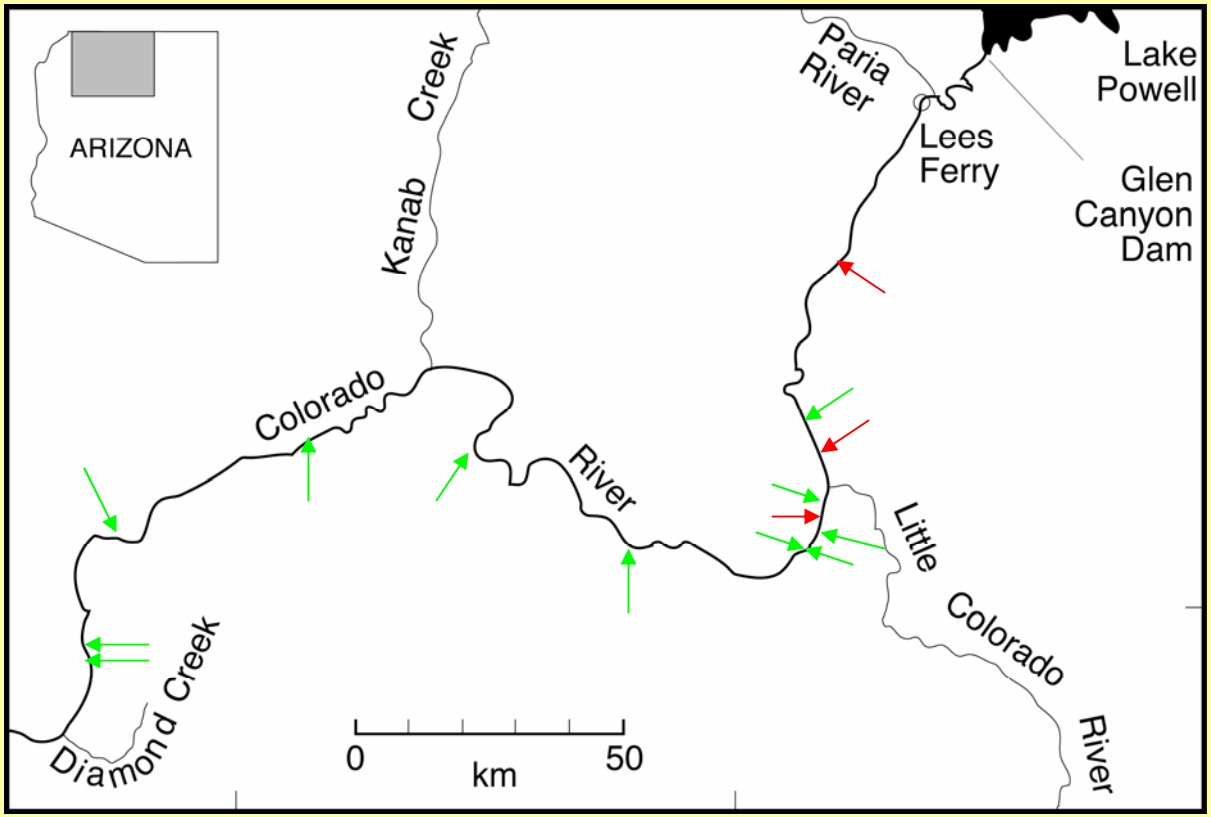
Project Goals:

- Quantify eolian sand transport at selected sites (wind speed & direction, sand flux)
- Modeling: How would changes in bar morphology affect eolian transport? (dam operations, vegetation removal)
- Assess extent of eolian deposits at selected archaeological sites

Focus Sites

Field work to begin in November 2003



Instrument station (anemometers, sand traps, rain gauges)

Stratigraphic analysis (with NPS, tribes)

Instrument details

BSNE sand traps (Fryrear, 1986)

- *Widely used in sedimentological, agricultural studies to sample wind-blown particles*
- *Non-motorized; vanes turn boxes to face wind*
- *4 per pole → vertical profile of sand transport*

Anemometers (Wind speed & direction)

- *"Spinning cup" wind sensor records wind speed and direction*
- *Data collected by battery-powered data logger*
- *3 per tripod → vertical profile of wind → calculate shear stress on bed*

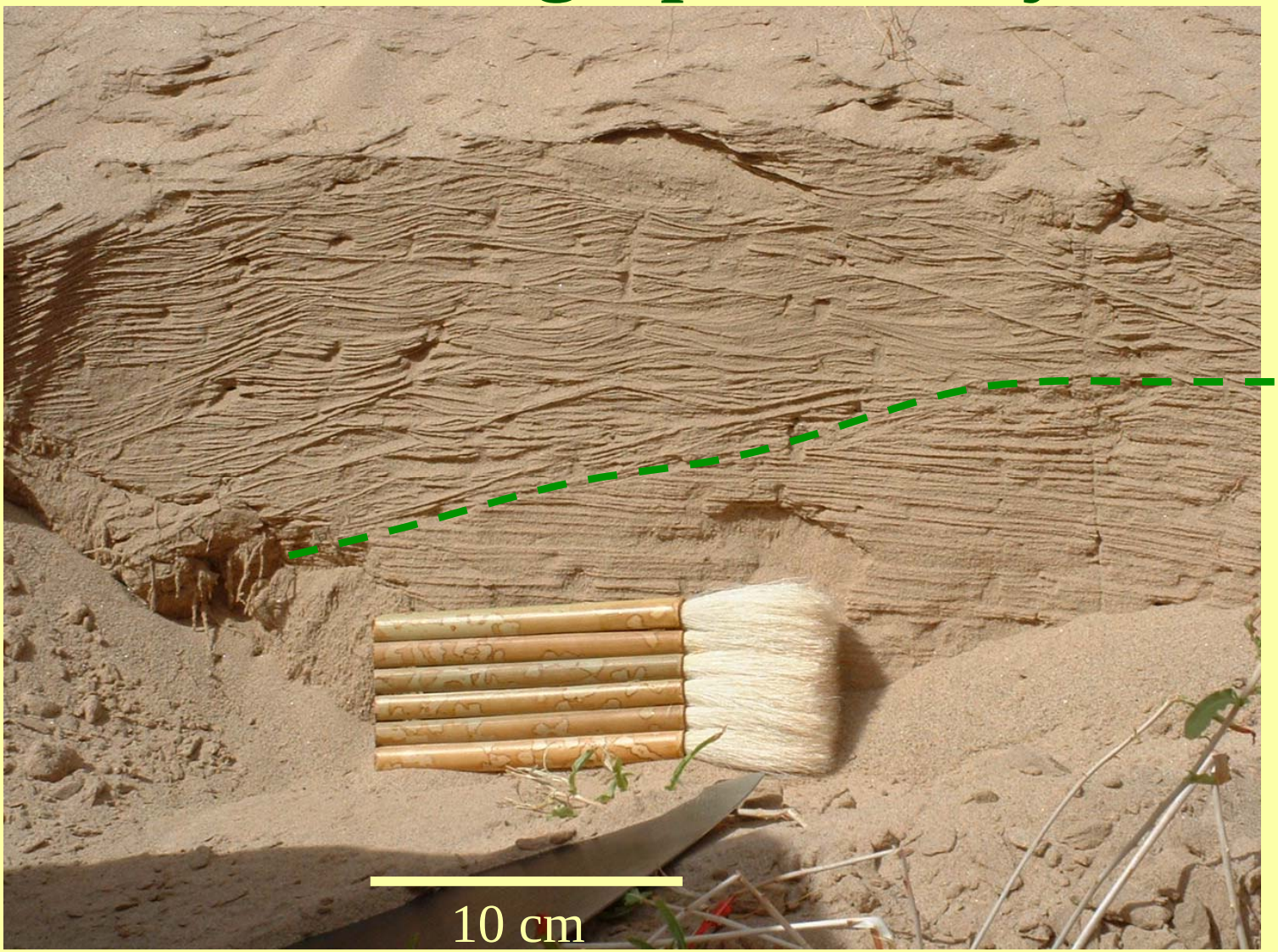
Rain Gauges

- *Distinguish erosion caused by wind vs. precipitation*
- *Identify times when sand is too wet for eolian transport*

All are zero-impact instruments, no trace after removal


Anemometer 1
Anemometer 2
Data logger
Anemometer 3
Rain gauge
Tripod

Stratigraphic analysis



Sedimentary structures identify fluvial vs. eolian deposition

Interdisciplinary work:

- Sediment transport
- Stratigraphy
- Geomorphology
- Archaeology
- Hydrology

All needed to address project goals

Participants:

USGS, GCMRC, National Park Service, Hualapai Tribe, Hopi, WAPA, Others…

For more information:

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