



Update on the Cultural Monitoring R&D Project

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Glen Canyon Dam Adaptive Management Program
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Cultural Monitoring R&D Project

- Part 1: What are we doing?
- Part 2: How are we doing?
- Part 3: What's coming next?

Monitoring for what?

To provide reliable objective data on resource condition to answer AMP priority questions

What is the status and trend in resource condition?

- **What factors are contributing to changes in condition (positive or negative)?**

Are preservation treatments working?

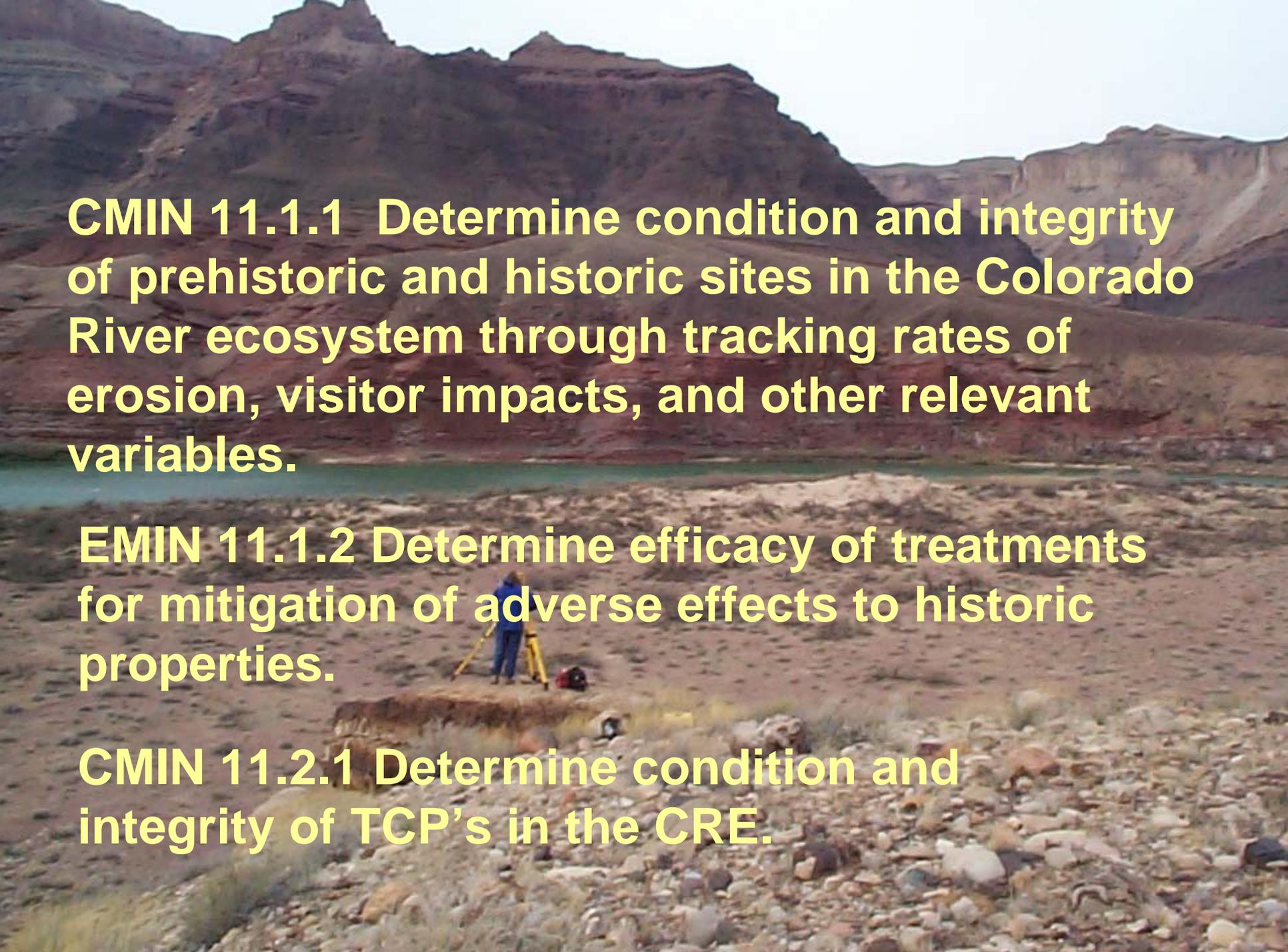
- **If additional treatments are needed, where will they be most effective and do the most good?**

Are we achieving AMP goals?

Sources of Guidance for Cultural Monitoring Program Development

- **AMP Consensus Products**
 - AMP Strategic Plan (2003 draft)
 - AMP Priority Questions (2004)
 - Core Monitoring Information Needs
 - MRP & Strategic Science Questions
- **Independent Panel Reviews**
 - 2000 PEP for Cultural Resources
 - 2005 Geomorphology Symposium
 - 2007 Legacy Data Review Panel
- **CRAHG, TWG, AMWG, SAs Comments**



A person in a blue jacket and dark pants is standing in a desert canyon, operating a surveying instrument on a tripod. The instrument is yellow and black. The person is positioned on a rocky, sandy bank. In the background, there are large, reddish-brown rock formations and a river or stream flowing through the canyon. The sky is overcast.

CMIN 11.1.1 Determine condition and integrity of prehistoric and historic sites in the Colorado River ecosystem through tracking rates of erosion, visitor impacts, and other relevant variables.

EMIN 11.1.2 Determine efficacy of treatments for mitigation of adverse effects to historic properties.

CMIN 11.2.1 Determine condition and integrity of TCP's in the CRE.

Why do we need R&D?

“[T]here seems to be a widespread desire to assess ‘overall site condition.’ As an unexamined concept this may seem unproblematic. However, we suggest that without careful definition it is essentially meaningless. “

from the Legacy Data Review Panel report (2007) p.12

Condition is “a multidimensional concept that needs to be unpacked into multiple variables. . .”

from the Legacy Data Review Panel report (2007) p.12

Why do we need R&D? (continued)

“We reiterate the need for a strong focus on clearly articulated objectives, questions and concepts and the need for a design and execution of quantitative data collection and analytical strategies that can measure key variables as directly as possible”

from the Legacy Data Review Panel report (2007) p.18

Analogous issues in fish monitoring

- Condition can not be measured directly -- need to define proxies, e.g. weight and length
- Need indicators that can be measured reliably & efficiently & are relevant to issue of concern
- Need to tailor variables and equations to specific species
- Condition indices based on many years of research and monitoring (measured data)



R&D is focused on developing protocols to measure and quantify degree of stability and rate of physical change

- Objective measurements of physical change
- Replicable, efficient, cost-effective, low impact, accurate
- Independent data to inform qualitative assessments
- Data to complement (not duplicate or replace) ASMIS



Where are we now?

Phase 1 (FY06-07) included 3 Primary Tasks

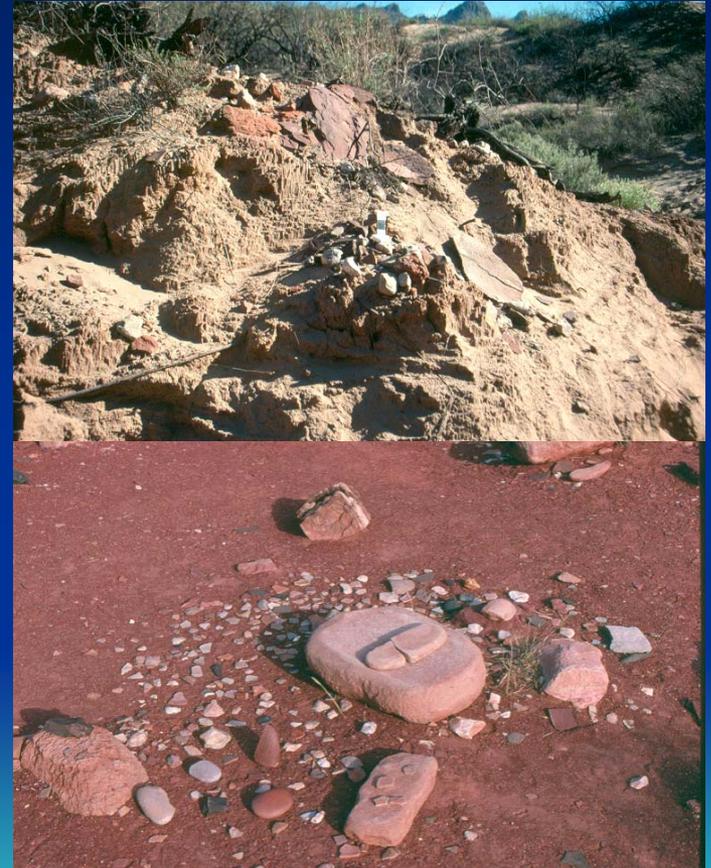
- **Task 1: Collect baseline data on geomorphic attributes and archaeological integrity**
- **Task 2: Assess existing (legacy) monitoring data**
- **Task 3: Test various methods for measuring and tracking change in condition**
 - 3.1 Compare efficiency/accuracy/impacts of different survey techniques for measuring topographic change
 - 3.2 Implement pilot weather monitoring component
 - 3.3 Select and test human impact measurements
 - 3.4 Develop protocols for check dam effectiveness

Phase I Accomplishments: Task 1

Assess archaeological & geomorphic site attributes

Status:

- archaeological and geomorphic assessments of 232 sites accomplished; field work completed in September 2007
- draft reports delivered January & February 2008
- draft reports currently undergoing review



Phase I Accomplishments: Task 2

Evaluate existing monitoring data

Status:

- preliminary assessment of data in 2006 identified critical data gaps and needs
- **GIS data updated & expanded in 2007**
- legacy data review panel convened in September 2007
- **final report (November 2007) delivered to TWG December 2007**

Task 3.1: Compare efficiency, accuracy, and impacts of measurement techniques

Status:

- Total station vs. LiDAR evaluation completed
- Final report currently in independent peer review
- Draft report on LiDAR as change detection tool in progress. Draft May, 2008; final August, 2008
- RTK GPS and new LiDAR technology testing in 2008



Task 3.2 Implement weather monitoring

Status:

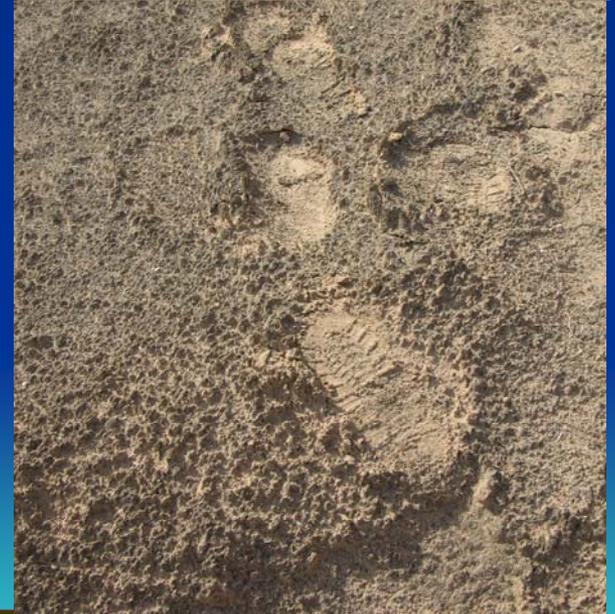
- 9 weather stations deployed Feb-Mar, 2007
- Various technical and software issues tackled and resolved in 2007
- 2 additional stations and 4 sand traps deployed in February, 2008 for HFE
- Processing of sediment samples in progress
- Data report due June 2008, final due in Sept.



Task 3.3 Select and test human impact monitoring protocols

Status:

- CRMP monitoring program being finalized; draft plan in progress
- NPS focus is on documenting visitation impacts on NR integrity
- Developing monitoring protocols to quantify visitor disturbances linked to geomorphic stability (e.g., trail depth, damage to soil crust)
- New protocols to be tested in September, 2008



Task 3.4: Evaluate checkdam effectiveness and design checkdam monitoring protocols

Status:

- USU geomorphologists collected geomorphic, soil, and survey data at 7+ sites in spring & fall, 2006 and 2007
- Draft report in progress; first draft due now (March 30); final due June 30, 2008



FY2008

what next?

- Review and complete Phase I reports - ongoing (spring-summer 2008)
- Process geomorphic and archaeological site data to identify “strata” for sampling (spring 2008)
- HFE monitoring at selected sites (spring & fall)
- Evaluate & refine human impact monitoring protocols (summer 2008)
- Test new LiDAR system and RTK GPS as change detection tools (end of summer 2008)
- Design pilot monitoring plan and data base (ongoing through the end of 2008)

FY2009-FY2011

- Implement pilot monitoring program system-wide (FY2009-2011)
- Evaluate airborne LiDAR data as change detection tool (if LiDAR is flown in FY2009)
- Develop geomorphic numeric model to provide predictive capabilities (FY2010-2011)*
- Review monitoring results with PEP, refine protocols, implement long-term plan (FY2011)

Need for Geomorphic Model to Inform Archeological Site Monitoring Program

“build on past and current research to develop fully predictive physical models of erosion potential and site vulnerability”

Recommendation from the Geomorphology Symposium Panel
(February, 2005)

“Adequately addressing the question of dam effects demands an understanding of the geomorphic processes implicated. Expert geomorphologists are needed to provide well specified geomorphic models with clearly defined test implications.”

Legacy Data Review Panel Report (2007)

Applications of Geomorphic Model

- To determine which sites are more/less vulnerable to future deterioration (with monitoring to test/validate assumptions)
- To predict & decide where erosion control treatments are most likely to be effective
- To link riverine and terrestrial processes in future ecosystem modeling efforts



Cultural Monitoring R&D Project: Progress and Accomplishments

- **Convened independent review panel, evaluated existing site data, identified critical data gaps and data needs**
- **Completed archaeological and geomorphic assessments of 232 sites. Draft reports from NPS and USU cooperators in review**
- **Developed GIS polygons for all sites**
- **Installed 9 weather stations and 12 sand traps at seven locations; multiple technical issues addressed**
- **Completed comparison of total station vs. LiDAR for tracking topographic change (USGS OFR in review, final due May, 2008)**
- **Collected comprehensive LiDAR data at 9 sites to evaluate LiDAR as a change detection tool (work in progress, final due Aug. 2008)**
- **Completed repeat surveys for check dam effectiveness at seven sites (report in progress, final due June 30, 2008)**

Relation to NPS Monitoring (ASMIS)

(Archeological Site Management Information System)

- Parks must use ASMIS to report condition (for GPRA)
- ASMIS qualitatively evaluates overall site condition; relies on judgments about amount of previous disturbance and physical stability of the site
- Condition can only improve through increased stability (decrease in rate of impacts)

