

**Glen Canyon Dam Adaptive Management Work Group**  
**Agenda Item Information**  
**August 29-30, 2012**

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Agenda Item

Fiscal Year 2013-14 Budget and Workplan

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Action Requested

√ Motion requested. The following proposed motion is based on the recommendation from the TWG. However, no motion is presumed to be made unless and until an AMWG member makes the motion in accordance with the AMWG Operating Procedures.

AMWG recommends the FY2013-14 Biennial Budget and Workplan from the Bureau of Reclamation and Grand Canyon Monitoring and Research Center, as reviewed by TWG on June 20-21, 2012, to the Secretary of the Interior for approval.

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Presenters

Shane Capron, Technical Work Group Chair, Western Area Power Administration

Dave Garrett, Executive Director, Science Advisors

Glen Knowles, Chief, Adaptive Management Group, Upper Colorado Region, Bureau of Reclamation

Jack Schmidt, Chief, Grand Canyon Monitoring and Research Center, U. S. Geological Survey

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Previous Action Taken

√ By TWG: At its June 2012 meeting, TWG passed the following motions by consensus.

The TWG recommends that AMWG recommend the FY2013-14 Biennial Budget & Workplan from the Bureau of Reclamation and Grand Canyon Monitoring and Research Center, as reviewed by TWG on June 20-21, 2012, to the Secretary of the Interior for approval.

The TWG requests by consensus that the Department of the Interior consider the following issues in the development of the FY2013-14 Biennial Budget & Workplan from the Bureau of Reclamation and Grand Canyon Monitoring and Research Center:

1. Maintain the annual Lees Ferry creel surveys (\$25,000 FY13, \$25,000 FY14)
2. Include cultural resources Science Advisor for \$10,000 annually.

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Relevant Science

N/A

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Background Information

**TWG Report – Shane Capron**

Budget Process

During review of the budget and work plan, the TWG and Budget Ad Hoc Group (BAHG) have continued to implement the budget process as requested by Anne Castle (Secretary's Designee: March 31, 2011; May 4, 2011) which modified parts of the AMWG approved budget protocol (May 6, 2010). Both of the Anne Castle memos are attached to last year's AIF and posted at [http://www.usbr.gov/uc/rm/amp/amwg/mtgs/11aug24/Attach\\_10a.pdf](http://www.usbr.gov/uc/rm/amp/amwg/mtgs/11aug24/Attach_10a.pdf). The AMWG approved budget protocol paper can be found at [http://www.usbr.gov/uc/rm/amp/twg/mtgs/12feb02/Attach\\_05a.pdf](http://www.usbr.gov/uc/rm/amp/twg/mtgs/12feb02/Attach_05a.pdf).

The goal of this process is to identify and resolve technical issues of detail at the TWG/DOI level and refer only policy-level issues to AMWG for consideration. As part of this process, a fully described budget and work plan is provided to TWG and the BAHG for review before the June TWG meeting. At its June meeting, TWG makes a budget recommendation to AMWG, and any remaining technical issues are forwarded to DOI for consideration. The AMWG considers a budget recommendation to the Secretary at its August meeting.

#### Action Taken by TWG and BAHG

The TWG and BAHG received the Reclamation and GCMRC budget and workplan on May 31. TWG had previously reviewed a draft budget and the TWG Chair provided initial technical comments to DOI. This April 19, 2012 memorandum can be found at [http://www.usbr.gov/uc/rm/amp/twg/mtgs/12apr16/Attach\\_08b.pdf](http://www.usbr.gov/uc/rm/amp/twg/mtgs/12apr16/Attach_08b.pdf).

Responses to those initial TWG comments were provided by DOI on June 15, 2012, and can be found at [http://www.usbr.gov/uc/rm/amp/twg/mtgs/12jun20/Attach\\_08b.pdf](http://www.usbr.gov/uc/rm/amp/twg/mtgs/12jun20/Attach_08b.pdf).

In addition to the initial technical issues, six policy issues were raised by TWG to AMWG at its May 2012 webinar. TWG received AMWG input on all six items during the webinar and followed that direction in developing its recommendation.

The BAHG met twice via webinar in early June to work through issues and concerns with regard to the budget. This resulted in a refined list of issues for the full TWG to consider at its June meeting.

The TWG met on June 20 and 21 and heard reports from Reclamation, GCMRC, BAHG, and the Science Advisors (SAs). (See below for more information about the SAs review of the budget.)

The TWG was able to resolve nearly all of the BAHG-identified concerns with the help of Reclamation and GCMRC. The final list of concerns and discussion of those concerns can be found at [http://www.usbr.gov/uc/rm/amp/twg/mtgs/12jun20/Attach\\_08g.pdf](http://www.usbr.gov/uc/rm/amp/twg/mtgs/12jun20/Attach_08g.pdf). This list also includes changes Reclamation and GCMRC agreed to make to their respective budgets. It is TWG's expectation that those changes will be reflected in a revised budget that will be provided to AMWG before or at the time of the August meeting.

At its June 2012 meeting, the TWG recommended, by consensus, that the AMWG recommend the FY13-14 AMP budget to the Secretary for his approval. The budget that the TWG considered can be found at [http://www.usbr.gov/uc/rm/amp/twg/mtgs/12jun20/Attach\\_08a.pdf](http://www.usbr.gov/uc/rm/amp/twg/mtgs/12jun20/Attach_08a.pdf).

The TWG did not forward any policy issues to the AMWG. However, TWG did request that the Department of the Interior consider two technical changes to the budget and workplan:

1. Maintain the annual Lees Ferry creel surveys for \$25,000 in FY13 and \$25,000 in FY14; and
2. Include a cultural resources Science Advisor for \$10,000 annually.

### Technical Issues

The following is additional information on the two technical issues that were forwarded to the Department of the Interior by the TWG.

**1. Maintain the annual Lees Ferry creel surveys for \$25,000 in FY13 and \$25,000 in FY14.**

The TWG heard a presentation by Arizona Game and Fish Department about the utility of the creel surveys and the impact of reduced survey frequency if funding were not provided. The TWG generally felt that this information on angler use was important in assessing success in moving to a high quality trout fishery, and that the reduced frequency would make that more challenging to accomplish. A number of members voiced concern about taking over the funding for a State-related activity, and that this could create a precedent for future funding requests. However, although they voiced this concern, they agreed with the utility of the survey and did not block consensus.

**2. Include a cultural resources Science Advisor for \$10,000 annually.**

There has been discussion and consideration of adding a Science Advisor for some time, particularly an environmental specialist. However, TWG felt that the current Science Advisor staffing was deficient in the cultural resources area and discussed the merits of making this change. It was determined by the TWG that a cultural specialist would be helpful in reviewing budgets, especially with upcoming changes in the cultural program (including monitoring and treatment).

### Budget Improvements

Overall, the discussion at the TWG was of appreciation to GCMRC and Reclamation for the substantial improvements made in this budget over those of past years. GCMRC made a number of advances that we should note.

First, there is a level of discussion in the workplan that we have not seen before: a tone that includes education and learning. It describes how GCMRC, cooperators, and others came to decisions about research and monitoring projects, and provides the background needed to understand why these were chosen. The workplan included excellent writing describing the scientific rationale for projects and showed outstanding critical thinking. Most of all, the workplan included recognition that science is not perfect, along the way we will make mistakes, and we will need to make course corrections. Second, the workplan described the important hypotheses that need to be tested, a description of how we will test them, and then a discussion about how we will synthesize that information to distinguish among those hypotheses. TWG felt that this was a big improvement.

The TWG Chair congratulates all of the scientists and staff for such a tremendous effort; this work involved many agencies and cooperators.

### TWG Process Improvements

The TWG followed a consensus-building process that led to consensus on a budget recommendation. This approach was intended to be responsive to recommendations made by the CRAHG relating to the need to include all opinions in the decision-making and not move to votes that marginalize some members. The Chair thought this process worked very well and helped to

involve everyone. Members voiced concerns about the budget, and the TWG worked through them until they reached agreement. This type of process can take more time within a meeting, but the Chair feels this approach is valuable and should be continued. The June TWG meeting actually ended early, despite reaching consensus on every decision. More discussion is provided in the TWG Chair report for this AMWG meeting.

### **Science Advisors' Report – Dave Garrett**

The AMP Science Advisors have reviewed the 2013-2014 Biannual Work Plan and developed a review report for the AMWG. The SA Executive Coordinator reviewed the report with the TWG and GCMRC at the TWG June meeting. A PowerPoint with a short summary of the report has been developed for the AMWG for a short presentation at its August meeting. The Work Plan presents a strong science program for 2013-2014. The SAs have made several recommendations to improve the program which include; creation of a beginning chapter to clarify the critical importance of science programs responding to stakeholder needs through use of adaptive management processes; completion of core monitoring plans and a status of knowledge report; improve systems design linking research to stakeholder objectives; improve project integration and specify more clearly sampling designs.

The Science Advisor budget review can be found at [http://www.usbr.gov/uc/rm/amp/twg/mtgs/12jun20/Attach\\_08d.pdf](http://www.usbr.gov/uc/rm/amp/twg/mtgs/12jun20/Attach_08d.pdf).

### **Bureau of Reclamation Budget – Glen Knowles**

Reclamation's budget consists primarily of costs associated with administration of the GCDAMP, including Reclamation salaries, contract administration, compliance activities, tribal participation, meeting facilitation, and member travel reimbursement. For the FY 2013-14 Budget and Work Plan, notable changes include creation of the Native Fish Conservation Carryover Fund, a budget that consists of prior year carryover dollars in support of fish conservation needs and in particular non-native fish control as defined in the Non-native Fish Control EA and FONSI. Another important change is a new proposal for Reclamation's Cultural Resources Program, which includes six projects to address planning, mitigation and monitoring needs associated with Reclamation's National Historic Preservation Act compliance for the GCDAMP. Reclamation appreciates the hard work of the TWG Chair, TWG, and BAHG in refining its budget proposal, and has made a number of revisions through this process as documented in TWG Report above, most recently in response to comments raised at the June 2012 TWG meeting and summarized here: [http://www.usbr.gov/uc/rm/amp/twg/mtgs/12jun20/Attach\\_08a.pdf](http://www.usbr.gov/uc/rm/amp/twg/mtgs/12jun20/Attach_08a.pdf).

### **GCMRC Budget – Jack Schmidt**

The GCMRC budget for FY13/14 was revised following review from the Science Advisors and commentary from the Technical Work Group (TWG). In direct response to the recommendations of the TWG, the Creel Survey proposed by Arizona Game and Fish will be conducted and fully funded as Project Element F.2.3. \$10,000 was added to the budget of the Science Advisors to support addition of a cultural resources expert to the Science Advisors group. \$73,000 was added to Project B for the maintenance of gages in the event that a High Flow Experiment (HFE) is conducted; this amount will be carried over to FY14 in the event that no HFE is conducted in FY13.

The total GCMRC budget for FY13 is \$10.8 million, of which \$8.6 million (80%) is funded by FY13 GCDAMP funds. Supplemental Reclamation funds of \$1 million support Lake Powell water quality

monitoring, part of the cultural resources monitoring and research program, and selected 2-year fisheries research projects. The remainder of the FY13 GCMRC budget is being funded by previously unspent carryover funds. The projected FY14 GCMRC budget is \$10.6 million, and \$8.9 million is anticipated to come from GCDAMP funds.

The fish and aquatic ecology programs account for 38% of the FY13 budget. The stream flow and water quality measurement programs for the Colorado River and Lake Powell, as well as the geomorphology program, account for 28% of the total FY13 budget. Vegetation monitoring and cultural resources monitoring and research account for 3% and 5%, respectively, of the FY13 budget.

VIA ELECTRONIC MAIL ONLY

Memorandum

Date: August 24, 2012

To: Anne Castle, Assistant Secretary for Water and Science, Department of the Interior

From: Jack Schmidt /s/  
Chief, Grand Canyon Monitoring and Research Center, U.S. Geological Survey

Glen Knowles /s/  
Chief, Adaptive Management Group, Upper Colorado Region, Bureau of Reclamation

Subject: Background information regarding final draft of the Glen Canyon Dam Adaptive Management Program Biennial Budget and Work Plan for FY 2013-2014

The final draft Biennial Budget and Work Plan for FY 2013-14 (BWP) was posted on the Bureau of Reclamation (Reclamation) website on Friday, August 17, 2012, accessible here: [http://www.usbr.gov/uc/rm/amp/amwg/mtgs/12aug29/FY13-14\\_BWP1.pdf](http://www.usbr.gov/uc/rm/amp/amwg/mtgs/12aug29/FY13-14_BWP1.pdf). This memorandum provides background as to the context of that document for use in the August 29-30, 2012 Glen Canyon Dam Adaptive Management Program (GCDAMP) Adaptive Management Work Group (AMWG) meeting, and highlights important changes made to earlier versions of the BWP in response to comments by the GCDAMP Science Advisors, Technical Work Group (TWG), and the TWG Budget Ad Hoc Group (BAHG). Additional information on development of the BWP is provided in the BWP Agenda Information Form for the August 29-30 AMWG Meeting, accessible here: [http://www.usbr.gov/uc/rm/amp/amwg/mtgs/12aug29/AIF\\_Budget.pdf](http://www.usbr.gov/uc/rm/amp/amwg/mtgs/12aug29/AIF_Budget.pdf).

*Bureau of Reclamation portion of BWP (Chapter 1):*

The BWP and Budget of the Bureau of Reclamation (Reclamation) allocates approximately \$1,910,000 of Power Revenue Funds in FY 2013 and approximately \$1,904,000 in FY 2014. It also allocates \$475,000 in each year of Department of the Interior appropriations for participation in the GCDAMP by the five GCDAMP member Indian Tribes.

The Reclamation portion of the GCDAMP budget is traditionally focused on administration of the GCDAMP, including compliance needs, personnel costs, meeting planning, meeting travel, tribal participation, and other administrative costs. This BWP is consistent with this, with two important new projects: a newly consolidated Cultural

Resources Program Implementation project, and a new project entitled Native Fish Conservation Carryover Fund. These two projects will, respectively, enable our implementation of important cultural resource needs such as our National Historic Preservation Act compliance, including the recently completed memoranda of agreement documents for the High Flow Experimental Protocol and Non-native Fish Control, and provide for funding in FY13-14 for implementation of non-native fish control efforts, should such efforts be needed, to meet, in part, Endangered Species Act compliance needs. Both of these projects are responsive to the majority of comments and input received from the TWG and BAHG.

Funding for the participation of the five GCDAMP Indian Tribes in the program, as well as for tribal monitoring programs, continue to be important aspects of Reclamation's GCDAMP budget. We received comments from the BAHG and TWG that the Department of the Interior (DOI) increase tribal participation grants by the consumer price index (CPI) every year. As explained in the June 15, 2012 memorandum from Deputy Assistant Secretary for Water and Science Lori Caramanian to the TWG Chair and TWG on changes to the BWP, while we greatly value the input of the tribes into the GCDAMP and are striving to improve our relationships and incorporation of tribal input and perspectives into the GCDAMP decision-making process for the operation of Glen Canyon Dam, DOI cannot at this time provide an increase in these funds or commit to CPI indexing due to current budget constraints.

The BAHG and TWG also commented on the need to provide a detailed Public Outreach Ad Hoc Group (POAHG) budget in the BWP. The POAHG has now developed a detailed budget for FY13-14, provided in the POAHG Agenda Information Form for the August 29-30 AMWG Meeting, accessible here:

[http://www.usbr.gov/uc/rm/amp/amwg/mtgs/12aug29/1\\_AIF\\_POAHG.pdf](http://www.usbr.gov/uc/rm/amp/amwg/mtgs/12aug29/1_AIF_POAHG.pdf).

This budget was not completed in time to be incorporated into the BWP, but the budget will be presented at the AMWG meeting and the final BWP will be updated as appropriate.

*Grand Canyon Monitoring and Research center portion of BWP (Chapter 2):*

The BWP and Budget of the U. S. Geological Survey Grand Canyon Monitoring and Research Center (GCMRC) allocates approximately \$8,630,000 of Power Revenue Funds, approximately \$980,000 of Reclamation funds, and approximately \$830,000 of GCMRC carryover funds to support monitoring and research activities in federal fiscal year (FY) 2013 (October 1, 2012, to September 30, 2013). Similar activities in FY 2014 will be supported by approximately \$8,910,000 of Power Revenue Funds, approximately \$990,000 of Reclamation funds, and approximately \$610,000 of GCMRC carryover funds. Thus, GCMRC monitoring and research activities in the Colorado River ecosystem (CRe) downstream from Glen Canyon Dam are projected to cost \$10,440,000 in FY 2013 and \$10,520,000 in FY 2014.

The BWP for FY 2013 and FY 2014 is organized into 10 monitoring and research projects (Projects A – J), implementation of an unspecified project in natural resource

economics (Project K), independent review, administration by the GCMRC and by the USGS Southwest Biological Science Center, and an incremental allocation to support quadrennial missions to acquire remotely sensed data from overflights. Of the 10 monitoring and research projects, 3 (Projects A-C) are in the physical sciences of hydrology, water quality, sediment transport, and geomorphology; these projects are focused on Lake Powell reservoir and the CRE. Five projects (Projects D-H) are focused on fisheries science and aquatic ecology, and one project (Project I) is focused on the riparian ecosystem. An additional project (Project J) is focused on monitoring topographic change at archaeological sites and on geomorphic research that provides a large-scale context for detailed site measurements.

A draft of the BWP was presented to the Glen Canyon Dam Adaptive Management Program (GCDAMP) Technical Work Group (TWG) on 20-21 June 2013. At that time, the TWG recommended approval of that version of the BWP. By consensus, the TWG requested that an annual creel survey be funded in FY 2013 and FY 2014 and that a cultural resources advisor be explicitly added to the present roster of Science Advisors. Additionally, 19 items were discussed by the TWG and actions in response to these items were agreed upon. Discussion by the TWG was informed by a comprehensive review of the June draft BWP by the Science Advisors, who provided their critique to the TWG members. Additionally, many projects were identified but funding sources had not been identified at that time. Thus, minor changes to the BWP were anticipated by the TWG, and it was anticipated that some projects might be dropped or new funding sources identified.

The version of the BWP that was posted last week and that is presented to the AMWG is responsive to the motions and discussion of the TWG as well as the comments and review by the Science Advisors. Staff of the GCMRC paid special attention to the Science Advisor comments as the staff revised project descriptions. GCMRC has also submitted a formal Response to Reviewer Comments document in which the various research teams discuss reviewer comments and describe how project descriptions were accordingly revised. Revision of the June draft BWP was also based on extended conversations with the National Park Service. Several meetings were held between GCMRC staff and the staffs of Glen Canyon National Recreation Area (GCNRA) and Grand Canyon National Park (GCNP). GCMRC staff and their scientific collaborators reviewed study plans with GCNRA and GCNP staff in an effort to identify issues of administrative concern, and every effort was made to develop alternative measurement strategies to address concerns of the National Park Service. In some cases, NPS staff were added to research collaborations.

A meeting was also held with natural and cultural resource staff of several Native American tribes to review GCMRC project plans and to identify project components that might better address issues of tribal interest. Other areas of tribal interest are addressed in Chapter 1 of the BWP.

Whirling disease has recently been detected in the Glen Canyon trout population, and this is potentially a significant management issue. The proposed BWP will provide critical

information to inform future management decisions. Projects will provide information on the distribution and effects on whirling disease in two ways. First, surveys conducted as part of Elements F.1 (System Wide Electrofishing), F.2 (Rainbow Trout Monitoring in Glen Canyon), and F.6 (Detection of Rainbow Trout Movement from the Upper Reaches of the Colorado River Below Glen Canyon Dam/Natal Origins) will be able to report the number and location of capture of any fish showing overt signs of the disease. Second, the Arizona Game and Fish Department, as part of their fall monitoring efforts (Element F.2), will continue to collect a sample of trout to submit for laboratory analysis to determine the prevalence and distribution of infected fish. To date, these laboratory analyses have been paid for with funding from the state of Arizona.

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In relation to the June version, the introductory presentation of GCMRC's part of the BWP (pages 34-47) was expanded to specifically discuss the relation of this work plan to various administrative and stakeholder direction provided during the past few years. Chapter 2 begins with an Overview of the Projects (Pages 35-39) that describes in lay terms how the projects relate to one another in terms of their attempt to inform an integrated ecosystem level understanding of the CRE. Thus, this section of Chapter 2 describes the primary purpose of each project, the primary management and research questions addressed by various groups of projects, and how the various projects relate to one another.

The introductory part of Chapter 2 (Pages 39-45) also provides extended discussion of how the BWP addresses concerns raised in several recent administrative documents and decisions. Extended discussion is provided concerning how the BWP is responsive to the recently adopted Desired Future Conditions (DFC). Project foci are linked to DFC issues and to metrics that have been suggested to evaluate the degree to which DFCs are achieved. The BWP does not address every DFC. Priorities were established by Assistant Secretary Castle in March 2011, and GCMRC focused on those DFCs that were identified in the Assistant Secretary's memo.

The BWP is also responsive to the Science Planning and related activities of the recently released Environmental Assessments of a Protocol for High-Flow Experimental Releases and for Non-Native Fish Control. Each of these documents contains a Science Plan that had been developed by GCMRC. These Science Plans were responsive to the data needs required to implement these programs and to evaluate the success of these efforts. The most important BWP projects that are linked to these EAs are Project B (measurement of the influx of fine sediment from the Paria that triggers an HFE), Project A (measurement in changes in fine sediment deposits in the CRE by which success of the HFE Protocol can be evaluated), and the various fish Projects D-H (by which changes in fish populations and the reasons for those changes can be understood).

The relation between the BWP and the 11 GCDAMP Program Goals are described. The monitoring methods described in the BWP are a significant advancement beyond the descriptions of similar monitoring methods described in the draft General Core Monitoring Plan. The BWP seeks to use the best available science to inform monitoring

methods by which key resource metrics can be evaluated. The relation between each project and various Core Monitoring Information Needs (CMINs) and Research Information Needs (RINs) are described in each project description plan.

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The proportional allocation of funds among the various project areas is approximately what it was in June 2012 – 29% of the total program costs is projected to be spent in the measurement of discharge, water quality, and sediment transport and 39% in monitoring and research concerning fish and the aquatic ecosystem. The largest single project concerns Monitoring Native and Non-native Fishes where approximately \$2,380,000 will be spent. Projects A (Sandbars and Sediment Storage Dynamics; ~\$1,410,000) and B (Streamflow, Water Quality, and Sediment Transport; ~\$1,280,000) are also large. Project J (Monitoring Cultural Resources ... and Defining the Large-Scale Geomorphic Context; \$540,000) and Project I (Riparian Vegetation Studies; \$379,000) are both substantial expansions of program activities and of program budgets.

Funding for each proposed activity in FY 2013 and FY 2014 is identified. Reclamation identified several projects (J.3 and several fish projects) that will be funded by allocation of Reclamation carryover funds to support projects that have a research focus and have a high likelihood of being completed in 2 years. Additionally, GCMRC allocated most of its unspent FY 2012 carryover funds to support other projects. Thus, there are no projects in FY 2013 or FY 2014 that are unfunded. Reclamation has indicated its preliminary approval of reallocation of GCMRC carryover funds for these purposes, and the final allocation of these funds will be negotiated after the final budget is approved.

In developing this budget, GCMRC science staff and collaborators, as well as GCMRC administrative staff, made estimates of their project expenses. Across-the-board 5% reductions in logistics expenses and expenses for “travel and training” were thereafter implemented. As requested by the TWG, Appendix 2-D lists all river trips projected to occur in support of this BWP, and GCMRC logistics staff is confident in their capacity to support this level of effort.

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#### Description of Changes in Specific Projects:

**Project A** – The only substantive change in this project was the incorporation of the Grand Canyon River Guides Adopt-a-Beach program in the overall project. This program requires a small investment (~\$10k) and yields a significant amount of additional information about the long-term changes in sandbars that are used as campsites. Additionally, some of the scope of work in Element A.3 was shifted from FY 2013 to FY 2014 to accommodate budget changes. All elements of this project are now funded.

**Project B** – The only substantive change in this project was the addition of ~\$70,000 to cover additional river trips for the purpose of maintaining main-stem Colorado River gages before and after a HFE. In the event that no HFE is conducted in FY 2013, these funds will be carried forward to FY 2014.

**Project C** – Project C was revised to address editorial comments and to clarify a description of the interactions of reservoir levels, inflows, and releases and how they influenced river temperatures in 2011. The revised budget was increased by approximately \$16,000 to provide a full time hydrologic technician for the project.

**Project D**- We made suggested editorial changes throughout and also made revisions to clarify that two nights of sampling will be conducted at selected aggregations to attempt closed population estimates using mark-recapture methods; these efforts will also yield a more precise estimate of capture probabilities. The overall budget decreased by approximately \$20,000 due to revised estimates of logistics costs.

**Project E** – Recommended editorial changes were made throughout the project description. Element E.2 was reorganized to better describe what issues are being addressed and why the proposed methods are worthwhile. We dropped the stoichiometry element of resource quality (i.e., N content) and now focus solely on contaminants as levers on resource quality. We will attempt to use C and S as tracers of trophic pathways, contingent on to-be-conducted pilot research that demonstrates there is sufficient separation among end-members for this to be a useful tool. We also propose gut content analysis of fishes in case there is not sufficient separation in end-members for stable isotope analysis to be a useful tool. Our revised budget increased by approximately \$24,000. Although salaries decreased slightly, we underestimated logistics costs in our initial draft particularly those costs associated with helicopter flights.

**Project F** – We made suggested editorial changes throughout and added a section to the summary identifying monitoring information that will be provided by this project. We also added two project elements by splitting components of larger elements into their own stand-alone elements. These include Element F.3, Mainstem Monitoring of Native and Nonnative Fishes near the LCR Confluence, and Element F.4, LCR Monitoring. At the request of the TWG, we also added a project as part of Element F.2 funding Arizona Game and Fish Department to conduct a creel survey of the Glen Canyon and Lees Ferry trout fishery for a cost of \$25,000. The overall budget increased by approximately \$18,000 despite the addition of the creel survey. Revised estimates included increases in salaries, \$8,000, and logistics, \$27,000, as well as decreases in operating expenses, \$26,000, and GIS/RS/electronics support, \$15,000.

**Project G** – We made suggested editorial changes throughout the document and added recommended citations. In response to comments from the TWG, we added wording to indicate that food availability as it relates to predation vulnerability would also be evaluated in our laboratory studies. We also added language to emphasize that brown trout removal will be undertaken in consultation and collaboration with Tribes involved in the GCDAMP. The revised budget decreased by \$3,000. Salaries were increased by about \$8,000, but logistics costs decreased by approximately \$11,000.

***Project H*** – Only minor editorial changes in project descriptions were made to this project. Our revised budget decreased by about \$23,000 largely due to lower estimates of operating expenses and logistics costs.

***Project I*** – We made suggested editorial changes throughout the document and eliminated the project element focusing on riparian vegetation dynamics and trophic level linkages related to tamarisk defoliation (I.2). We added a task to develop a state and transition model for riparian vegetation change. In addition, we revised the staffing plan by adding a post-doctoral researcher as the GCMRC PI recently took another position. The revised budget increased by approximately \$54,000 due to the addition of a full time salary for a post-doctoral researcher to replace the GCMRC PI who had approximately half her salary budgeted on this project in the original draft.

***Project J*** – We made several editorial changes to address reviewer comments, added additional citations, and substantially reorganized and expanded the project narrative to further clarify project purpose and research objectives. We also expanded the project scope and budget to include additional geomorphic research in Glen Canyon, per request of Glen Canyon NRA and added use of stationary cameras at select locations for tracking changes in sediment source areas and erosional features. Project J's overall budget increased \$20,100 in FY 2013 and \$16,400 in FY 2014 to accommodate the additional research effort Glen Canyon and increased equipment costs.

***Economist position*** – no changes were made

***Independent Review*** -- \$10,000 were added to cover the anticipated costs of adding a Science Advisor in Cultural Resources.