

Glen Canyon Dam Adaptive Management Program
Executive Coordinator for Science Advisors
Review of GCMRC FY2018 Annual Report

David P. Braun, Sound Science LLC
GCDAMP Executive Coordinator for Science Advisors
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Presentation Outline

- Purposes of review
- Summary of review findings
 - *(final written report: late March, after ARM)*
 - Progress on triennial work plan
 - External peer review of methods and reasoning
 - Documenting changes in protocols
 - External peer review of predictive models
 - Recommendations for adaptive management

Purposes of Review

- Review requested by Reclamation
 - Reviewers=Executive Coordinator (Braun, Unnasch for Sound Science LLC)
 - No external Science Advisors panel in place for review
- Four review foci
 - Protocols used in scientific activities
 - Long term monitoring plan
 - Annual monitoring and research plans
 - Recommended next steps based on an adaptive management approach

Projects Reviewed

- A: Streamflow, Water Quality, and Sediment Transport and Budgeting
- B: Sandbar and Sediment Storage Monitoring and Research
- C: Riparian Vegetation Monitoring and Research
- D: Geomorphic Effects of Dam Operations and Vegetation Management for Archaeological Sites
- E: Nutrients and Temperature as Ecosystem Drivers
- F: Aquatic Invertebrate Ecology
- G: Humpback Chub Population Dynamics
- H: Salmonid Research and Monitoring
- I: Warm-Water Native and Non-Native Fish Research and Monitoring
- J: Socioeconomic Research
- K: Geospatial Science and Technology
- [L: *Remote Sensing Overflight*]
- N: Hydropower Monitoring and Research
- Appendix 1: Lake Powell Water Quality Monitoring

“GCMRC” Projects are Not Exclusively GCMRC

- 5 of 11 projects include cooperators
- Cooperating institutions include:
 - USFWS
 - NPS
 - AZGFD
 - Multiple universities
 - Reclamation (Lake Powell)
 - Ecometric Research, Inc. (Josh Korman)

Progress on Triennial Work Plan

- Most projects on target, except:
 - *E—Nutrients*: Mesoscale experiments not viable; P data comparability with Lake Powell measurements?
 - *G-J—Fish*: Some effort diverted to brown trout assessment (analyses, modeling, writing)
 - *J—Tribal surveys*: Slow progress, but not unexpected
 - *L—Remote sensing overflight*: Not funded in this TWP; affects information flow to other projects (e.g., C)
 - *Appendix 1—Lake Powell water quality*: Problems with P data comparability

External Peer Review of Project Methods and Reasoning

- Tally of peer review activities provides check on status of project protocols and reasoning
- Why external expert review matters for GCDAMP
 - Ensure *sound methods* consistent with current best practices in every discipline
 - Ensure *sound reasoning* consistent with current state of knowledge in every discipline
 - Provide *crucial suggestions* for alternative methods and arguments
- Total expert review activity indicates level of effort to maintain sound methods & reasoning

USGS “Fundamental Science Practices”

- Policies govern all work by GCMRC *and cooperators*
- Apply to all “*research and monitoring activities related to USGS science*” to ensure “*unbiased, objective, and impartial information*”
- Governs how all “*information products (including maps, imagery, and publications) are developed, reviewed, approved, and released.*”

Levels of Review in USGS FSP

(see handout from USGS)

- USGS Review Levels
 - Supervisor (*GCMRC*)
 - Science Center Manager (*Southwest Biological Center*)
 - Office of Science Quality and Integrity (OSQI)
- External Reviews
 - Peer experts requested by **each** USGS level (2 or more peers)
 - Peer experts requested by journal editor or conference organizer
 - Journal editors or conference organizers
- Publications in professional series can have **5 or more** peer expert reviews before release (>> if major revisions requested)

Peer Review of FY 2018 Information Products by Project

Tally of Project “Products/Reports” Tables in Annual Report

Project	Professional Publications	Professional Presentations	Data Releases	Totals
A	2	3		5
B	10		4	14
C	4	1	4	9
D	3		1	4
E				
F	2	3		5
G	6	5		11
H	1	1	1	3
I	5			5
J	4	5		9
K				
N		2		2
Appendix 1		1		1
Total Products	37	21	10	68
Total Reviews	185+	42+	20+	247+

Other Review Processes for GCMRC Projects

- Protocol Evaluation Panels
 - Most recent =
 - FY2012, Food-base studies
 - FY2016, Fishery studies
 - FY2018, Lake Powell Water Quality Monitoring
 - FY2019, Proposed, food-base studies
- Informal reviews
 - Knowledge Assessments: Most recent = FY2017
 - Technical Work Group

Documenting Changes in Protocols

- Methods in GCMRC projects are evolving...
 - To improve accuracy, precision, detection limits, capture probabilities, etc.
 - To accomplish the same or more with fewer resources (*budget limits, need to share resources among more investigations*)
 - To add capabilities (new data streams) to project scope
 - This is normal and desirable
- However, changes in project methods...
 - Can affect information flow
 - Can affect backward compatibility

Documenting Changes in Protocols for GCDAMP

- GCMRC and cooperators generally report changes, e.g.,
 - Fish sampling designs, capture/detection methods
 - Can affect capture/detection probabilities
 - Water quality measurements, especially for Phosphorus
 - Can affect detection limits, accuracy, precision (error range)
- Recommend systematic documentation
 - Crucial to understanding backward/forward compatibility
 - Crucial to “institutional memory”
 - *Should include analysis of potential implications*

Predictive Models in GCDAMP

- GCDAMP increasingly relies on quantitative, predictive models as *decision support tools*:
 - To predict consequences of experimental releases & other management actions, to guide decision making
 - To generate predictions under different assumptions, to test assumptions by comparing predictions to evidence
 - Especially assumptions about “how” and “why”
- Several applications in current investigations, e.g.,
 - Humpback chub and trout models
 - Bug-flow response model

External Peer Review of GCDAMP Predictive Models

- GCMRC and cooperator publications describe models
- GCMRC data releases: computer code, I/O data
- Recommendations
 - Systematic documentation and peer expert review
 - External review crucial given complexity of models
 - *Note:* Fish models developed for LTEMP EIS were peer reviewed as part of LTEMP development
 - Presentations to GCDAMP to help stakeholders understand model workings and reliability in support of adaptive management

Recommendations for Adaptive Management

- Why included in this review
 - Responsibilities for adaptive management process lie with GCDAMP, not with GCMRC
- Recommendations address possible ways to enhance GCMRC contributions to adaptive management

Three Recommendations for Adaptive Management

- Include more use of “strong inference” in project designs
 - Design investigations to test more alternative hypotheses, where sensible
 - Use “what if” exercises and stakeholder input to enrich scope of hypotheses
- Track and report indicators (*aka* metrics) of LTEMP priority resource condition
 - Start with indicators from DFCs, LTEMP EIS, Tribal presentations to TWG, 2017 Knowledge Assessment
- Track and report indicators of all crucial inputs
 - Crucial to (a) distinguishing impacts of LTEMP actions; and (b) planning for possible futures
 - Water + sediment, nutrients, temperature, possibly others

Questions?