



Fall Steady Experimental Flow Plan TWG Review and Recommendation

Presented by Shane Capron
Chair, Technical Work Group

AMWG Motion: May 2008

Consistent with the requirements of the Final Environmental Assessment:

- Experimental Releases from Glen Canyon Dam, Arizona, 2008 through 2012 dated February 29, 2008, and the Final Biological Opinion for the Operation of Glen Canyon Dam dated February 27, 2008, the AMWG recommends to the Secretary of the Interior that the Department of the Interior proceed with the scientific work identified to study the steady flows planned for September and October 2008 as outlined in the May 20, 2008 memorandum from the Chief of the Grand Canyon Monitoring and Research Center (GCMRC) to the Glen Canyon Dam Adaptive Management Program stakeholders. AMWG further recommends to the Secretary that he direct the GCMRC to, by July 31, 2009,
- Complete the design and development of a September/October Steady Flow Science Plan for 2009-2012, including a recommended range of flow parameters and resources,
- Work with the AMWG and TWG to establish measures of scientific success as part of the Science Plan, and
- Report to AMWG by June 1 of each year on the project included in the Science Plan, for review and possible revision

AMWG Motion: May 2008

- **Complete the design and development of a September/October Steady Flow Science Plan for 2009-2012, including a recommended range of flow parameters and resources,**
- **Work with the AMWG and TWG to establish measures of scientific success as part of the Science Plan, and**
- **Report to AMWG by June 1 of each year on the project included in the Science Plan, for review and possible revision**

Background

- ✓ February 27, 2008 – Biological Opinion for the Operation of Glen Canyon Dam (Supplement 2009)
- ✓ February 29, 2008 – Final EA GCD experimental releases 2008 through 2012; steady flows
- ✓ May, 2008 – AMWG motion requesting study plan
- ✓ July, 2009 – SA review of initial draft FSEF plan
- ✓ August, 2009 – Plan revised, TWG initial review
- ✓ September, 2009 – 23 pages of comments/responses
- ✓ February, 2010 – Plan revised (final)
- ✓ March, 2010 – TWG final review, ad hoc formed for final issues
- ✓ November, 2010 – TWG recommendation
- ✓ February, 2011 – AMWG consideration

NEED

“It is hypothesized that steady flows during the fall will benefit native fishes by stabilizing and warming the nearshore habitats that are occupied by juvenile (less than 150 mm total length) life stages of endangered humpback chub (*Gila cypha*) (Stone and Gorman, 2006). Fall steady flows may also affect other downstream biological resources, including the food base for native and nonnative fish.” FSEF Plan page 3

GCRMC Approach

Synthesis of 6 Projects

Near Shore Ecology – BIO 2.R15, field in 2009-2011, 2012 data

Stock Assessment of Grand Canyon Native Fish – BIO 2.R7

Aquatic Foodbase Monitoring – BIO 1.R1, R4, M1

Monitoring Lees Ferry Fishes – BIO 4.M2

Supplemental water temperature data collection (NSE, 2010)

Ecosystem Modeling – Plan 12.P1

TWG Comments Incorporated

Data Synthesis & Pursue modeling

Added ecosystem modeling (Plan 12.P1)

Added data synthesis & integration section

Reporting and synthesis to TWG January 2013

How will the plan answer SSQs?

Linked projects with SSQs

Include results of LSSF and 2005 Steady Flows

Information added for various study areas



TWG Comments Not Incorporated

Add in testable hypotheses

GCMRC: not fruitful with current design

Transition flows: study and explore other months/time of year to test transition flows

GCMRC: FSEF cannot address transition flows on foodbase; another study

Need to address stranding of transition flows

GCMRC: existing data suggests stranding during the transition is unlikely given the current discharge levels

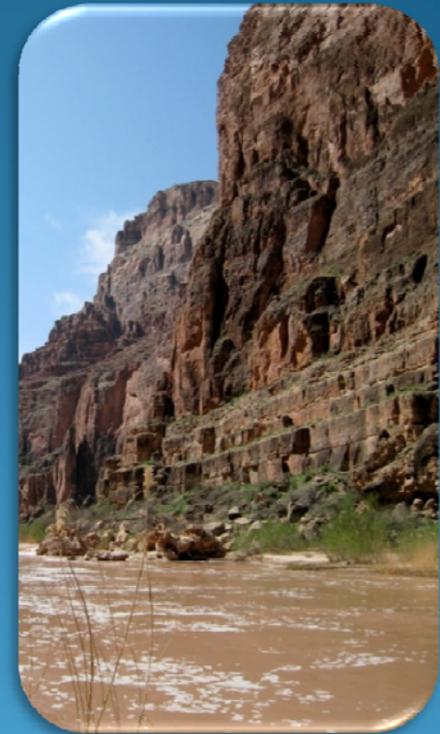


TWG Motion

November 2010

The TWG has reviewed the following document: “Study Plan—Biological Resource Responses to Fall Steady Experimental Flows Released from Glen Canyon Dam, 2009-2012.” dated February 2010. TWG understands that GCRMC will prepare a synthesis of results from the various studies identified in the plan and present that to the TWG in January 2013. This synthesis should include the following:

- A. The scientific linkages between the study results and the Strategic Science Questions (SSQs) and other Information Needs identified in the study plan,
- B. Analysis of the effects and causal factors including the ability to answer the SSQs as well as a description of the uncertainty of the results including confounding factors (e.g., storm events),
- C. A synthesis of all the results evaluating the biological success of the Fall Steady Flow experiment and the overall objectives described in the plan and the 2009 Biological Opinion.



Discussion

- NSE is central to this project, current evidence suggests no detectable effect of steady flows on humpback chub growth or survival
- Mechanical removal (if) will complicate science in 2011, may confound NSE and other studies, efficacy of research in 2011?
- NSE efforts could be altered to better address nonnative predation, temperature effects on growth, habitat use, movement between LCR and mainstem, rather than continue to look for steady flow differences

What does NSE do really well?

- **Direct estimates of juvenile native fish abundance, growth, and survival (40-100mm size class, 100mm+)**
 - At earlier age than ASMR estimates
 - Could become part of monitoring program to assess juvenile fish population responses to experiments
- **Habitat use information**
 - Limited to their small study reach
 - Working to link with physical science program
- **Information from otolith work**
 - Growth, movement patterns, timing of outmigration from LCR

Proposed Motion for Consideration

AMWG approves the plan as described in “Study Plan—Biological Resource Responses to Fall Steady Experimental Flows Released from Glen Canyon Dam, 2009-2012,” dated February 2010, with the understanding that GCRMC will prepare a synthesis of results from the various studies identified in the plan and present that to the TWG in January 2013.



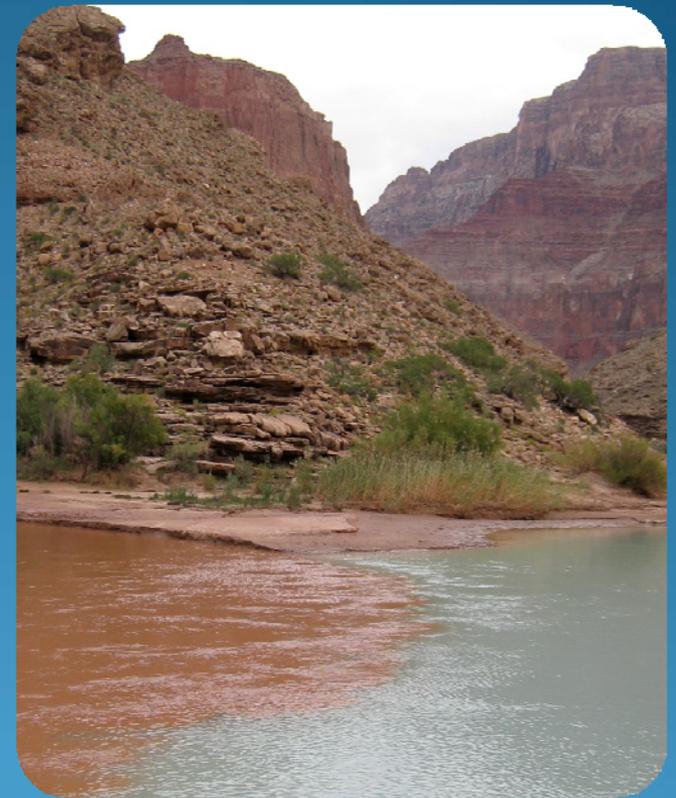


General Core Monitoring Plan TWG Chair Report

By Shane Capron
Chair, Technical Work Group

The Road Map

- February 2010 AMWG briefing
- Background
- Strategy
- Revisions to Document
- TWG Appendix B
- Next Steps



What is the GOAL of Core Monitoring?

Develop a robust, long-term monitoring program that is core to the goals of the AMP.

Supports critical functions of the AMP and provides the foundation to answering critical questions or supporting critical management actions.

Projects will not be altered in periods of funding challenges.

The GCDAMP Strategic Plan defines core monitoring as follows:

Consistent, long-term, repeated measurements using scientifically accepted protocols to measure status and trends of key resources to answer specific questions. Core monitoring is implemented on a fixed schedule regardless of budget or other circumstances (for example, water year, experimental flows, temperature control, stocking strategy, nonnative control, etc.) affecting target resources.

After information needs are identified in adaptive management programs, development and implementation of monitoring programs typically proceed in three phases (Atkinson and others, 2004):

1. Resources are inventoried and key relationships between physical process, species, habitats, and other causes of variation such as dam operations are identified.

This was largely completed for most GCDAMP resource goals by the early 2000s

2. Long-term monitoring protocols and sample designs are pilot tested.

This step has been the focus for GCRMC during the past 8-10 years

3. Long-term monitoring and adaptive management activities are implemented.

This is where we are now, this is what we are trying to accomplish.

2009 WORKSHOP RESULTS

Dot-Ranking

1. Describe **criteria for evaluation**.
2. Need **DFCs**.
3. A **risk assessment** for critical choices, trade-off analysis
4. Should **avoid the “Christmas tree” approach**, in 40-60% range of the science budget.
5. The strategy discussion needs to be a greater focus of the document describing the **two strategies (science and management)**.
5. More integration of **tribal monitoring** in each CMP/goal.

STRATEGY

- Integrate workshop results/changes into the document
- Tug-of-war with GCMRC resulted in the recommendation for TWG to develop an implementation chapter/Appendix B
- Focus: step 4 of the process which integrates adaptive management into the process, evaluation of trade-offs, risk, costs

Challenge: how do we as a program develop management documents?

General Core Monitoring Plan Revisions

Chapter 1: streamlined, text edited

Chapter 2: shortened; focus now on needs for monitoring data, conceptual frameworks

Chapter 3: NEW chapter, focus on 4-step process, use of criteria and trade-off analysis

Chapter 4: text changed in response to specific comments; prioritized CMINS added per request of TWG chair

Chapter 5: minor edits only



Priority issues/concerns addressed in current draft plan

1. **Expanded description of Step 4:** describes criteria & analyses that will be done before TWG makes final Core Monitoring recommendation
2. Recognizes need to conduct **trade-off analyses & risk assessments** to understand implications of choosing monitoring approaches with more/less accuracy, statistical precision, sampling intensity etc. – also budget implications of these choices
3. Define **TWG process for evaluating/approving** long term core monitoring proposals (Appendix B)

TWG APPENDIX B

A Collaborative Approach



- (a) program Goals and CMINs
- (b) criteria for monitoring element inclusion within plans,
- (c) trade-off analyses in a risk assessment framework, and
- (d) stakeholder involvement in the development of all of these elements.

TWG APPENDIX B: SDM

Step 1: Clarify the Decision Context (CMP: scope, roles)

Step 2: Define Objectives and Evaluation Criteria (Appendix B, the core of SDM is a set of well defined objectives and evaluation criteria)

Step 3: Develop Alternatives (App. B: High, Medium, Low)

>> Workshop to define specifics for each plan, refine criteria

Step 4: Estimate Consequences (individual plans, performance)

Step 5: Evaluate Trade-Offs and Select

>> Workshop to establish preference assessment (e.g. swing weighting)

Step 6: Implement and Monitor (CMP)

TWG APPENDIX B: Scope and Cost

Trade-off analysis framework

- “High” – would implement the CMINs for that goal to the extent practicable and represent as close to full implementation as can be obtained with current resources, and is based on current implementation strategy by GCMRC.
- “Medium” – would implement modest reductions in spending (about 10-30%) to implement the higher priority CMINs.
- “Low” – would implement substantial reductions in spending (about 40-50%) to implement only the highest priority CMINs.

TWGW APPENDIX B: Evaluation criteria

- AMWG Priority
- MOs and CMINs
- Compliance
- Legacy data
- Ecosystem importance
- Data quality/availability
- Cost/benefit and risk assessment
- Status of knowledge
- Methodology
- Trade-off Analysis

NEXT STEPS

1. Final changes to main document.
2. Final revisions to TWG Appendix B, integrate SA comments.
3. TWG review in March for general plan. Approval?
4. First CMP in 2011? Fish, vegetation? Implement decision support activities, SDM.

AMWG ROLE

1. TWG and GCMRC will provide a robust risk assessment with trade-offs and a recommendation, but how will AMWG balance decisions about core monitoring with other needs?
2. Are we on the right track with high, medium, low?
3. The less spent on “core” monitoring, more science will get pushed to another category that represents discretionary science – what is the right balance?
4. How much of the budget is needed for management actions?
5. What are you willing to give up in monitoring? Can AMWG focus on information needed for critical questions?
6. As this program is evolving, CMINs, RINs, SSQs are all evolving but no clear mechanism to update this list? These are the big picture items we need AMWG to review, update with TWG and GCMRC support. Revise, prioritize?



Annual Reporting Meeting Schedule TWG Chair Report

By Shane Capron
Chair, Technical Work Group

Annual Reporting Meeting

January 18-19, 2011

- › Why do we do it?
 - › Record of results and challenges
 - › Common understanding of the research
 - › Budget/work plan changes, policy considerations
- › 29 Presentations covering 2 days
- › Developed a list of 24 issues which need BAHG/TWG attention to resolve
- › Requests for input needed to carry out research
- › Results which suggest changing direction, resolution



Annual Reporting Meeting

Management Implications

SEDIMENT

Water temperatures were about average

Above average sand inputs, high turbidity in Marble Canyon

Winter fluctuations expected to export sand

- > HFE EA Science Plan implementation, 2011 and beyond?
- > Should we increase sediment sampling in Western Grand Canyon and Glen Canyon?



Annual Reporting Meeting

Management Implications

Nonnative Fish

Mainstem trout CPUE higher than in 2000/2001

LCR reach similar to pre-removal densities of trout

Generally increasing native fish trend

High flows in 2011 could make redds susceptible to flows.

> Redd suppression flows in 2011 (low Sunday flows)?

> Nonnative EA Science Plan implementation, 2011 and beyond?

> Still questions regarding downstream emmigration from Lees Ferry vs. spawning



Annual Reporting Meeting

Management Implications

Humpback chub (HBC)

Removals of age-0 and age-1 HBC from LCR were higher than the 5% goal, need to manage our need for fish

Need to develop a science plan for Chute Falls translocations, what is the management goal?

VIE tagging of juveniles seems promising, should we continue and expand on the NSE work to monitor/track juveniles?

> Consider steady flows for mainstem aggregation surveys.



Annual Reporting Meeting

Management Implications

Near Shore Ecology project: detect changes between fall steady flows/fluctuations

After 2 years of sampling, no detectable effects found, growth, survival, habitat use

High survival rates of juvenile HBC in the mainstem; may imply low predation rates in that area during the study (2009-10)

Methods robust for tracking juveniles (40-100 mm)

Movement between LCR and mainstem and subsequent growth rate may be important to know, utilize in models

Steady flows highly confounded by storms in 2010

> Should we modify the NSE project in 2011 to increase learning?

> Expansion of methods in other projects in 2012?



Annual Reporting Meeting

Management Implications

Foodbase

Evidence for food competition at RM 30, less so at RM 60 but increasing trout numbers could increase the likelihood, plus no data for 2009 and 2010 when trout were increasing.

No monthly sampling in 2011 (yes in 2012), may be needed to support HFE science plan.

No down-river sampling planned until PEP review



Annual Reporting Meeting

Management Implications

Socioeconomics

The socioeconomic implementation plan has substantial costs

How will the AMP consider economic program needs while there are many other competing projects and limited funds?



Major Topics This Year

Major activities for TWG to consider include the following:

- Finalization of the General Core Monitoring Plan (March)
- Approve specific core monitoring plans by resource (e.g., fish, vegetation)
- FY 2012 budget & work plan modifications as necessary
- WY 2012 hydrograph recommendation
- Decisions support methods (Science Advisors)
- Socioeconomic implementation plan
- PEPs (Food base/Lake Powell)
- Workshops:
 - Economics 101 – March 7
 - Knowledge Assessment II (KA II)
 - GTMax/economics – early spring
 - Nonnative workshop – GCMRC, spring
 - Individual core monitoring plans

TWG Meetings and Work Plan

- Feb.-Mar. – BAHG review of work plan issues
- March 7 – Economics-101 workshop, Phoenix
- March 8-9 – 12 budget changes, hydrograph
 - **Propose AMWG meeting (early May) – review budget recommendation from TWG**
- June (2 days) – final FY 12 budget changes, hydrograph
 - **Propose AMWG meeting (early September) – review final budget recommendation changes from TWG**
- September/October meeting



Discussion



TWG Chair Report Socioeconomics

By Shane Capron
Chair, Technical Work Group

Background

- **AMWG briefing in February 2010**
 - December 2009: Socioeconomics workshop
 - February 2010: Socioeconomics expert panel report finalized with recommendations: Drs. Hamilton, Hanemann, Peters, Loomis.
 - **Series of recommendations covering:**
 - Hydropower
 - Recreation
 - Tribal
 - Non-use
 - **Series of questions/information needs identified by participants**



AMWG Motion

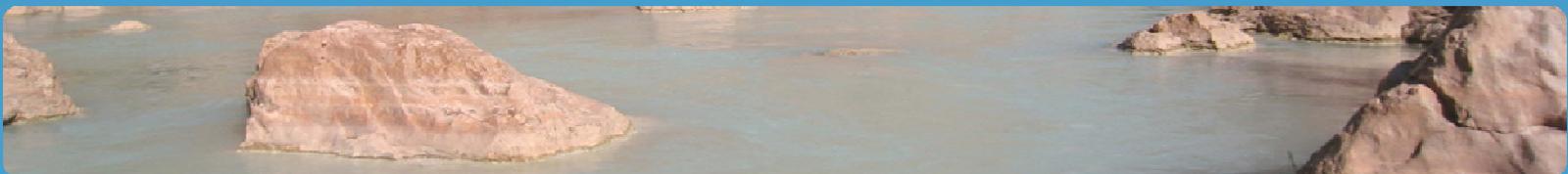
August 2010

- a. **Information needs** associated with each study or analysis and the prioritization of those needs,
- b. **Scope and costs** associated with each project and potential funding sources,
- c. A description of **how the information would be useful** to the program, and
- d. A more thorough review of the economics panel report.



Implementation Plan

- › **What did TWG do?**
 - › **Established Socioeconomics ad hoc group**
 - › **Chair Capron, Henderson, Fairley, Palmer, Barrett, Cox, Thiriot, James**
- › **Initial draft recommendations in August 2010, hydropower and recreation-use**
- › **Numerous conference calls, TWG review in January 2010**
- › **Strategy:**
 - › **Table 1: description of panel recommendations; tracking**
 - › **Table 2: workshop information needs**
 - › **Table 3: implementation plan**
- › **Cost of implementation, our strategy was moderate**
- › **Partnerships: NPS is doing similar work, could cooperate**



Implementation Plan

Table 1: Panel Recommendations

INCLUDES TWG COMMENTS: 1/3/2011

Table 1. Socioeconomic Projects identified in the February 26, 2010 “Final Report of the GCMRC Socioeconomic Research Review Panel.”

Proposed Study/Activity	Questions Addressed	Proposed Use by AMP (Expert Panel Perspective)	TWG Comments
Socioeconomic research overall and its application to GCDAMP decision-making. Cost: TBD	J, F	How will the market, non-market use and nonuse values be integrated into policy analysis? The Panel recommended that the DOI Office of Policy Analysis and/or DOE and/or WAPA develop a policy position paper on how the dollar values of market, non-market and non-use values will be used in the different decision making processes such as NEPA analysis, adaptive management and in any benefit-cost analysis. Resolving these questions of how market, non-market use and nonuse values should be integrated into Grand Canyon policy formulation would address questions J and F raised at the December Socioeconomics workshop.	CREDA: At the end of the report the question is raised – how will the results of all this economic work be used in the GCDAMP decision making process? CREDA suggests that this should be one of the very first questions to be answered. DOI must not wait until it sees the answers before it decides how or if economic impacts will affect its decisions.
FY2010			
Staffing. Cost: TBD		As GCMRC shifts to greater emphasis on socioeconomic studies, GCMRC staff with resource economics expertise will be required to conceptualize the required studies, to initiate RFPs and help secure study funding, and to provide study oversight. Resource economics staff will also be needed to help interpret study results and to outline the implications of these results for agency policy. Additional resource economics staff will be required to do this effectively. This assumes that most of the socioeconomic research will be conducted by outside consultants. If some of the studies were to be conducted in-house, the requirement for additional staff would be much greater.	Norm: include staffing proposal by expert panel (done).

Implementation Plan

Table 2: Workshop Information Needs

Importance and Timing of Socioeconomic Questions to Inform Decisionmaking for the AMP

All Workshop Participants and Official TWG Members

Socioeconomic Questions	All Participants			Official TWG Members		
	Average Importance Rating	Phase 1	Phase 2	Average Importance Rating	Phase 1	Phase 2
	28 participants			16 participants		
B-How do high flow and other experiments affect recreation (river rafting fishing guides and other associated businesses, including tribes)?	4.0	79%	21%	3.9	75%	25%
H-Having heard two distinct views, what is the value of hydropower capacity of QCD?	4.0	79%	21%	3.8	75%	25%
W-Determine impacts on marketed hydropower and recreation values of alternative flow scenarios in real time to support decision making	4.0	64%	36%	4.0	56%	44%
Q-What is the total non-use value for natural cultural, and recreational resources along the river?	3.8	50%	50%	3.8	44%	56%
D-What are the points of disagreement on methodologies and assumptions in regard to power analysis?	3.8	75%	25%	3.7	75%	25%

Table 3: Implementation Plan

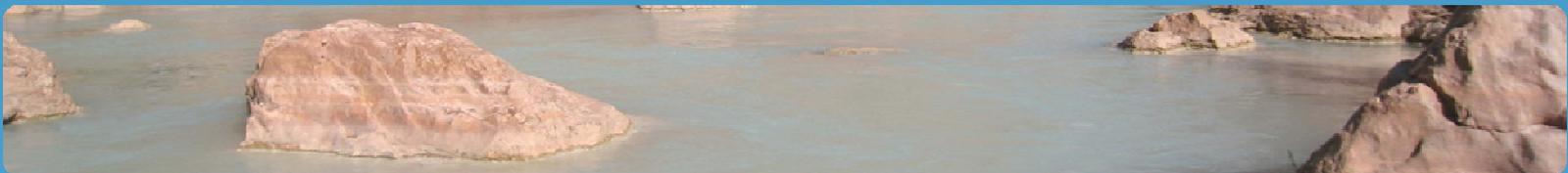
Table 3. Proposed Socioeconomic Plan for FY2011-2014, as recommended by the TWG Socioeconomic Ad Hoc Group.

ROW #	Proposed Study/Activity	AMP Info Needs	TWG Questions to be addressed	Proposed Use by AMP (SEAGH Perspective)
1	Socioeconomic research overall and its application to GCDAMP decision-making. Cost: TBD	N/A	Resolving questions of how market, non-market, use and non-use values should be integrated into Grand Canyon policy formulation would address questions J and F.	How will the market, non-market use and nonuse values be integrated into policy analysis? Policy should be developed in a collaborative effort between the AMWG, DOI and DOE/WAPA on how the dollar values of market, non-market and non-use values will be used in the different decision making processes such as NEPA analysis, adaptive management and in any benefit-cost analysis.
2	Staffing. Cost: TBD Time: FY 2012 and beyond	N/A	N/A	As GCMRC shifts to greater emphasis on socioeconomic studies, GCMRC staff with resource economics expertise will be required to conceptualize the required studies, to initiate RFPs and help secure study funding, and to provide study oversight. Resource economics staff, or outside consultants, may be needed to help interpret study results and to outline the implications of these results for agency policy. Additional resource economics staff or contractors may be required to do this effectively. This assumes that most of the socioeconomic research will be conducted by outside consultants. If some of the studies were to be conducted in-house, the requirement for additional staff would be much greater.
	FY 2011			

Implementation Plan

RESEARCH TOPICS (Table 3)

- General Needs
- Workshops
- Power
- Recreation Use: market and non-market
- Tribes
- Nonuse Values
- Core Monitoring



Implementation Plan

GENERAL NEEDS

- [1]** How will market and non-market use, and non-use values be factored into AMP decision-making?
- [2]** Staffing: Additional resources, GCMRC staff or contractors, may be needed to implement this program.

Implementation Plan

WORKSHOPS

- [3] Economics 101: March 7, Phoenix GCDAMP invited
- [7] Non-Use Values: 2012

Implementation Plan

POWER

- [4]** Define (policy) base & change cases analyses, 2011
- [5]** Peer review of GTMax model, 2011
- [6]** Power modeling of base case, WECC spillover analysis, 2011-2012
- [10]** Power modeling of change cases and power flow financial and economic analyses, 2012
- [11]** Contingent. WECC power analysis, date TBD
- [17]** Real-time power impacts spreadsheet, 2014

Implementation Plan

RECREATION USE: rafters/anglers from Lees Ferry to Mead

[9] Part A: Market Use, expenditure analysis

Part B: Non-Market Use, develop survey, OMB clearance

2012-2013

[12] Part B: Non-Market Use continues, 2013-2014

Initiate recreations surveys.

Implementation Plan

TRIBES

- [8]** Scoping to identify tribes for specific surveys of preferences and attitudes, determine if separate tribal studies are needed, 2012.
- [13]** Contingent. Prepare surveys for tribal preferences and attitudes, 2013.
- [15]** Contingent. Conduct surveys for tribal preferences and attitudes, 2014.

Implementation Plan

NONUSE VALUES

- [14]** Initiate OMB clearance to work with focus groups to develop surveys, 2013.
- [16]** Conduct focus groups and piloting of nonuse value survey, initiate OMB clearance for full survey, 2014.
- [18]** Conduct full nonuse value survey, 2015-2016.

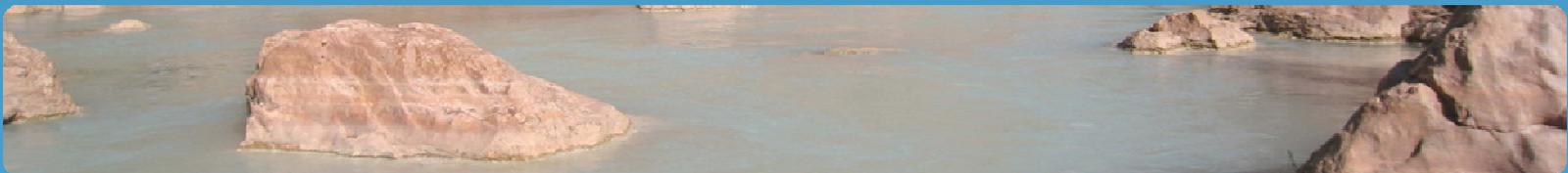
Implementation Plan

CORE MONITORING

[19] Consider core monitoring program for socioeconomics, 2015 and beyond, what should be repeated.

NEXT STEPS

- General agreement among ad hoc & TWG on projects
- Finalize Table 3
- Develop document, include review of the panel report
- Revised draft at March TWG
- Final recommendation at June TWG



NEXT STEPS - AMWG

- **AMWG: should we revise 2012 budget to integrate economics?**
- **AMWG: need policy weigh in on definition of base and change cases in 2011.**
- **AMWG: should TWG collaborate with NPS on economics?**
 - **NPS is on an aggressive timeline for their socioeconomic program**
 - **Need input on categories of information by June; direct use surveys in field in late-Fall**
 - **TWG proposes series of calls and in-person mtg. in March**
 - **Potential to collaborate, both AMP and NPS benefit**



Discussion