Glen Canyon Dam Adaptive Management Work Group
Agenda Item Information
August 24-25, 2010

Agenda Item

Fiscal Year 2011-12 Budget and Workplan

Please note that, contrary to practice of the last several years, TWG considered the hydrograph separately from the budget and workplan in order to accommodate the development of a Department of Interior/Department of Energy hydrograph proposal. Therefore, there is a separate agenda item form for the proposed hydrograph for FY11-12.

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.

The AMWG recommends that the Secretary of the Interior adopt the FY 2011-12 Draft Budget (tables provided by GCMRC dated June 28, 2010) and Work Plan (dated June 11, 2010) with the following changes:

1. Fund $505,838 for the Treatment plan in FY11, unless Reclamation can maintain necessary compliance with $205,838 in FY 11, as demonstrated to AMWG. (line 50)
2. Reduce funding for Aquatic Food Base monitoring by $100,000 in FY11. (line 84)
3. Move funding for the Non-native Fish Suppression Fund for FY11 to the Experimental Fund until the Non-Native Fish Control EA process is completed and funds are necessary. (line 45)
4. Restore $20,000 to the Science Advisors budget (line 171) in FY11 and FY12 from Administrative support (line 165).

Presenters

Shane Capron, Technical Work Group Chair
Glen Knowles, Chief, Adaptive Management Group, Upper Colorado Region, Bureau of Reclamation
John Hamill, Chief, Grand Canyon Monitoring and Research Center, U. S. Geological Survey

Previous Action Taken

√ By TWG: At its June 2010 meeting, TWG passed the following motion:
The TWG recommends the FY 2011-12 Draft Budget (tables provided by GCMRC dated June 28, 2010) and Work Plan (dated June 11, 2010) and recommends it be forwarded to the AMWG for further action with the following changes:

1. Fund $505,838 for the Treatment plan (line 50) in FY11, unless Reclamation can maintain necessary compliance with $205,838 in FY 11, as demonstrated to AMWG.
2. (Line 84) Reduce funding for Aquatic Food Base monitoring by 100k in FY11.
3. Remove funding for the Non-native Fish Suppression Fund for FY11 and use in the Experimental Fund until the Non-native EA process is completed and funds are necessary (line 45).

4. (line 171) Add $20,000 to the SA budget in FY11 and FY12, to restore funding. Funding would be taken from line 165 (Admin. support).

Relevant Science

N/A

Background Information

The full budget and workplan can be found at http://www.usbr.gov/uc/rm/amp/amwg/mtgs/10aug24/BWP_10jul27.pdf.

The TWG Chair provided a list of 17 budget issues to AMWG members at their May 6 Webinar. For further details, see the May 6, 2010 Budget AIF at http://www.usbr.gov/uc/rm/amp/amwg/mtgs/10may06CC/Attach_03a.pdf. AMWG discussed various issues and provided input to TWG; however, no motion was passed. The AMWG primarily discussed the following issues:

1. Continued use of the experimental fund to support ongoing studies.
2. Continued use of the nonnative contingency fund for other purposes.
3. Insufficient funding for a trout movement study.
4. Removal of the humpback chub translocation study.
5. Need to support power economics studies.
6. Need for compliance funds (e.g., LTEMP)
7. Potential large funding need for nonnative fish control.

After the webinar, GCMRC and the TWG Chair worked together to discuss and determine how to respond to the AMWG comments with a modified budget and workplan.

The TWG reviewed the revised GCRMC and Reclamation FY 2011-12 biennial budget and workplan at its June 2010 meeting. The TWG heard presentations from GCMRC and Reclamation on the workplan, and from the BAHG on its budget deliberations.

Many of the issues discussed at the May AMWG webinar had been resolved in the revised budget and workplan, e.g., inclusion of funding for Chute Falls translocations, trout movement studies, nonnative contingency fund, and compliance. However, substantial concerns remained about the following issues:

- Status of the treatment plan implementation and compliance with section 106 requirements.
- GCMRC's proposed expansion of the aquatic food base program in FY11 as part of the HFE science plan, before completing a PEP review (see PLAN 12.P6.11-12 on page 204 of the workplan). TWG has not fully considered this approach to implementing an HFE science plan but some TWG members expressed concerns that most of the experimental fund is being used to support this budget, which will eliminate ready funding for any future HFE.
- Reduction of the Science Advisors budget by $50,000. TWG recommended restoring $20,000 to the Science Advisors, from the GCMRC proposed budget for editing and publications, to support the development of decision-making processes for the program. (See the Science and Management AIF for further background information on this issue.)

- Due to tribal concerns with the nonnative fish suppression fund appearing to be hard-wired for mechanical removal methods, TWG recommended moving that funding to the experimental fund in order to allow for those funds to be used for implementing the action resulting from the nonnative control EA.

The TWG also considered seven other amendments that did not receive sufficient support to be included in the budget motion, but are included as a list here to be considered for funding if carry-over funds are available in FY 2011 or 2012. This list of unfunded projects was suggested in the budget process document approved by AMWG on May 6, 2010. Ideally, TWG would have considered the unfunded projects list provided by GCMRC (see Hamill memo) and this list, and then prioritized them. We look forward to achieving that goal during our next budget cycle. Other issues discussed was the need to develop an administrative history of the program as well as how to integrate a more complex economics program within the budget.

Unfunded projects list – to be used with carryover funds if available (not prioritized)

a. The FY11-12 budget/work plan should include $25,000 (in FY 12) to fund an Extirpated Species Workshop to achieve the following:
    i. Finalize and prioritize species list
    ii. Assess current compliance environment for various implementation strategies
    iii. Develop a strategic framework to implement the extirpated species goal within AMP.
b. The FY11-12 budget/work plan should include $89,568 to fund deferred project DASA 12.D9.10-11. This one-time study is needed to aid the AMP in quantifying a desired future condition for sediment resources. This work could be funded by reducing the DASA 12.D5.10 cooperative agreement by $89,568 for one year or $45,000 over two years. (line 249)
c. Add $75,000 in FY11 and FY12 to Recreation Values (line 132), to initiate recreation surveys of Glen Canyon anglers and day use rafters.
d. Change the funding to $50,000 in line 139 in FY11 and FY12 to develop "change case" analyses for future hydrograph proposals.
e. Fund POAHG (line 7) in FY 11 at $56,184 and FY12 at $57,870.
f. Add $ *(unspecified amount)* to the Experimental Fund (line 42).
g. Add $20,000 to line 165 in FY 11 and FY12 (Admin. support).

Bureau of Reclamation Budget – Glen Knowles

Please see the attached memorandum from Glen Knowles dated July 27, 2010, which was originally sent to the AWMG on July 27, 2010.

GCMRC Budget – John Hamill

Please see the attached memorandum from John Hamill dated July 27, 2010, which was originally sent to the AWMG on July 27, 2010.

Also, please see the attached memorandum from John Hamill dated August 6, 2010, which includes language and justification of several proposed modifications to the draft workplan.

IN REPLY REFER TO:

United States Department of the Interior

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BUREAU OF RECLAMATION
Upper Colorado Regional Office
125 South State Street, Room 6107
Salt Lake City, Utah 84138-1147

July 27, 2010

To: Adaptive Management Work Group

From: Glen Knowles
Chief, Adaptive Management Group, Environmental Resources Division

Subject: DRAFT Fiscal Year 2011-12 Glen Canyon Dam Adaptive Management Program Biennial Work Plan, Budget, and Hydrograph (BWP)

In a recent memo, John Hamill provided you information on the Draft Fiscal Year (FY) 2011-12 Glen Canyon Dam Adaptive Management Program (GCDAMP) Biennial Work Plan, Budget, and Hydrograph (BWP), and provided the BWP as an attachment, as well as recommendations from the Grand Canyon Monitoring and Research Center (GCMRC). We also wish to provide you with our comments on the BWP and on recommendations to the AMWG from the TWG on its budget recommendation.

The primary issue identified in Reclamation's side of the budget at the June 29-30, 2010, Technical Work Group meeting concerned Canyon Treatment Plan and Implementation (line item 50 in BWP Appendix E-1). As you know, this project involves Reclamation compliance with Section 106 of the National Historic Preservation Act, and specifically with treatment of archaeological sites in Glen and Grand Canyon. Because of recent concerns raised by the GCDAMP Tribes over the implementation of this project, no agreement has been reached on implementation of this project in FY 2010 or 2011. More recently, Mike Berry, our regional archaeologist, retired. Considering this, we propose to reprogram $300,000 from this project in FY 2011 into other areas of the BWP to meet important upcoming needs. Because we have been directed by the Secretary of the Interior's Office to begin the Long Term Experimental and Management Plan Environmental Impact Statement (LTEMP EIS) process in FY 2011, we have reallocated $300,000 for Compliance Documents (line item 39 in BWP Appendix E-1) for FY 2011 to meet this need. TWG objected to this proposal, and recommended fully funding the Canyon Treatment Plan and Implementation with this motion: "Fund $505,838 for the treatment plan (line 50) in FY11 unless Reclamation can maintain necessary compliance with $205,838 in FY11, as demonstrated to the Adaptive Management Work Group (AMWG)."

We are now working to hire a replacement regional archaeologist, and have begun discussions with representatives from the State Historic Preservation Office, Tribes, National Park Service, and other relevant agencies to put in place a process to come to consensus between the agencies and tribes on how best to move forward with our Section 106 compliance. We realize that our efforts may not fully satisfy all of these entities, but unfortunately we must begin to rebuild this process before we can proceed further. We will meet soon with the Programmatic

Agreement Group to begin this important work. In the interim, we continue to forecast that fully funding the Canyon Treatment Plan at past levels ($505,838 in FY 2011) will not be necessary in FY 2011 because of the need to regroup with and rebuild our program for Section 106 compliance, and recommend that these funds be reallocated to begin to address the LTEMP EIS. In FY 2012, we recommend returning to prior funding levels for the Canyon Treatment Plan ($508,305).

We also want to bring to your attention that $77,602 has been identified in FY 2010 as carryover funds in Reclamation's side of the budget. These are monies that were to be used as part of funding for mainstem nonnative control, but due to tribal concerns for the taking of life, these funds were unexpended and returned to Reclamation. We recommend that these funds be moved to Compliance Documents (line item 39) for use in the LTEMP EIS process. We anticipate the cost of the LTEMP EIS in FY2012 will exceed this amount (including the cost share using Reclamation appropriated funds). Once the cost of the LTEMP EIS is better understood Reclamation will seek additional hydropower revenues for that purpose.

We look forward to your input into the BWP process at the upcoming AMWG meeting.

/s/ Glen W. Knowles

cc: Secretary's Designee

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July 27, 2010

MEMORANDUM

To: Adaptive Management Work Group

From: John Hamill, Chief, Grand Canyon Monitoring and Research Center, Southwest Biological Science Center, US Geological Survey, Flagstaff, Arizona

Subject: DRAFT Fiscal Year 2011-12 Glen Canyon Dam Adaptive Management Program Biennial Work Plan, Budget, and Hydrograph (BWP)

Attached is the subject BWP for your consideration (Attachment 1). The Technical Work Group (TWG) and Reclamation comments on the attached BWP will be provided separately. GCMRC's proposed BWP addresses several recommendations from Department of the Interior (DOI) and the Adaptive Management Work Group (AMWG) to provide additional funding emphasis to the following projects:

- Nonnative fish control (shown in Reclamations portion of the BWP).
- Long Term Experimental and Management Plan EIS development (shown in Reclamations portion of the BWP).
- Increased aquatic food base, sediment, rainbow trout, and Glen Canyon recreation experience monitoring to support the evaluation of the proposed High Flow Experiment Protocol
- A new study to evaluate rainbow trout use of the Paria River to Badger Rapid reach (the reach immediately below Lee's Ferry)
- HBC monitoring and translocation above Chute Falls.
- Hydropower economic analyses by Western Area Power Administration with independent technical oversight by GCMRC.

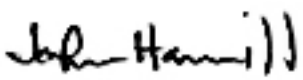
GCMRC assumed several changes in Reclamation's portion of the budget to accommodate the new projects (Attachment 2). In addition, to achieve a balanced budget, a number of projects were scaled back or deferred to accommodate these projects (Attachment 2). Proposed expenditures from the Experimental Fund are detailed in Attachment 4.

On June 29-30, 2010, the TWG met to review the BWP. A summary of the TWG's recommended changes and our response are provided in Attachment 5. Attachment 6 identifies several projects that GCMRC would recommend for funding contingent on the availability of surplus funds in FY 11 and 12.

On July 15, GCMRC met with representatives of the Hopi, Hualapai, Southern Paiute and Zuni tribes to review the draft BWP. The major comments we received from the tribes and our response to those comments are provided in Attachment 7. We request that AMWG consider our response and recommendations as it develops its recommendation on the BWP to the Secretary.

In the last two years, a flat budget along with an increased emphasis on funding for management and compliance actions has greatly increased competition for funding in the Adaptive Management Program (AMP). GCMRC is concerned that this shift in emphasis without new revenues will adversely impact resource monitoring and applied research projects that are aimed at assessing the status of key resources and evaluating the effectiveness of management or experimental actions. I believe this has serious implications for the ability of the AMP to "learn by doing" and assess progress towards achieving desired future conditions. GCMRC supports implementation of compliance and management actions, but believes a strategy is needed to seek additional revenues to meet the growing demands for science and management in the AMP. We believe that DOI and the AMWG need to work together to address this issue.

Your participation in this review process is appreciated.



Attachments:

1- TWG/AMWG Review Draft of FY 11-12 BWP
2- Major funding shifts
3- List of deferred projects
4- Summary of expenditures from the Experimental Fund
5- GCMRC response to TWG Comments on the BWP
6- GCMRC Recommended Projects for Funding with Surplus Funds
7- GCMRC Response to Tribal Comments on the BWP

cc: Secretary's Designee

Attachment 2 -- Major funding shifts in the GCMRC FY 11-12 Biennial Work Plan (June 8, 2010 draft)

- LTEMP EIS Support needs $250k FY11 & FY12
    - To be held in reserve by Reclamation
    - Assumes an additional $250K of matching funds from Reclamation
- Nonnative Fish Suppression Contingency Fund needs FY11 $600k, FY12 $300k
    - To be held in reserve by Reclamation
    - To be allocated in accordance with the Nonnative Fish Environmental Assessment
- GCMRC recommends that the following Reclamation funds be redirected for LTEMP EIS & Nonnative Fish Suppression Contingency Fund
    - ½ POAHG funding FY11 $28,092, FY12 $28,935
    - All Compliance Documents funding FY11 $50,584, FY12 $52,101
    - ½ Admin Support for NPS Permitting funding FY11 $60,120, FY12 $61,924
    - All Nonnative Fish Suppression Contingency Plan funding FY11 $144,819, FY12 $50,521
    - Canyon Treatment Plan funding $300k FY11
- TOTAL Redirected Reclamation Budget: FY11 $583,615, FY12 $193,481

Attachment 3. GCMRC FY11 and FY12 Major Deferred or Scaled Back Projects. Dollar amounts shown are the amounts reduced from each project. Projects that were cut to address AMWG/DOI recommendations in response to the May 2010 review are highlighted in grey.

Project Number /Title		Amount Reduce FY11	Amount Reduced FY12	Comments
GOAL 1—Aquatic Food Base				
BIO 1.M1	Aquatic Food Base Monitoring	84,200	84,200	Deferred field sampling except at Diamond Creek and Lees Ferry in FY11-12
GOAL 2—Native Fishes				
BIO 2.M4	Monitoring of Mainstem Fishes	518,427	239,300	Deferred increased mainstem monitoring FY11-12 subject to change based on fish data analyses
BIO 2.R7	Stock Assessment of Grand Canyon Native Fish	48,700	49,000	Decreased analysis of fish data
BIO 2.R13	Remote PIT Tag Reading	84,500	84,500	Defer expansion of PIT tag system
BIO 2.R17	Nonnative Control Plan Science Support	76,900	76,900	Decrease staff support
BIO 2.tbd	Fall Steady Flows Thermal Imaging	86,200	86,200	Deferred
GOAL 6—Riparian and Springs				
BIO 6.M2	Bird Monitoring / Alternating Years with Vegetation Transect Monitoring	-	53,000	Defer bird monitoring FY12
BIO 6.R4	Arthropod Monitoring Research & Development	0	95,400	Proposed by PEP to be implemented in alternating years FY10, FY12
GOAL 7—Quality of Water				
PHY 7.R2	Integrated Flow, Temperature, and Sediment Modeling of the CRE	145,200	145,200	Defer further model R&D
GOAL 9--Recreation				
REC 9.R5	Evaluate Relation between Flows and Recreation Experience	225,000	225,000	Deferred in FY08-12
REC 9.R6	1973 Weeden Campsite Survey Revisited	75,000	75,000	Deferred in FY09-12

Project Number /Title		Amount Reduce FY11	Amount Reduced FY12	Comments
REC 9.R7	Update Regional Recreation Economic Study	250,000	250,000	Deferred in FY08-12
GOAL 10--Power and Economics				
HYD 10. tbd	Phase I - Results of Economic Value Workshop	117,300	117,300	Deferred FY11-12
GOAL 11—Cultural Resources				
CUL 11.R1	Cultural Research & Development towards Core Monitoring, Phase II	45,000	45,000	Reduced scope of work in FY11-12
CUL 11.R3	Geomorphic Model of Archaeological Site Vulnerability	266,100	266,100	Deferred in FY09-12
GOAL 12— Administrative / Management				
DASA 12.D1	Quadrennial Remote Sensing Overflight	83,500	116,500	Decreased savings for overflight FY11-12
DASA 12.D1	Hyperspectral Overflight for Vegetation Mapping	95,200	95,200	Deferred FY10-12
DASA 12.D3	Library Operations / Scanning Support	66,200	66,700	Decreased to 1/2 time position,
DASA 12.D9	Integrated Image Analysis and Change Detection	89,600	89,600	Deferred 1984 Sandbar Image Analysis FY10-12
PLAN 12.P1	Support and Enhancement of Ecosystem Modeling Efforts	143,000	143,000	Defer model expansion, publication of results & MATA workshop FY11-12
PLAN 12.P5	NEW Desired Future Conditions Facilitation & Decision Support	60,500	60,500	Deferred FY11-12
ADM 12.A4 (B)	Science Advisors Support	50,000	50,000	Reduce services FY11-12
ADM 12.A5	GCMRC Component of SBSC Sys Admin Support	72,900	72,900	Defer expanded GCMRC Website development,
TOTAL GCMRC Major Deferred or Scaled Back Projects		**2,683,427**	**2,586,500**	

Attachment 4. Experimental Fund Expenditures and Projected Balance -- FY10 through FY12

Project Number/Title		FY10 Gross Actual Funding from BOR Experimental Fund	Gross FY11 Proposed Funding from BOR Experimental Fund	Gross FY12 Proposed Funding from BOR Experimental Fund	Comments
Beginning Balance at Start of Fiscal Year		-	427,174	286,672	
Contributions to Experimental Fund from Reclamation		493,500	505,838	521,013	
BIO 2.E18.11	NEW Evaluation of Trout Movement, Natal Origins and Alternatives for Controlling Rainbow Trout Populations Near the LCR (PBR)	-	198,631	311,610	FY11 Total project = $437,201; FY12 Total project = $459,061
BIO 1.M1.11	HFE Science Plan Implementation Aquatic Food Base	-	100,000	100,000	$100k per year Goal 1 FY11 & FY12
BIO 4.M2.11	HFE Science Plan Implementation Monitoring Lees Ferry Fish	-	22,709	22,709	$22,709 Goal 4 FY11 & FY12
PHY 8.M2.11	HFE Science Plan Implementation Sediment	-	300,000	300,000	$300k per year Goal 8 FY11 & FY12
REC 9.R4.11	Evaluate Recreation Values and Visitor Experience Quality in the Glen Canyon Reach		25,000	25,000	$25k per year Goal 9 FY11 & FY12
EXP 7	HFE Synthesis of Knowledge (Study 7)	66,326	-	-	
Total Expenditures		**(66,326)**	**(646,340)**	**(759,319)**	
Balance at End of Fiscal Years		**$ 427,174**	**$ 286,672**	**$ 48,366**	

Attachment 5. GCMRC Response to TWG recommendations related to the June 28, 2010 draft the BWP

Reclamation's Portion of the Budget

1. TWG Recommendation: Fund $505,838 for the Treatment plan in FY11, unless Reclamation can maintain necessary compliance with $205,838 in FY11, as demonstrated to AMWG.
   GCMRC Response: In preparing the draft BWP, GCMRC assumed based on conversations with Reclamation, that $300,000 of funding for the treatment plan would be available in FY 11 to help fund DOI AMWG priorities (preparation of an LTEMP EIS, nonnative fish management, etc.). If the TWG's recommendation is adopted, it will create a $300,000 shortfall in the budget that would have to be made up by cutting other projects in the work plan. It is our understanding that Reclamation continues to support using $300,000 of treatment funds in FY 11 for other AMWG priorities and that this will not impact their Section 106 compliance responsibilities.

2. TWG Recommendation: Remove funding for the Non-native Fish Suppression Fund for FY11 ($600k) and use in the Experimental Fund until the Non-native EA process is completed and funds are necessary.
   GCMRC Response: GCMRC recommended depositing $600K in FY 11 and $300K in FY 12 into the Non-native Fish Suppression Contingency Fund to address high priority nonnative fish management needs, the specifics of which will be defined in the ongoing nonnative fish control EA. GCMRC has no objection to the TWG's recommendation. However, we believe the AMWG should clarify the limitations, if any, on use of these funds if they are deposited into the Experimental Fund (i.e., are they available to support nonnative fish management once the EA is complete?).

GCMRC's Portion of the Budget

1. TWG Recommendation: Reduce funding for Aquatic Food Base (AFB) monitoring by $100k in FY11.
   GCMRC response: GCMRC proposed using $100k of experimental funds to increase the frequency of AFB sampling to support the evaluation of the HFE protocol. The funding increase would go towards hiring additional technicians needed to increase sampling frequency from quarterly to monthly and to process the additional samples (sampling would only occur at Lees Ferry and Diamond Creek under both funding levels). Using an identical monthly sampling scheme, the AFB project documented significant changes in AFB at Lees Ferry in response to the March 2008 HFE (reported at January annual reporting meeting, April Saguaro Lake Workshop, and in Rosi-Marshall and others 2010 Open-File report) and these changes provided a clear mechanistic explanation for the strong positive rainbow trout response in Lees Ferry. Analysis of downriver data is forthcoming and may have implications for the native fish community downstream. As such we believe that increased AFB monitoring should be a component of the HFE science plan. We appreciate the TWG's concern that the results of the AFB research project are still in progress and the PEP review is not planned until late FY 11. However, we believe increased AFB sampling is warranted to establish a baseline for evaluating the impacts of HFE's on the AFB and to provide the statistical power needed to detect potential changes in the AFB due to future HFEs.

2. TWG Recommendation: Add $20,000 to the Science Advisors budget in FY11 and FY12, to restore funding. Funding would be taken from Administrative Support.

   GCMRC Response: To implement this recommendation, the level of editorial support for GCMRC publications will need to be reduced by $20,000 (net) in FY 11 and FY 12. This change will delay

the publication of several GCMRC publications planned for FY 11 and 12. GCMRC will make this change if supported by the AMWG.

Attachment 6. GCMRC Recommended Contingency Projects to be Funded Subject to the Availability of Surplus Discretionary Funds (in Priority Order)

Attachment 3 identifies over $2.5M in projects that have been deferred due to funding shortfalls. In addition, at their June 29-30, 2010 meeting, the TWG identified several other projects that were deferred due to lack of funding or TWG support (see TWG motion). The following are GCMRC's recommended contingency projects to be funded subject to the availability of surplus discretionary funds in FY 11 or 12 (in priority order):

1. Restore funding for bird and arthropod monitoring in the riparian zone in FY 11 and 12 ($60K/year) (see attachment 7, item 4 for more details)
2. Restore funding for mainstem fish monitoring in FY 11 if no mechanical removal of nonnatives in the LCR reach occurs $240K)
3. Provide funding for an extirpated species workshop in FY 11($25K)

Attachment 7. GCMRC response to tribal issues related to GCMRC's draft FY2011-12 work plan. These issues were identified at a July 15, 2010 meeting involving the Hopi, Hualapai, Southern Paiute, and Zuni tribes.

1) Several of the tribes remain concerned with any proposed killing of fish in Grand Canyon. Projects that are of particular concern, because they involve the taking of life, include:

- Non native fish control
- Near shore ecology, specifically otolith study (requires sacrificing fish)
- Other projects that may involve sacrificing fish

GCMRC Response: Multiple tribal consultation meetings have occurred with all Tribes involved with the AMP about mechanical removal at the mouth of the LCR, non native control issues in general, and various components of the NSE project. No final decisions have been made on how to address these issues and consultation is continuing to occur with all the AMP tribes on development of Reclamation's environmental assessment for nonnative fish control and on the otolith component of the NSE. GCMRC recognizes that the consultation process needs improvement and we are actively working with other DOI to improve the efficiency and effectiveness of the process. Additional DOI and tribal consultation meetings are being planned to further improve this process and to define alternatives to mechanical removal at the mouth of the LCR that may be more acceptable and less offensive to tribal values. GCMRC is also prepared to meet with tribal representatives on technical aspects of these issues.

2) Zuni has concerns with electrofishing in general and the associated "collateral damage" that may be occurring. Zuni are concerned that fish as well as other animals are negatively affected by electroshocking. They would like to know more about the potential effects of this activity on fish and other aquatic species.

GCMRC Response: GCMRC will compile available information (existing peer-reviewed literature) on the potential effects of electroshocking on fish and other aquatic species. We recognize and acknowledge that this method and every other monitoring method we use has pros and cons, and we struggle to weigh the trade-offs of all the different methods being used to monitor fish in the LCR and mainstem. We welcome input on how to effectively monitor native and non-native fish communities to provide the most reliable data to the Adaptive Management Program on the status and trends of species of concern.

3) Hopi and Zuni are concerned about the overall level of human activity in and around the LCR, both from researchers and recreational visitors. Hopi would prefer that there is no human activity in the LCR, but they realize this is probably not possible, therefore they want to see activity levels reduced to the minimum necessary. They support more emphasis on remote sensing methods, such as the remote PIT tag reader, if it results in less human activity in the LCR.

GCMRC Response: In general, we agree that reducing the level of activity in and around the LCR is a desirable objective for the program, and we are actively exploring options for doing this while maintaining a high-quality monitoring and research program for the AMP. In an initial iteration of the FY2011-12 work plan, we had proposed reducing the intensity of the Chute Falls translocation and associated monitoring work by cutting it back to every other year, but this recommendation was not supported by TWG. We have put considerable effort into developing the PIT tag reader in the LCR in hopes that this will eventually reduce the level of fish handling, and by extension, reduce the need for multiple monitoring trips in the LCR. We are currently exploring the implications of cutting back on LCR monitoring trips, specifically in the fall. The implications of reducing monitoring in the LCR is being studied in conjunction with the ongoing statistical analysis of existing monitoring data relative to level of effort and reliability of population modeling methods, as recommended by the 2009 Fish PEP.

4) The most tribally important biological resources in Grand Canyon, from the perspective of Hopi and several other tribes, are the plants and animals of the riparian corridor, yet studies of those resources have been steadily decreased in the AMP to accommodate more and more HBC/fish studies. Zunis (and other tribes) value springs as sacred places; they would support more monitoring of the springs and associated organisms with culturally appropriate methods.
GCMRC response: Monitoring of birds and arthropods in the riparian zone are elements of GCMRC's draft Core Monitoring Plan which is now being reviewed by the TWG. However, funding for these projects had to be deferred in FY 11 and 12 to provide funding for AMWG and DOI priority project (nonnative management, LTEMP EIS, etc.). We recommend that the AMWG recommend to the Secretary that an additional $60K be provide to support implementation of bird and arthropod monitoring in FY 11 and 12 contingent upon to the availability of any surplus funds that may develop in FY 11/12.

5) More integration of tribal perspectives in the AMP program is needed. Zuni observed that tribal reports on resource monitoring (work supported with funding from Reclamation) are not being forwarded from BOR to GCMRC or shared with TWG. Hualapai would like to see Traditional Ecological Knowledge approaches incorporated into science projects and policy decisions. The tribes want their perspectives to be more directly incorporated into the future treatment plan.
GCMRC response: GCMRC concurs with the recommendation that results of tribal monitoring work should be shared with GCMRC and routinely reviewed by TWG. We appreciate the potential for Traditional Ecological Knowledge (TEK) to provide valuable additional perspectives on resource conditions, but we also believe there needs to be better appreciation by all stakeholders of what TEK is and what it is not, recognizing that there are aspects of TEK that are fundamentally incompatible with western scientific methods. GCMRC has proposed that a tribal perspectives chapter could be included in the next iteration of the State of the Colorado River Ecosystem (SCORE) report, and tribal members have responded favorably to this suggestion. We are also planning to have a workshop this fall to discuss how to better integrate tribal monitoring activities with other cultural monitoring programs in the future. Recently, there have been some preliminary discussions with Reclamation and the tribes about holding the monitoring workshop in conjunction with another workshop that would be sponsored by Reclamation to explore integration of tribal perspectives into the cultural resource treatment plan. GCMRC is willing to host/help facilitate Reclamation's workshop. The tribal representatives who attended the meeting with GCMRC and other DOI agency representatives on July 15 agreed that one or more workshops to discuss the treatment plan between government and tribes are needed.

6) Proposal to add a Native American to the Science Advisors, who can help integrate tribal perspectives into SAs reviews and recommendations.
GCMRC response: GCMRC will discuss with the SA Executive Director options for incorporating additional Native American expertise within the Science Advisors programs, recognizing that funding to the SAs is being reduced to accommodate additional AMP priorities in FY2011-12.

7) Channel Mapping – if channel mapping occurs between RM61 and 87 as proposed, researchers would need to access the left bank between RM 61-65. Access to left bank in this area was a concern for NPS during permitting of the NSE project this year due to the closure of this area to protect the Salt Mine.
GCMRC response: We would like to address and resolve any concerns tribes may have with channel mapping in this area in advance of initiating a permit request from NPS. It is not certain at this time if mapping will occur in this reach as planned, but if it will, GCMRC is willing to consider alternative methods for mapping this part of the river corridor.

United States Department of the Interior
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August 6, 2010

MEMORANDUM

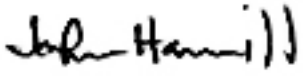
To: Adaptive Management Work Group

From: John Hamill, Chief, Grand Canyon Monitoring and Research Center, Southwest Biological Science Center, US Geological Survey, Flagstaff, Arizona

Subject: Proposed revisions to the June 11, 2010 draft Fiscal Year 2011-12 Glen Canyon Dam Adaptive Management Program Biennial Work Plan, Budget, and Hydrograph (BWP)

Attachment 1 summarizes several recommendations to modify the subject "draft BWP". These revisions are based on recent input from stakeholders, cooperators, and GCMRC's Senior Ecologist, Dr. Carl Walters. Only one of these proposed changes has budget implications. The remaining changes are clarifications to the scope of work for several native fish projects and removal of several lines of text under the Goal 10 project. Attachment 2 shows how the text in the BWP would be modified to reflect these proposed changes.

Based on a recommendation from the TWG chair, we will schedule a conference call with the TWG prior to the AMWG meeting to address any questions or concerns related to these proposed changes. Interested AMWG members are also invited to participate in the call. If you are unable to participate in the conference call, please do not hesitate to contact me with any questions you may have.



Attachments:

1- Summary of proposed changes to the BWP
2- Proposed modification to the BWP text

cc: Secretary's Designee

Attachment 1
USGS/SBSC/GCMRC
Proposed FY 11-12 work plan changes summary
6 August 2010

BIO 2.M1.11-12—(LCR Humpback Chub Monitoring)

1. **Change:** Deleted the following "Goal" (p. 53): Determining the critical physical and biotic factors that may be limiting to, or supportive of, the humpback chub and other native fish populations in Grand Canyon so as to develop strategies that reduce, eliminate or control limiting factors.
   - **Rationale:** GCMRC and cooperator (USFWS) wish to be more conservative, not overstating project objectives. Other objectives remain the same.
   - **Budget implications**: neutral

2. **Change:** In "Need for Project", deleted the following language (p. 53): The PEP did recommend that elements of monitoring conducted in the lower 1,200 m of the LCR—such as sampling protocol, gear types, and analysis—were suitable for continuation.
   - **Rationale:** GCMRC and cooperator (USFWS) agree that full analysis of PEP recommendations are not yet complete, so it is premature to present this conclusion in the work plan.
   - **Budget implications:** neutral

3. **Change:** In "Methods", corrected the sampling location to read (p. 55): Personnel at Salt Camp will make daily measurements of turbidity with the Hach 2100 turbidimeter and water temperature.
   - **Rationale**: Identify correct location of work.
   - **Budget implications**: neutral

4. **Change:** In "Methods", deleted the following activity (p. 55):
   Mainstem Hopi-Salt Site
   At the conclusion of the October LCR effort, two people from the LCR crew proceed down the mainstem by boat to the Hopi-Salt site (~RM 63.5). Thirty hoop nets are set along standardized sites within this reach. Each net is fished for 3 nights and checked daily.
   - **Rationale:** This work will be conducted by the Near Shore Ecology project. Cooperator (USFWS) will instead participate in humpback chub aggregation monitoring.
   - **Budget implications:** neutral

5. **Change:** In "Products/Reports" (p. 56): Clarified that reporting will be annual, not final.
   - **Rationale**: More accurate description of product, as it is produced annually.
   - **Budget implications:** neutral

BIO 2.M3.11-12 (Humpback Chub Translocation and Monitoring Above Chute Falls)

1. **Change:** In "Project Goals" (p. 58, also p. 60): Clarified that the area of work is "the area known as Chute Falls" because the work area also includes Atomizer Falls, a location that is downstream of, and includes, Chute Falls.
   - **Rationale:** Work area has not changed, but describing as the area known as Chute Falls is a general description that includes all historic work locations. This description of the geographic work area is applied elsewhere in the work plan, but does not affect the historic and current work areas.
   - **Budget implications:** neutral

2. **Change:** In "Logistics" (p. 60): noted that follow up monitoring of translocations is conducted the following summer, not the following fall.
   - **Rationale:** More accurate description of when the work is conducted.
   - **Budget implications**: neutral

3. **Change:** In "Products/Reports" (p. 61): Clarified that reporting will be annual, not final.
   - **Rationale**: More accurate description of product, as it is produced annually.
   - **Budget implications**: neutral

BIO 2.M4.11-12 (Mainstem Fish Monitoring)

1. **Change:** In "Methods and Tasks" (p. 65): Changed the schedule of mainstem monitoring trips to the following:
   - FY 2011: Conduct two spring mainstem electroshocking trips to monitor native and nonnative fishes. Delete the two fall trips, one to sample humpback chub aggregation locations and one to use multiple gear types to sample native and nonnative fishes. In the current iteration of the work plan, the spring trips are not planned, but the two fall trips are planned.
   - FY 2012: No change. Maintain two spring mainstem trips and two fall mainstem trips (aggregation and multi-gear sampling).
   - **Rationale:** In order provide funding to address AMWG/DOI priorities related to native and nonnative fish research and management, GCMRC reduced the scope of mainstem fish monitoring from 4 trips per year to 2 trips per year in FY 2011. If nonnative fish control were to take the form of mechanical removal in the Little Colorado River reach in 2011 then an estimate of the rainbow trout population in that reach could be obtained. Given that conduct of mechanical removal is far from certain at this time we think it is particularly important to plan for the spring mainstem monitoring. If neither mechanical removal nor spring mainstem monitoring is conducted in 2011 there will be limited data describing the mainstem fish community. Deferring spring mainstem monitoring would result in a significant gap in the long term the spring/summer fish data. Our current assessment is that delivering consistent data on mainstem fish populations in 2011 is a higher priority than conducting the fall aggregation and multi-gear trips in 2011. We have reviewed this proposed change with our Senior Ecologist, Carl Walters, and he supports the proposal to conduct spring mainstem monitoring in 2011 at the expense of the fall aggregation and multi-gear trips.

- **Budget implications**: Approximate $280K is included in the FY 11 budget for fall aggregation and multi-gear trips. Mainstem electrofishing trips required more people and vessels than the aggregation and multi-gear trips and thus are more costly to conduct. An additional $100,000 to $150,000 would be required to implement the proposed change. We are in the process of developing exact figures and will know before the AMWG meeting how much more funding would be required to make the proposed change to the work plan.

  The draft BWP includes $600K in the nonnative fish contingency fund (Project C6) (in June 2010, the TWG recommended this be moved to the Experiment Fund). We recommend that a portion of these funds be used to implement this proposed change. We believe this would be appropriate because the data collected by the mainstem monitoring provides indexes of trends in nonnative fish captures, especially rainbow trout, brown trout, and common carp, as well as native humpback chub (downstream populations), flannelmouth sucker, and bluehead sucker. This information is critical to evaluating the need for nonnative fish control.

HYD 10.R.2. 11-12 – Evaluate the suitability of the GTMax Model for Modeling Economic Implications of Power Generation under current and future Dam Operations and conduct Initial Analyses

1. **Change:** In "Need for Project" (p. 154): Deleted the following text: "The existing power contracts for GCD expire in 2024. This creates the possibility that when new contracts are negotiated for post-2024, it would be possible (and desirable) for WAPA to seek contract modifications that take into account the power generation impacts of any modification in GCD operations. The opportunity for contract adaptation should be factored into the economic assessment of the economic costs of changes in GCD operations for the period after 2024."
   - **Rationale:** The recommendation to take into account proposed contract modifications when projecting hydropower costs into the future is not necessary for implementing the project as currently proposed in this work plan.
   - **Budget implications:** neutral

Attachment 2
USGS/SBSC/GCMRC
Specific language changes to FY 11-12 BWP
6 August 2010

GCDAMP Goal 10—Maintain power production capacity and energy generation, and increase where feasible and advisable, within the framework of the Adaptive Management ecosystem goals.

HYD 10.R2.11–12—Evaluate the Suitability of the GTMax Model for Modeling Economic Implications of Power Generation under Current and Future Dam Operations and Conduct Initial Analyses

Start Date
October 2010

End Date
October 2012

Principal Investigators
Western Area Power Administration staff and cooperators will work with GCMRC staff and cooperators to complete this project

Geographic Scope
The geographic extent of the western electrical grid

Project Goals

The immediate primary goal of this project is to objectively evaluate the suitability of Western Area Power Administration (WAPA)'s GTMax model for assessing how changes in GCD operations affects hydropower economics within the context of the Nation's western power grid. The longer term goal is to use this model (or if necessary, another more suitable model) to monitor, do economic forecasting of, and conduct post hoc analyses of, the economic implications of changing dam operations, in terms of hydropower production costs. This project specifically focuses on conducting a thorough evaluation of the suitability of the GTMax model for performing the kinds of economic analyses recommended by the independent panel at the December 2009 socioeconomic workshop.

Need for Project

WAPA has recently offered to conduct future economic analyses for the Adaptive Management Program on the economic implications of altering hydropower operations using its existing GTMax model. They have offered to do this using a fully transparent, peer reviewed process at no additional cost to the AMP. This generous offer is fraught with a number of uncertainties, however, including the degree to which the model has been previously independently peer reviewed and its suitability for assessing economic costs and benefits within the larger context of the Nation's western electrical grid. The western electrical grid, which is overseen by the Western Energy Coordinating Council and is therefore hereafter referred to as the WECC, defines the economic context in which hydropower values at Glen Canyon Dam need to be evaluated.

The GTMax model was originally developed by Argonne National Laboratories at the request of WAPA for modeling optimal operational scenarios to maximize power generation and minimize costs under changing hydroelectric demands or environmental conditions that affect power generation in the Colorado River Storage Project (CRSP) system. The model has never been explicitly or systematically evaluated as tool for conducting economic assessments for the GCDAMP within the larger context of the Nation's western electrical grid. One recommendation from the December 2009 panel was to conduct a thorough, fully transparent evaluation of the GTMax model in terms of its suitability for use in this larger economic context. The following project description reflects the recommendations of the independent panel at the December 2009 workshop:

The main effect of any future changes in the operation of GCD will most likely be a change in the timing of hydropower generation during the course of the day, the week and the year, rather than any change in the total Kwh generated at GCD over the course of the year. Because electric power has a different economic value at different times of the day, the week, and the year, this can translate into an economic cost. To assess the economic cost it is necessary to look at the real economic value of the power generated at GCD rather than the contract prices at which much of the power is sold. Also the GCD contract prices may involve economic transfers and therefore understate the economic value of this resource.

GCD and the Colorado River Storage Project (CRSP) system are embedded in the larger western power grid (the WECC). Similarly, the utilities to which CRSP sells power are embedded in the WECC. Therefore, in principle, the market by reference to which the economic value of GCD power is determined is not the CRSP system but the WECC. At any point in time, it is the marginal price of electricity in the WECC that determines the economic value of power generated at GCD.

The capital costs of existing power plants, whether in CRSP or the WECC generally, do not constitute a net economic cost to society of changes in operations. They are sunk costs, and they do not count as an economic cost of the existing power plants' operations. As a general statement, there currently exists excess capacity in the WECC. But, to the extent that, at some point in the future, reductions in power generation at GCD require an increment in generating capacity somewhere in the WECC system, the marginal cost of this extra capacity does count as a real economic cost. Again, it is not necessarily the cost of additional capacity in CRSP that matters; it is the cost of additional capacity anywhere in the WECC system to which WAPA and/or WAPA contractors have access. Moreover, such costs would be determined by the capital cost associated with the cheapest alternative source of additional capacity, which could be based on non-fossil fuel or could take the form of investments in the promotion of energy conservation (a.k.a., "negawatts"). The point is that these costs need to be considered within the larger economic framework of the WECC.

~~The existing power contracts for GCD expire in 2024. This creates the possibility that, when new contracts are negotiated for post-2024, it would be possible (and desirable) for WAPA to seek contract~~

~~modifications that take into account the power generation impacts of any modification in GCD operations. The opportunity for contract adaptation should be factored into the economic assessment of the economic costs of changes in GCD operations for the period after 2024.~~

Given the alternatives, an analysis of the existing GTMax model used by WAPA to optimize the operation of the integrated CRSP system of generation resources appears to offer the most practical and expedient option for determining if all consequences of changed operations can be managed within the WAPA marketing area, or if electrical (and thus economic) "spill-over" effects will alter generation patterns, market prices or transmission bottlenecks elsewhere in the WECC system. If the effects of changed operations at Glen Canyon can be managed by WAPA without economically significant changes in the rest of the western U.S., then the economic consequences of such operations will be limited to WAPA's customers, and future modeling efforts can also be limited in scope. However, at this point there is no way to know if such changes will spill over into the rest of the WECC system beyond WAPA without actually checking this by using a model of the WAPA system and checking changes at flowgates where WAPA interconnects with the rest of the WECC.

GCDAMP Goal 2—Maintain or attain viable populations of existing native fish, remove jeopardy from humpback chub and razorback sucker, and prevent adverse modification to their critical habitat.

BIO 2.R1.10—Little Colorado River Humpback Chub Monitoring Lower 13.6 km (Population Estimates)

BIO 2.R2.10—Little Colorado River Humpback Chub Monitoring Lower 1,200 m

BIO 2.M1.11, 12—Little Colorado River Humpback Chub Monitoring

Start Date

2011

End Date

Ongoing

Principal Investigators

D.R. Van Haverbeke, U.S. Fish and Wildlife Service and W. Stewart, Arizona Game and Fish Department

Geographic Scope

Little Colorado River up to 13.6 km upstream from the confluence with the Colorado River

Project Goals

This project seeks to continue monitoring of humpback chub *Gila cypha* in their primary spawning tributary in Grand Canyon, the Little Colorado River (LCR) using five monitoring trips in FY2011. If a review of the data confirms the recommendation of the 2009 Protocol Evaluation Panel for Grand Canyon fishes (PEP) to make protocol changes, a modified plan will be developed for Fall 2011 or Spring 2012 sampling with the continued goal of implementing an ongoing core monitoring of humpback chub in the LCR.

The specific objectives this project addresses include:

Providing an annual assessment of the humpback chub population in the LCR by collecting mark-recapture data and making closed population estimates of humpback chub in the lower 13.6 km of the LCR.

Collecting and reporting biological data for native and nonnative fishes including recording PIT tag numbers in tagged fish, length-frequency data, community composition, sexual condition and characteristics of fish (gender, ripeness, tuberculate, etc.), and frequency of external parasites (primarily *Lernaea cyprinacea*).

Collecting other pertinent information related to physical parameters of the LCR, especially temperature and turbidity~~, and~~

~~Determining the critical physical and biotic factors that may be limiting to, or supportive of, the humpback chub and other native fish populations in Grand Canyon so as to develop strategies that reduce, eliminate, or control limiting factors~~

Need for Project

The endangered status of humpback chub makes the species a resource of concern for the GCDAMP and natural resource managers. The data collected by this project has been essential to modeling the Grand Canyon population of humpback chub (Coggins and Walters, 2009). Monitoring of the Grand Canyon humpback chub population is also critical to meeting the important, ongoing need for status and trends information for this endangered fish. Because most humpback chub in Grand Canyon are found either in or near the LCR (Paukert and others, 2006), monitoring in the LCR is an efficient way to gather data on the population.

Since 2000, the research efforts of this project have included an annual spring and fall mark-recapture effort and annual monitoring in the lower 1,200 m of the LCR. The 2009 PEP noted that the spring sampling of humpback chub in the LCR is one of the most important fish monitoring projects that the GCMRC and its cooperators conduct on behalf of the GCDAMP and recommended that it continue in the future. While the PEP recognized that much good humpback chub information had been generated by the fall monitoring effort and monitoring the lower 1,200 m during the spring, the PEP did not identify these projects as critical to a core-monitoring effort. The PEP did observe, however, that these two projects might have other benefits, including occasional increased tagging efforts, in the future. ~~The PEP did recommend that elements of monitoring conducted in the lower 1,200 m of the LCR—such as sampling protocol, gear types, and analysis—were suitable for continuation.~~ The PEP recommended a thorough analysis of impacts of sampling protocol changes on Age-Structured Mark-Recapture (ASMR) model output and of our ability to assess accurately the status and trends of the entire LCR fish community. That analysis is ongoing, and is expected to be completed in late 2010.

The established program of five LCR monitoring trips will be continued in FY2011 to allow sufficient time to determine the ramifications of possible protocol changes on monitoring and modeling. The evaluation of proposed changes is being conducted in FY2010, and a meeting of the cooperating agencies and interested GCDAMP parties will be convened after completion of the data analyses to discuss results. This meeting will help identify the specific monitoring objectives, techniques, and analyses to support core monitoring.

Strategic Science Questions

Primary SSQ addressed:

SSQ 1-1. To what extent are adult populations of native fish controlled by production of young fish from tributaries, spawning and incubation in the mainstem, survival of young-of-year (YoY) and juvenile stages in the mainstem, or by changes in growth and maturation in the adult population as influenced by mainstem conditions?

Additional science question addressed by these projects:

SSQ 1-2. Does a decrease in the abundance of rainbow trout and other cold- and warm water nonnatives in Marble and eastern Grand Canyons result in an improvement in the recruitment rate of juvenile humpback chub to the adult population?

GCDAMP Science Advisors (SAs) have summarized the SSQs with the following question (the projects outlined here specifically address this question, especially their evaluation of annual spawning success):

SA 1. What are the most limiting factors to successful humpback chub adult recruitment in the mainstem: spawning success, predation on YoY and juveniles, habitat (water, temperature), pathogens, adult maturation, food availability, competition?

Information Needs Addressed

Primary information needs addressed:

CMIN 2.1.2. Determine and track recruitment (identify life stage), abundance, and distribution of humpback chub in the LCR.

Methods and Tasks

Annual Spring Humpback Chub Abundance Assessments in the Lower 13.6 km of the Little Colorado River (FY 2011)

In the spring, two mark-recapture trips (10 days) are conducted annually in the lower 13.6 km of the LCR to generate a closed population estimate of humpback chub (>100 mm total length). This program has been ongoing since 2000 using passive integrated transponder (PIT) tags. Additionally, this sampling effort provides much of the data for the ASMR stock assessment model, an open population model.

During each LCR trip, three camps are used: Salt Canyon, Coyote Canyon, and Boulders Camps. Unbaited hoop nets (0.5–0.6 m diameter, 1.0-m length, 6-mm mesh, single 10-cm throat) are set from shorelines to capture and PIT tag humpback chub as part of a mark-recapture program. Each camp is responsible for fishing hoop nets throughout an approximately 5-km reach from 0 to 13.6 km. Sixty hoop nets spaced 80 to 150 m apart are fished throughout the reach. Each hoop net is positioned in habitat suspected to yield good catches of humpback chub. Nets are repositioned as needed. On average, each hoop net is checked once every 24 hours. Each reach is divided into three sub-reaches and nets are fished for three net checks (3 days) in each sub-reach. In addition to fishing hoop nets as detailed above, personnel are responsible for the tasks including:

Measuring and recording the fork and total lengths, sex, sexual condition, and sexual characteristics for all captured native fish (except speckled dace)

Measuring and recording the total length, sex, and sexual condition of all other captured fish.

Implanting PIT tags in all humpback chub ≥100 mm total length and all other native fish ≥150 mm total length and fin clipping tagged fish recaptured on the same marking effort. In order to reduce PIT tagging, but still obtain population information, bluehead suckers will only be tagged during the first (April) trip), and

• Recording the location, shoreline habitat, hydraulic unit, set and pull time, and map locations for each hoop net set.

Personnel at ~~Boulders~~ Salt Camp will make daily measurements of turbidity with the Hach 2100 turbidimeter and water temperature.

Annual Fall Humpback Chub Abundance Assessments in the Lower 13.6 km of the Little Colorado River (FY2011)

The fall sampling primarily provides an estimate of the abundance of subadult fish rearing in the LCR. These data support the ASMR model to assess humpback chub population numbers. Two trips are used to collect the mark-recapture data used for closed population estimates in the fall (September and October). Sampling uses hoop nets evenly distributed throughout the lower 13.6 km of the LCR as in the spring sampling.

~~Mainstem Hopi-Salt Site~~

~~At the conclusion of the October LCR effort, two people from the LCR crew proceed down the mainstem by boat to the Hopi-Salt site (~ RM 63.5). Thirty hoop nets are set along standardized sites within this reach. Each net is fished for 3 nights and checked daily.~~

Annual Spring Native and Nonnative Fishes Relative Abundance Assessment in the Lower 1,200 m of the Little Colorado River (FY2011)

This program, established by the Arizona Game and Fish Department (AZGFD) in 1987, has operated continuously, except from 2000 to 2001 (Arizona Game and Fish Department, unpub. data, 2010). The program produces annual assessments of the relative abundance (that is, catch-per-unit effort) of all size classes of humpback chub, flannelmouth suckers, bluehead suckers, speckled dace, and a host of nonnative fish in the lower 1,200 m of the LCR. Data are collected during a 30- to 40-day period in spring (April and May) using hoop nets set in standardized locations throughout the reach. Results of this monitoring provide an independent comparison to the mark-recapture assessments. The statistical power of this portion of the monitoring program has not yet been assessed, but statistically significant differences in relative abundance are apparent in current data.

Annual Spring Humpback Chub Monitoring in the Lower 13.6 km of the Little Colorado River (FY2012)

Analysis of all the historical data of humpback chub monitoring generated by the three projects listed above will be conducted in FY2010 and early FY2011. The three cooperating agencies (USGS, USFWS, and AZGFD) will provide their data and participate in the analysis process. In particular, the analyses will focus on how closed population efforts and the ASMR (open) population estimate performs

using only subsets of tagging data. Specific sampling methods, gears, and analyses for core monitoring beginning in FY2012 will be developed in FY2011 for GCDAMP consideration.

Links/Relationships to Other Projects

Improvement of the status of the humpback chub will be necessary for the species to be considered for downlisting or delisting. The most recent iteration of the recovery goals for the humpback chub (initiated in 2007) required a minimum of 2,100 adults in Grand Canyon, a steady or increasing trend in the population, and control of environmental threats, among other requirements. One element of humpback chub conservation in Grand Canyon could be a Glen Canyon Dam flow-release regimen that supports this species. These flows can be expected to affect many elements of the canyon resources, including sediment, cultural resources, and recreation. Therefore, releases that benefit one resource like the humpback chub must also be consistent with conservation of other resources. Conservation of LCR resources, especially water, and protection from catastrophic events is important not only to protecting the spawning humpback chub population in the LCR, but also to protecting other organisms found there.

Logistics

FY2011

Two spring mark-recapture trips, and two fall mark-recapture trips subject to outcome of PEP analyses and cooperator/stakeholder input, helicopter support.

Lower 1,200 m: One spring trip, subject to outcome of PEP analyses and cooperator/stakeholder input, helicopter support.

FY2012

Two spring mark-recapture trips, and two fall mark-recapture trips subject to outcome of PEP analyses and cooperator/stakeholder input, helicopter support.

Lower 1,200 m: One spring trip, subject to outcome of PEP analyses and cooperator/stakeholder input, helicopter support.

Products/Reports

The USFWS will deliver two trip reports annually within 60 days of completion of the fieldwork, including data collected, to the GCMRC. The trip reports will be summarized and analyzed in a final report delivered to the GCMRC in January of the following year. These reports address the lower ~~15~~ 13.6-km monitoring and the monitoring ~~above~~ in the Chute Falls area (see project description for BIO 2.M3.11–12)

~~An annual~~ A final report will be prepared by USFWS in cooperation with GCMRC, in USGS Open File Report format following USGS Fundamental Science Practices.

The AZGFD will deliver one annual report on the results of their monitoring of the lower 1,200 m of the LCR to the GCMRC.

An annual report will be prepared by AZGFD in cooperation with GCMRC, in USGS Open File Report format following USGS Fundamental Science Practices.

A core-monitoring report, summarizing core-monitoring efforts, 2009 PEP recommendations, and results of analyses recommended by the 2009 PEP will be completed in FY2011.

Budget

FY2011 $576,135

FY2012 $604,940

BIO 2.M3.11–12—Humpback Chub Translocation and Monitoring Above Chute Falls

Start Date

2003

End Date

Ongoing

Principal Investigator

D.R. Van Haverbeke, U.S. Fish and Wildlife Service

Geographic Scope

The Little Colorado River (LCR) above Chute Falls

Project Goals

The goals of this project in FY2011–12 include:

Determining the critical physical and biotic factors that may be limiting to, or supportive of, humpback chub and other native fish populations in Grand Canyon to identify strategies to reduce, eliminate, or control limiting factors.

Identifying the habitat characteristics that are most important to all life stages of humpback chub to identify methods that maintain, and possibly replicate, suitable habitats.

Reducing predation risk to humpback chub from nonnative species that may ascend the LCR from the mainstem Colorado River.

Allowing opportunity for translocated humpback chub to grow and survive in additional habitat.

Specific objectives of the project includes:

Translocating small humpback chub from near the confluence with the Colorado River to ~~above~~ the area known as Chute Falls.

Obtaining population estimates for humpback chub ≥100 mm and ≥200 mm above Chute Falls.

Coordinating the production of a document that establishes a written framework for translocation, including overall goals, specific objectives, and objective measures of success. This framework should be consistent with the Genetics Management Plan, when it becomes available.

Need for Project

Translocation is a management action designed to help conserve humpback chub. In 2003, as a conservation measure to the Biological Opinion on the 2002 experimental flows and nonnative fish removal proposal, the U.S. Fish and Wildlife Service (USFWS) began a translocation program funded by Reclamation for humpback chub above Chute Falls in the LCR. Chute Falls is a series of waterfalls approximately 16 km upstream on the LCR above the confluence with the Colorado River. Despite evidence that fish do move above Chute Falls, the potential exists for genetic drift, or a change in the genetic makeup of the population when compared to the main humpback chub population farther downstream on the LCR, owing to the "founder effect," a situation managers wish to avoid. Genetic drift was considered in the *Draft Humpback Chub Genetics Management Plan* (U.S. Fish and Wildlife Service, unpub. data, 2008).

Translocating humpback chub above Chute Falls was conducted six times between 2003 and 2010. Because the LCR above Chute Falls contains fewer nonnative fish than the lower portion of the LCR, translocation above Chute Falls is thought to allow humpback chub opportunity for better survival than in the lower LCR. Translocation also increases the demographic range for the species by nearly 5 km. Researchers have documented movement of humpback chub from below Chute Falls to above the barrier, providing new information about the movement capabilities of humpback chub. Monitoring above Chute Falls is important for evaluating the effectiveness of translocating humpback chub.

The 2009 PEP report clearly stated that management objectives for Chute Falls and other translocations should be specified in measurable terms to guide monitoring and reporting. The panel could not comment on current monitoring activities with available information. The need for additional translocations and the timing of those efforts should be compared to recommendations made in the *Final Humpback Chub Genetics Management Plan*, which is being prepared by the USFWS, when it is available. In addition, translocations to Shinumo Creek and Havasu Creek, which are planned for the near future, should be incorporated into translocation planning efforts. The GCMRC will work with USFWS and other cooperators to develop a translocation framework to help guide future translocation efforts.

Strategic Science Questions

The Glen Canyon Dam Adaptive Management Program Science Advisors have summarized strategic science questions related to humpback chub with the following question, which this project specifically addresses, especially annual spawning success:

SA 1. What are the most limiting factors to successful humpback chub adult recruitment in the mainstem: spawning success, predation on YoY and juveniles, habitat (water, temperature), pathogens, adult maturation, food availability, competition?

Information Needs Addressed

Primary information need addressed:

CMIN 2.1.2. Determine and track recruitment (identify life stage), abundance, and distribution of humpback chub in the LCR.

Methods and Tasks

Two mark-capture trips will be conducted in the summer ~~above~~ the area known as Chute Falls in the LCR to monitor translocated fish and potential offspring and to generate a closed population estimate for humpback chub. These trips occur during late May or early June when the LCR discharge is at base flow. In addition to the annual population estimate, these data can be incorporated into ASMR and other open population models. All fish ≥ 100mm TL are implanted with PIT tags.

A camp has been established on Navajo lands 16.2 km above the LCR and Colorado River confluence, which is used to temporarily house project staff during the field work. The camp has an established helicopter pad and offers protection from most floods.

Baited hoop nets (0.5–0.6-m diameter, 1.0-m length, 6-mm mesh, single 10-cm throat) are fished in the LCR corridor above ~~Chute Falls~~ Lower Atomizer Falls (13.6 km), which is the upstream extent of the current downstream LCR monitoring. The overall reach is divided into two subreaches and each subreach fished for 3 days. Approximately 50 hoop nets are fished throughout this upper reach from 13.6 to 18.0 km, with an average spacing between nets of approximately 100 to 150 m. Hoop nets are positioned in favorable habitats for catching humpback chub and repositioned as needed. On average, each hoop net is checked once every 24 hours. Each net is baited near its cod end by attaching a nylon mesh bag (30- by 30-cm, 6-mm mesh) containing AquaMax™ Grower 600 for Carnivorous Species (Purina Mills Inc., Brentwood, MO). All captured humpback chub are checked for colored elastomer tags and PIT tags. Individuals not previously PIT tagged, but of sufficient size to tag without injury, are held overnight offshore in an aerated tank, or in the LCR in a secured holding pen to allow time for digestion of any consumed bait, and thereafter tagged and released.

In addition to fishing baited hoop nets and PIT-tagging humpback chub as detailed above, staff will be responsible for:

Measuring and recording the fork and total lengths, gender, spawning condition, and sexual characteristics for all captured fish (except speckled dace).

Recording the location, shoreline habitat, hydraulic unit, set and pull time, and map locations for each hoop net set, and

Measuring daily turbidity (using the Hach 2100 turbidimeter), water temperature, and CO_2 (using titration)

Links/Relationships to Other Projects

Projects such as this one that investigate potential strategies for expanding the Grand Canyon humpback chub population support the basin wide goal of conserving humpback chub with the long-term goal of downlisting and delisting the species from the Federal endangered species list. Chute Falls translocations and monitoring inform additional translocations to other tributaries, currently expected to be Shinumo Creek, and perhaps Havasu Creek.

Logistics

Both the translocation trip and the monitoring trip for this effort require helicopter support. Translocation is anticipated in the summer with follow-up monitoring in the ~~fall~~ following summer.

Products/Reports

The USFWS will deliver two trip reports annually within 60 days of completion of the fieldwork, including data collected, to the GCMRC. The trip reports will be summarized and analyzed in ~~a final~~ an annual report delivered to the GCMRC in January of the following year. These reports address the lower ~~15~~- 13.6-km monitoring and the monitoring ~~above~~ in the area known as Chute Falls, including Lower Atomizer Falls and above (see project description for BIO 2.M1.11–12).

An annual report will be prepared by USFWS in cooperation with GCMRC in USGS Open File Report following USGS Fundamental Science Practices.

Budget

FY2011 $131,051

FY2012 $137,602

BIO 2.M4.11–12—Monitoring Mainstem Fish

Start Date

2010

End Date

Ongoing

Principal Investigators

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Geographic Scope

The mainstem Colorado River in Grand Canyon between Lees Ferry and upper Lake Mead

Project Goals

This project is intended to increase knowledge of native and nonnative fish in the Colorado River mainstem. It is also intended to be responsive to the recommendations of the 2009 PEP for Grand Canyon Fishes. The project seeks to advance the following goals:

- Monitor the documented humpback chub aggregations in the mainstem Colorado River
- Continue to monitor native and nonnative fish in the mainstem Colorado River
- Provide presence/absence and distribution information on Colorado River native and nonnative fish

Conduct three monitoring efforts (four trips in total) in years without mechanical removal in the Little Colorado River reach (or other, comparably large control effort) subject to additional funding being made available by Reclamation from the Nonnative fish control contingency fund or other funding source. In years when a large mechanical removal trip is conducted in the Little Colorado River reach then the personnel and equipment will be shifted from the two full mainstem monitoring trips to the mechanical removal effort, collecting intensive monitoring data for that reach. Monitoring is intended to be responsive to advances in data analysis, sampling design, and gear selection. A flexible approach that builds on prior knowledge is needed to develop monitoring of the Colorado River fish population that is responsive to continuing changes in dam operations, climate, local meteorology, species population sizes, and management actions. Primary emphasis is on broad sampling, with a secondary emphasis on developing high statistical confidence in species-specific trends. If this monitoring suggests changes in either native or nonnative populations, future monitoring can be directed at gathering more data on a specific species or location

Provide annual monitoring and timely reporting that allows for annual review of specific sampling design, gear, and data analyses. The cooperating agencies will meet formally at least once a year with interested Grand Canyon Adaptive Management Program (GCDAMP) members to review and potentially modify sampling design, gear, and data analyses. The three lead cooperators— Arizona Game

and Fish Department (AZGFD), U.S. Fish and Wildlife Service (USFWS), and Grand Canyon Monitoring and Research Center (GCMRC)—will assume responsibility, with other cooperators as assigned, for data reporting and analysis

Tasks to address the goals described above will be phased in over the FY2010–12 period and are to be included in analysis of existing fish data recommended by the 2009 PEP.

Need for Project

Native fish populations in Grand Canyon are key resources of concern influencing decisions on both the operation of Glen Canyon Dam and non-flow actions. To inform these decisions, it is imperative that accurate and timely information on the status of fish populations, particularly the endangered humpback chub, be available to managers. A suite of adaptive experimental management actions are being contemplated to better understand the mechanisms controlling the population dynamics of native fish and to identify policies that are consistent with the attainment of management goals. The assessments generated from this project provide a baseline from which to assess the effects of implemented experimental actions. This information is therefore crucial to (1) inform the program as to attainment of identified goals, (2) provide baseline status and trend information to be used as a backdrop to further understand mechanisms controlling native and nonnative fish population dynamics, and (3) evaluate the efficacy of particular management policies in attaining program goals. The results of this project are potentially useful in assessing changes to the Federal Endangered Species Act listing status of humpback chub in Grand Canyon.

Nonnative fish are among the greatest threats to native fish in western North American rivers (Miller, 1961; Minckley and Deacon, 1991; Tyus and Saunders, 2000; Coggins, 2008). Nonnative fish may threaten native fish by direct predation, by competing for available food and other resources, and by habitat modification (Minckley, 1991; Hawkins and Nesler, 1991). Nonnative fish were introduced into Grand Canyon not later than early in the 20th century (Woodbury, 1959; Valdez and Ryel, 1995). While native fish survived these initial introductions at least long enough to be described by early researchers, other system stressors, especially the modification of natural flows as a result of dam installation and operations, appear to have increased the threats to native fish from nonnative fish (Minckley, 1991; Clarkson and Childs, 2000).

The GCDAMP has recognized nonnative fish as a threat that needs to be addressed, proceeding with implementation of a nonnative fish control experiment around the Little Colorado River (LCR) inflow reach from 2003 to 2006. The 2003 to 2006 control project was most successful at removing rainbow trout. This work plan builds on that effort. As the Colorado River mainstem becomes warmer because of climate effects (Seager and others, 2007), the potential for an increased threat from warm water adapted nonnative fish increases (Eaton and Scheller, 1996; Chu and others, 2005; Rahel and Olden, 2008). There is an immediate need to investigate which species pose the greatest threats to natives in Grand Canyon, to understand how those species might be better monitored and controlled, and to test control approaches for efficacy.

In response to identified GCDAMP goals, the 2009 PEP for Grand Canyon Fishes concluded that it is important to conduct mainstem fish monitoring with a variety of sampling designs and gear types. The experts involved with the PEP determined that fine resolution of confidence in species-specific mark-recapture population estimates could only be accomplished with large amounts of personnel time, sampling gear and equipment, and funding that is not currently available. Further, the PEP determined that even if more resources could be employed, fine-scale data collection every year was not warranted and could cause harm to native fish. Therefore, the PEP recommended a broad approach to use multiple

gear types at various times of the year and over a broad geographic range to give scientists and managers the most useful data on an annual basis.

Strategic Science Questions

Primary SSQ addressed:

SSQ 1-1. To what extent are adult populations of native fish controlled by production of young fish from tributaries, spawning and incubation in the mainstem, survival of young-of-year and juvenile stages in the mainstem, or by changes in growth and maturation in the adult population as influenced by mainstem conditions?

SSQ 1-2. Does a decrease in the abundance of rainbow trout and other cold- and warm water nonnatives in Marble and eastern Grand Canyons result in an improvement in the recruitment rate of juvenile humpback chub to the adult population?

Additional SSQs addressed:

SSQ 1-4. Can long-term decreases in abundance of rainbow trout in Marble and eastern Grand Canyons be sustained with a reduced level of effort of mechanical removal or will recolonization from tributaries and from downstream and upstream of the removal reach require that mechanical removal be an ongoing management action? This question also applies to future removal programs targeting other nonnative species.

SSQ 1-8. How can native and nonnative fishes best be monitored while minimizing impacts from capture and handling or sampling?

SSQ 5-6. Do the potential benefits of improved rearing habitat (warmer, more stable, more backwater and vegetated shorelines, more food) outweigh negative impacts due to increases in nonnative fish abundance?

The GCDAMP Science Advisors articulated the following summary science questions addressed by this project:

SA 1. What are the most limiting factors to successful humpback chub adult recruitment in the mainstem: spawning success, predation on young of year and juveniles, habitat (water, temperature), pathogens, adult maturation, food availability, competition?

SA 2. What are the most probably positive and negative impacts of warming the Colorado River on humpback chub adults and juveniles?

Information Needs Addressed

Primary information needs addressed:

CMIN 2.1.2. Determine and track recruitment of all life stages, abundance, and distribution of humpback chub in the Colorado River.

CMIN 2.4.1. Determine and track the abundance and distribution of nonnative predatory fish species in the Colorado River.

CMIN 2.6.1. Determine and track the abundance and distribution of flannelmouth sucker, bluehead sucker, and speckled dace populations in the Colorado River ecosystem.

RIN 2.4.2. Determine if suppression of nonnative predators and competitors increases native fish populations.

RIN 2.4.3. To what degree, which species, and where in the system are exotic fish a detriment to the existence of native fish through predation or competition?

RIN 2.4.4. What are the target population levels, body size, and age structure for nonnative fish in the Colorado River ecosystem that limit their levels to those commensurate with the viability of native fish populations?

Methods and Tasks

The methods described below are intended to be consistent with the 2009 PEP for Grand Canyon Fishes and will be compared to the PEP final analysis report to ensure consistency when that document is available. Annual review may indicate alternative methods are required, especially if expanding humpback chub populations or expanding nonnative fish populations are indicated by the data from this and other trips collected in these and previous years. This approach is intended to sample species and habitats as broadly as possible in order to give managers and scientists diverse information on which to direct this and other projects in future years. If the analyses conducted by GCMRC, USFWS, and AZGFD in 2010 and 2011 indicate that the methods described herein and the recommendations of the 2009 PEP are not warranted, alternative approaches to monitoring will be developed and implemented. All three of the projects described below, mainstem spring electrofishing, humpback chub aggregation monitoring, and mainstem fall monitoring, will be conducted in 2012. Mainstem spring electrofishing is the only project planned for 2011.

Mainstem Spring Electrofishing

Mainstem fish monitoring, including the monitoring below Diamond Creek, has used boat-operated electrofishing to provide information on status and trends of native and nonnative fish in the Colorado River between Lees Ferry and Lake Mead since 2001. Data from these trips supports annual analyses of species catch-rate data, species distribution data, and species length frequency and size data. Electrofishing remains the most important tool for providing an overall assessment of the mainstem fish community. Two electrofishing trips will be conducted at stratified random sites not in immediate proximity to campers. This protocol applies only to years in which a large mechanical removal project (or similar large scale effort) is not conducted. If management agencies determine that a mainstem mechanical removal of nonnative fish in the Little Colorado River reach, or similar effort, is desired, then the personnel and equipment used for mainstem spring electrofishing will be shifted to the mechanical removal project. Mainstem spring electrofishing is included in this work plan because no mechanical removal project has been planned or scheduled at the time of work plan preparation. Mechanical removal would result in intensive fish community sampling in the LCR reach and so could substitute for mainstem spring electrofishing, at least for a limited number of years. If no mechanical removal is conducted then the funding for personnel and equipment will have to be transferred from the Reclamation portion of the GCDAMP budget to pay for these expenses.

Mainstem Fall Humpback Chub Aggregation Monitoring

Several known aggregations of humpback chub (Valdez and Ryel, 1995) will be sampled with a variety of nets by this project. Additional sites selected by a stratified random selection will also be sampled. The primary humpback chub aggregations that will be sampled include 30 Mile, near the confluence of the LCR, and Inner Granite Gorge. The project will also sample at and below the mouth of Shinumo Creek, a tributary to the Colorado River, to investigate whether humpback chub translocated to this tributary have moved into the mainstem. Gear types may include, but are not limited to, the following: hoop nets, trammel nets (when water temperature below 20 deg. C), and seines. Gear selection is dependent on habitats sampled.

This project makes use of trammel nets when water temperatures are below 20 degree C to limit stress on captured fish. Trammell net sets are for 2 hours or less. Because working trammel nets requires use of motor boats, this monitoring will emphasize use of trammel nets in locations determined in advance of the trip, but other gear types may be deployed as time and opportunity is available. Sampling in the LCR reach is not conducted in areas where the nearshore ecology project is working. Data from this monitoring will provide data for the ASMR model for humpback chub.

Mainstem Fall Monitoring

This project will conduct multi-gear monitoring at potential nonnative fish aggregations, especially near humpback chub aggregations, tributary inflow areas and also stratified random sites. Gear types may include, but not be limited to, hoop nets, trammel nets, backpack and oar-powered electroshockers, seines, minnow traps and angling. Gear selection is dependent on habitats sampled. This trip is launched late in September and will be non-motorized.

The primary site selection for this trip will be conducted using a stratified random design. As additional information is gathered regarding nonnative species, this trip may also be focused on areas where nonnative concentrations may be found, such as near the mouth of warm water tributaries. Data from these trips supports annual analyses of species catch rate data; species composition and distribution; species size class composition, and may also support the update of the ASMR model for humpback chub.

Links/Relationships to Other Projects

Understanding the factors influencing the dynamics of the Grand Canyon native fish populations, especially the endangered humpback chub, is important to evaluating the effects of management and conservation activities, especially GCD operations. To determine these factors, a combination of large scale manipulations (for example, experimental removal of nonnative fish or long-term implementation of contrasting flow regimes) and smaller scale process oriented research (for example, assessment of juvenile fish growth rates under various temperature regimes or availability of particular food items) will likely prove most efficient in determining the key mechanisms regulating native fish populations. In each of these endeavors, it is critical that baseline trends in population abundance and recruitment be known. Only with this knowledge is it possible to assess the population level effects of large-scale manipulations. Although it is informative to assess the effects of experimental management on processes thought to be important, like growth or survival at particular life stages, this is not enough to determine the efficacy of particular management actions. Linkages between these processes and ultimate recruitment to populations must be established. Again, these linkages can only be made if baseline trends in population abundance and recruitment are available.

Logistics

The logistical needs for the project are as follows:

Mainstem Fall Humpback Chub Aggregation Monitoring—1 trip in ~~FY2011 and~~ FY2012, September, motorized; GCMRC, USFWS, AZGFD
Mainstem Fall Fish Monitoring—1 trip in ~~FY2011 and~~ FY2012, October, float; GCMRC
Mainstem Spring Electrofishing Monitoring—2 trips in FY 2011 and 2 trips in FY2012, February and March, motorized; AZGFD

Products/Reports

Annual reporting on the catch rates, species encountered, size class distributions, and locations of captures for the fall HBC monitoring will be the responsibility of the agency leading the effort, currently anticipated to be GCMRC in FY2011 and USFWS in FY2012

All fish data will be submitted to GCMRC for inclusion in the fish database. These data are used for other projects, especially the stock assessment project, and to support nonnative fish monitoring

Annual reports will be delivered in USGS Open File Report format

Budget

FY2011 $280,503 (+$100K-$200K—to be determined)

FY2012 $558,449