Integrated Modeling Workshop 9-11-08

In attendance:

GCMRC and cooperating scientists:
Paul Grams, Scott Wright, Mark Schmeeckle, Peter Wilcock, Dave Rubin, Jack Schmidt (AM only), Dave Topping (PM only), Ted Melis (AM only), John Hamill (AM only), Dale Robertson (intermittently)

Stakeholders:
Norm Henderson
Steve Mietz
Andre Potochnik
Don Ostler
Kerry Christensen
Glen Knowles
Sarah Hurteau
Mary Barger
Brad Warren
Bill Werner
Rick Johnson
Jay Groseclose (phone)
Cliff Barrett (phone)
Mike Yeatts

Notes taken during meeting:

- Linkages with terrestrial environment
    - Deposition in locations other than eddy sand bars
        - Banks
        - Cobble bars
    - Stability of pre-dam terraces
    - Sites modeled previously – LCR to Unkar, deposition for different flow scenarios
    - Aeolian Transport
        - How much sand needed to fill arroyos?
        - Linkage between preserved sites and site characteristics
    - Silts and clay
- How do flows affect archeology sites?
- Modeling downstream from Diamond Creek?
- Interaction between fine sediment (silt and clay) with biology
    - On bars
    - On the bed
    - NTU's (turbidity)
- Model precision
    - How much is needed?
    - Focus on general questions.
        - Grand Canyon Protection Act
    - "Optimization" likely requires precision.
- Integration
    - Comprehensive model vs. toolbox approach.
- Interest in application for near-term decisions
    - Daily information to go into GCD Annual Operating Plan
    - Monthly volumes
- Impact of changing hydrology in basin
    - Constraints in wet vs. dry years
- "Goals"

- o Long-term "maintenance" of bars "sustainable"
- o Effects of downramping on bar maintenance
- o Near-shore bar morphology
    - Backwater habitat formation and stability
    - Relation between habitat and monthly volumes (steady vs. variable within MLFF
- Test high-flow scenarios
    - o Sediment loading (concentration)
    - o Flow (peak and duration)
    - o Frequency
    - o How to define success (net loss vs. gain OR bar volumes above water surface?)
    - o Define minimum required to "improve" sand bars and "optimum" for "success"
        - Peak flow rate
        - Sediment input condition
        - Frequency of high flows
- What is optimum condition?
    - o Increase in bars?
    - o Increase in net storage
    - o Decreasing rate of decline in net storage?
- Role of antecedent conditions?
    - o Bar grain size
    - o Dam releases timed to coincide with trib (LCR) floods?
- Spatial extent of modeling
    - o Marble canyon
    - o To Diamond Creek
    - o Below Diamond Creek?
- Modeling scenarios
    - o Limit to possible operations
    - o Do not limit to possible operations – test scenarios that may not be politically viable at present.
    - o Compare variability to historic conditions.
    - o Sediment augmentations.
    - o Prediction of trade-offs
    - o 10-yr scenarios were run in 2006
- Temperature
    - o By river mile
    - o Optimizing dam operations
        - Mainstem
        - Near-shore
    - o Overflight of surface temperatures for backwater temperature models?

Update on 2009 Modeling Project: recent workshop and next steps

October 15, 2008

Technical Workgroup Meeting, Phoenix

Physical Modeling Goals

❑ Evaluate planned operations and "what if" scenarios for dam operations

    ❑ Develop and apply predictive models of <u>stage and discharge</u>

    ❑ Develop and apply predictive models of mainstem and nearshore temperature dynamics

    ❑ Develop and apply predictive models of mainstem <u>sediment transport and sandbar dynamics</u> and stability

    ❑ Evaluate and improve (if needed) Lake Powell model

❑ Provide input to and support ecological modeling

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Physical Modeling Program: 2009

- **September workshop**
  - **Modeling team received input from stakeholders and discussed 2009 work plan**
    - The team felt that the interests and concerns were largely consistent with the current modeling focus
  - **Outcome**
    - Continue with 2009 work plan, but add detail that addresses issues raised and workshop and some additional Science Advisor comments
    - Convene additional workshops (next in Jan – Feb 2010)
    - In 2009, develop a formal proposal for 2010 - 2011

Physical Modeling Research Team

- **U.S. Geological Survey**
  - **Scott Wright, David Rubin, David Topping, Paul Grams (Program Manager), Ted Melis**

  Academic Cooperators:

  Arizona State University – Mark Schmeeckle

  The Johns Hopkins University – Peter Wilcock

  Commercial Cooperators:

  Deltaris (Netherlands) – Kees Schloff

September Modeling Workshop:
Synopsis of Stakeholder Input

- **What type of scenarios should be modeled?**
  - **Limit modeling to operations within the currently established constraints**
  - **Do NOT limit modeling scenarios; model scenarios that may be outside current constraints**
  - **Compare current variability to historic conditions (provide historical perspective when presenting results)**
  - **Evaluate sediment augmentations**
  - **Evaluate trade-offs**

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September Modeling Workshop: *Stakeholder Input*

- **Modeling different high flow scenarios**
  - **What are the optimal conditions for:**
    - **Sediment loading**
    - **Flow peak magnitude and duration**
  - **What frequency of high flows is needed?***
  - **What are the minimum requirements to (1) improve bars and, (2) to sustain bars in present condition?***
- **Is the approach sustainable over the long term?**
- **What is the role of different antecedent conditions?**
  - **Might there be an advantage to having high flows coincide with LCR floods?**

≋USGS   *** Requires clarification and agreement on goals from stakeholders.**

September Modeling Workshop:
Stakeholder Input

- **Modeling for non-high flow conditions**
  - **What are the relative effects of different operation scenarios on sediment transport and sediment storage?**
  - **How do different down ramping rates affect bar stability?**
  - **What is the relation between habitat conditions and monthly flow volumes under MLFF?**

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September Modeling Workshop: *Stakeholder Input*

- **Linkages with terrestrial environment**
  - **What is the role of deposition in locations other than eddy sand bars (i.e. channel-margins, gravel bars, etc.)**
  - **What is the stability of pre-dam deposits**

- **Linkages with aquatic environment**
  - **Habitat formation and maintenance**
  - **Turbidity**
  - **Temperature**
    - **Predict mainstem temperatures by river mile**
    - **Predict near-shore temperatures**
    - **Collect additional water surface temperature data during overflight.**

- **How do high flows affect archeological sites?**
  - **How much sand is needed to fill archeological sites?**
  - **Is there a linkage between preserved sites and site characteristics?**

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September Modeling Workshop:
Stakeholder Input

- **Modeling scope**
  - **Focus on certain reaches?***
  - **Downstream from Diamond Creek?***
  - **Glen Canyon***
- **What is the desired condition?***
  - **Increase in bars?**
  - **Increase in net sand storage?**
  - **Decreasing rate of decline in bars or storage?**

* Requires clarification and agreement on goals from stakeholders.

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Future of Modeling Project

- Modeling project should not be considered "over" once ongoing model developments are finished (likely in the next 2-3 years)

- Development will result in an integrated "toolbox" of models. The "tools" require maintenance and updating, and staff who know how to use them

- For example, as new monitoring and research flow data become available, models should incorporate improved understanding of system dynamics

- Thus, modeling project should continue in a scaled back version alongside Long-Term Core Monitoring

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