

**Minutes of Technical Work Group Meeting  
March 17-18, 1998**

**FINAL**

**Presiding:** Robert Winfree, NPS (Chairperson)

**Committee Members Present:**

Clifford Barrett, RW Beck & Assoc.  
Kerry Christensen, Hualapai Nation  
Dave Cohen, Trout Unlimited  
Wayne Cook, UCRC  
Wm. Davis, EcoPlan Assoc./CREDA  
Joe Dishta, Pueblo of Zuni  
Kurt Dongoske, The Hopi Tribe  
Christopher Harris, ADWR  
Norm Henderson, GCNRA  
Amy Heuslein, BIA

Pamela Hyde, American Rivers  
Gene Jencsok, CWCB  
Robert King, UDWR  
Phillip S. Lehr, CRCN  
Carlos Mayo, Southern Paiute Consortium  
Bruce Moore, USBR  
Clayton Palmer, WAPA  
Bill Persons, AGFD  
Andre Potochnik, Grand Canyon River Guides  
John Shields, Wyoming State Engineer's Ofc  
Fred Worthley, CRBC

**Committee Members Absent:**

Mark T. Anderson, USGS  
Alan Downer, Navajo Nation

Owen Gorman, USFWS  
Tom Moody, Grand Canyon Trust

**Alternates Present:**

Julia B. Graf  
Debra Bills, USFWS

**Alternate For:**

Mark T. Anderson, USGS  
Owen Gorman, USFWS

**Other Interested Persons Present:**

Gary Burton, WAPA  
Steve Carothers, SWCA  
Larry Crist, USBR  
L. David Garrett, GCMRC  
Barry Gold, GCMRC  
Allen Haden, NAU  
Tim Hoffnagle, AGFD  
Jeanne Korn, GCMRC  
Dennis Kubly, AGFD  
Kirk LaGory, Argonne National Lab  
Ruth Lambert, GCMRC  
Tom Latousek, American Rivers  
Steven Lloyd, USBR

Lawrence Marquez, BIA  
Margaret Matter, WAPA  
Ted Melis, GCMRC  
Tony Morton, USBR  
Duncan Patten, ASU  
Randy Peterson, USBR  
Roger Pulwarty, NOAA  
Barbara Ralston, GCMRC  
Mary Reece, USBR  
Joe Shannon, NAU  
Larry Stevens, GCMRC  
Rebecca Tsosie, ASU  
Rich Valdez, SWCA  
Mike Yeatts, The Hopi Tribe

**Recorder:** Serena Mankiller, GCMRC

**3/17/98: Convened:** 9:38 a.m. **Adjourned:** 4:25 p.m.

**3/18/98: Convened:** 8:05 a.m. **Adjourned:** 4:10 p.m.

**MEETING OPENING AND ADMINISTRATIVE ITEMS**

**Welcome:** Robert Winfree welcomed committee members and guests.

**Review of Agenda:** The committee reviewed the agenda.

**Attendance Sheet:** Distributed.

**Review of Minutes:** (Attachment 1) Minutes of February 17-18, 1998 were reviewed.

**Recommendation:** TWG members shall submit revisions to the GCMRC Secretary by the end of this meeting.

### **Other Administrative Business**

**Federal Register Notice:** The notice for the April through July 1998 TWG meetings has been forwarded to the Federal Register. The notices are posted on the USBR web site.

**Recommendation:** The Federal Register notice should be posted on the GCMRC AMWG/TWG web site.

**USBR Web Site:** The USBR web site has been up for two weeks. The address is: [www.uc.usbr.gov](http://www.uc.usbr.gov); click on the Adaptive Management category. This is a public page containing official documents from AMWG and TWG.

**Video:** A video of KUAT's production of the 1996 spike flow research "The Desert Speaks" will be shown after the TWG meeting on March 17, 1998.

**Member Representation:** USFWS will be appointing a new TWG member in the near future to replace Owen Gorman. Pamela Hyde will be leaving American Rivers which will need to appoint a new TWG member.

**Ad Hoc Group Submission of Documents:** The Chairperson reminded the TWG that ad hoc groups must meet before submitting informational documents to the full TWG, and not from individual members of the ad hoc groups.

**Glen Canyon Reach Field Trip:** Barry Gold and Norm Henderson will send out information and we will put together a list of TWG participants interested in a field trip on Lake Powell, a dam tour and a half-day raft trip (May 16-17, 1998).

### **REPORTS FROM AD HOC GROUPS AND OTHER OFFICIAL REPORTS:**

**Spillway Gate Extensions Ad Hoc Group:** Bruce Moore stated that at the last meeting a paper was distributed for comments. The recommendation from the ad hoc group was that installation of the flashboards should be postponed indefinitely until more data is collected, and see how the operational scenario works out over the next few years. We will not reserve reservoir space but

will operate it as it is now to not reduce yield. The 8' extensions will remain in the yard for use in the event of an emergency (dam safety or hydrologic emergency). Emergency criteria will be addressed in the issue paper. Bruce is proposing to forward this to the AMWG for decision. The ROD would not have to be changed, but it would be noticed in the Federal Register.

*Recommendation:* The Federal Register notice will address the change to the original proposal published in the FEIS and ROD, and will be referenced in the AOP. TWG will review the draft notice and other documents prior to forwarding them to AMWG. TWG comments will be accepted through the end of May.

**Out Year Budget Ad Hoc Group:** (Budget Breakdown Attachment 2; GCMRC Staffing Structure Attachment 2a) Dave Garrett reported that more detail has been provided in the FY98/99/2000 budget documents. The revisions are still in process. When the Management Objectives/Information Needs process is completed, the general categories for the FY2000 budget will be finalized. The budget information will be presented to the TWG for review. Closure on the budget is required to enable it to be forwarded to the AMWG for decision at its July 21-22, 1998 meeting. Pursuant to the TWG's previous request, the GCMRC Staffing Structure is available for pick up at this meeting.

*Recommendation:* The budget information will be distributed at the next TWG meeting for review. The Out Year Budget Ad Hoc Group will meet on Friday, April 3 at a location to be announced (either La Quinta or ADWR) in Phoenix. General category allocations will be reviewed and discussed at that meeting.

**Management Objectives Ad Hoc Group:** (Management Objectives Attachment 3, dated 3-16-98; Lake Powell Assessment Report, Attachment 4, dated 3-6-98, 1998) Dave Garrett distributed the current draft of the Management Objectives document. Lake Powell Management Objectives were not addressed by the ad hoc group until the Lake Powell Assessment was completed and reviewed. The next meeting will be held March 24-25, 1998 at La Quinta in Phoenix. The focus will be on Lake Powell Management Objectives, and closure of the overall Information Needs prioritization. Closure is needed in April because the GCMRC must submit the five-year Strategic Plan to AMWG at its July 21-22, 1998 meeting.

*Recommendation:* TWG members who are unable to attend the Management Objectives Ad Hoc Group meeting may submit any comments or questions about information needs in the resource areas to the GCMRC prior to the March 24-25, 1998 meeting.

**State of Resources Report Ad Hoc Group:** (Attachment 5) Larry Steven reported that the annual State of the Ecosystem report will relate contemporary resource conditions to historical conditions. Most of the report will be presented graphically and will consist of a short executive summary and a larger text version available in hard copy and user-friendly electronic format. The purpose is to provide information to TWG, AMWG and the public to demonstrate that science is being used for adaptive management and information being gathered is being collated and presented in a way that satisfies the concerns of the GCPA. Dr. Stevens confirmed that this report will not be solely GCMRC's interpretation of the state of the resources, but will be based on

annual data from the Center's research, contract research, etc. It will objectively and impartially report the state of the ecosystem and trends annually and at certain intervals and some interpretive explanations will be included. It will reflect the TWG's group opinion on technical issues and they may use it to assist in making management decisions. A comprehensive literature list will be included at the end of the document. Larry Stevens and Tom Moody will be contacting various agencies and organizations to gather data for the graphical section of the report. It will contain "holes" where data cannot yet be provided and will be based as much as possible on final reports, but will include drafts where necessary to fulfill an information need in a short time frame. Researchers have to turn around their data on an annual basis, and if the data are readily available, we can reflect any condition changes annually. Some resource graphics will need to be updated only every 2-3 years because significant annual changes may not occur. Although GCMRC may prepare the report and submit it directly to the AMWG, the Center elects to avail itself of the benefit of the TWG's expertise by soliciting its review and input on the report before it is finalized and presented to the AMWG.

*Recommendation:* The TWG recommended inclusion of the annual hydrograph which will show how the system was operated and water supply for that particular year. Also include an annual ongoing comprehensive bibliography including GCMRC reports and PI publications. The ad hoc group is requesting TWG approval by mid-May to begin this process.

**Science Advisory Board Ad Hoc Group:** (Attachment 6) Barry Gold reported that the discussion paper has been revised to include the issues of reporting and how to establish the SAB. Bill Davis has drafted a paper regarding the reporting issue which will be included under the section on "voting" wherein the TWG will be able to review and give input to products generated by the SAB for the AMWG. The ad hoc group also decided to convene the SAB as a FACA body (independent subcommittee of the AMWG) and comply with the noticing requirements, and revised the discussion paper accordingly. The details of the subcommittee will be reviewed with Scott Loveless (USBR Solicitor). The SAB will not require a charter. GCMRC will put out an RFP to apply for the panel. A panel of scientific experts will review the resumes against the evaluation criteria and select the top choices. A roster will be developed for the AMWG, in conjunction with the Secretary of the Interior, to make the SAB panel selections. This group is being formed to provide advice to the AMWG, GCMRC and the Secretary of the Interior. Annually, the AMWG and GCMRC will go to the SAB and request work be done on certain areas. Robert Winfree suggested to avoid misinterpretation of who the SAB reports to, there should be one person designated as the main contact by the GCMRC, the TWG, the AMWG or the Secretary's Designee regarding proposed assignments. Also a statement that the SAB is an independent subcommittee which reports to the AMWG and not the GCMRC. The SAB's authority is limited to providing scientific and technical advice in response to questions asked of them by the AMWG, the GCMRC or the Secretary of the Interior. AMWG will decide on operations and priority-setting at its July 21-22, 1998 meeting.

*Recommendation:* Barry Gold will submit revisions to the TWG Chair/Vice-Chair for inclusion in the TWG Operating Procedures. Robert Winfree shall submit comments regarding the issue of reporting for the ad hoc group review and decision. Robert Winfree and Norm Henderson will join the SAB Ad Hoc Group. Barry Gold requested the ad hoc group be empowered to go forward with revising the discussion paper and implementing the RFP process.

On motion duly made, seconded and carried, the SAB discussion paper shall be revised; the TWG Operating Procedures shall be revised accordingly and adopted at the next TWG meeting; GCMRC shall release an RFP to recruit potential candidates for the SAB roster (said RFP shall contain the provision that procedures relating to the SAB's relationship with the GCMRC, the TWG and the AMWG are yet to be established); the ad hoc group shall remain active to continue to work with GCMRC to further craft the evaluation criteria and operating guidelines; and Dave Garrett shall work with the Secretary's Designee to advise him of the progress regarding the SAB.

**Glen Canyon Dam Issues Ad Hoc Group:** (Attachment not available) Wayne Cook stated that the ad hoc group has been discussing the conclusion that the 45,000 cfs flow did not release enough energy to accomplish all goals. Some agencies have suggested a larger magnitude flow. The ad hoc group has investigated the issue of both over 45,000 cfs (possibly 60,000 cfs which would utilize the spillways) and the 25,000 cfs load following. He felt this question should be resolved between now and next January when there may be a higher probability of a spike flow. Debra Bills discussed the fact that the GCMRC had requested a programmatic evaluation of all floods including but not limited to above 45,000 cfs for 2-4 days and fluctuations between January and June/July. She confirmed that the original goal of the programmatic approach was to develop a broad document to enable a quick response to the hydrologic criteria. Tony Morton stated that this will be worked on after this year's consultation has been completed. Wayne Cook suggested that the GCMRC investigate the issue of over 45,000 cfs flows and 25,000 cfs load following for the next hydrologic year. The context of the ROD versus the ability of the Secretary of the Interior to do research was discussed. Cultural resource areas are a potential issue. The GCMRC would utilize a scientific process to determine the resource needs of the system which would define the flow size and load following; they are two separate experiments.

*Recommendation:* The ad hoc group will complete its work on the paper by May 1, 1998 for further discussion by the TWG. The paper will propose that the GCMRC investigate this issue from a scientific basis, determine the impacts, and respond by mid-October to enable TWG to review it and decide on a recommendation for the January 1999 AMWG meeting. If possible, the schedules related to NEPA and ESA compliance should be factored into GCMRC's evaluation.

Public Comment: The Chairperson requested public comment; there was none.

**BHBF Resource Criteria Ad Hoc Group:** (Attachment 7) Barbara Ralston presented information on scoring of the Effects Matrix, after meetings with the physical and biological scientists. The physical scientists divided sediment into high versus low channel storage conditions to evaluate benefits or adverse impacts of a certain size flow. They also divided channel conditions to above and below the LCR. In a high sediment storage condition, Marble Canyon and below the LCR is benefitted positively from a high flow in any month. If the sand storage conditions are low the area of concern is Marble Canyon reach and the eddy and channel where sand storage is found becomes negatively impacted. You would need to critically evaluate a decision to run a high or 45,000 cfs flow. Low and high values need to be determined. Monitoring and triggering levels also need to be established. There are different degrees of interpretation of physical versus biological impacts. The biological scientists met and discussed the ranking system. They are mostly concerned with negative values. Resource narratives are very helpful and will continue to be developed on biological resources including life cycles, high

versus low productivity, seed dispersal, etc. A summary of the revised Effects Matrix representing -1 to -2 values was reviewed, including KAS, native fish, avifauna, trout and vegetation show impacts from a 45,000 cfs flow primarily from April-July. For any given month, the Effects Matrix would be reviewed for indications of a probable effect for a particular resource during a certain month. Management Objectives would be reviewed to determine if objectives will be achieved for that resource and will a BHBF prevent or slow down the achievement of those objectives (show stoppers/non-renewable resources). Other elements include measurable monitoring criteria to determine the resource impacts, and trade offs between resource impacts. Debra Bills will join the ad hoc group in order to address compliance issues.

*Recommendation:* Comments related to the Effects Matrix or the Narrative may be submitted to Barbara Ralston by March 25, 1998 for incorporation ([bralston@sven.uc.usbr.gov](mailto:bralston@sven.uc.usbr.gov) or 520-556-7363). Comments regarding approach, a need for monitoring and research, or numbers associated with a management objectives may be submitted to Robert Winfree by March 25, 1998. A discussion paper will be distributed ten days before the next TWG meeting.

**BHBF Science Plan Funding Ad Hoc Group:** (Attachment 8) Dave Garrett stated that work is continuing on the requested narrative, and budget detail to fund a possible BHBF. A contingency plan for monitoring Glen and Grand Canyons related to unanticipated high flows from the GCD was distributed and briefly reviewed by Larry Stevens. This proposal covers post-flow research, and what can and cannot be done. Notification of an unanticipated event would be about one week. A steering committee was suggested to deal with funding and activities subsequent to an event.

*Recommendation:* The narrative will be distributed to the TWG next week. Comments may be submitted to the GCMRC for incorporation. Approval will be requested on the narrative and the post-flow research for unanticipated spills documents at the April 7-8, 1998 TWG meeting. The TWG will have an opportunity to comment again.

Public Comment: The Chairperson requested public comment; there was none.

**Glen Canyon Dam Operations Notification:** Clayton Palmer reported that the public may obtain specific information about the operations of GCD by accessing the USBR's web site at: [www.uc.usbr.gov](http://www.uc.usbr.gov) and also WAPA's CRSP web site: [www.wapa.gov](http://www.wapa.gov) (click on the CRSP hot link). The page will specify water releases for the upcoming weeks/months. When Randy Peterson posts release information to USBR's web page, he will also forward it to the e-mail notification list, which includes the TWG. If an emergency condition arises and either WAPA or the USBR has to modify GCD operations in response, an ex-post explanation of that emergency and details about changes in operations will be e-mailed/faxed by WAPA to said list.

*Recommendation:* If you are not on Randy Peterson's email list, please add yourself to it.

Public Comment: The Chairperson requested public comment; there was none.

**PROGRAMMATIC AGREEMENT AND TRIBAL ISSUES**

**Federal-Tribal Law and Trust Relationships:** (Attachment 9) Rebecca Tsosie, Associate Professor and Executive Director of the Indian Legal Program at ASU presented information on trust responsibility and how it applies today in the context of some of our issues. She has published extensively on federal Indian laws, environmental law and cultural resources.

There is a unique political relationship among the nations that have indigenous peoples, in which the trust responsibility is a key. Dr. Tsosie addressed three topics: (1) the political basis for the trust responsibility; (2) the contemporary relevance of the trust responsibility as it constrains or promotes congressional and executive branch actions; (3) importance of the trust responsibility in the context of natural and cultural resources issues. The Trust Responsibility Doctrine encompasses three substantive qualities: (1) moral obligation for the US in its dealings with Indian nations to observe a duty of good faith and fair dealing standard; (2) a means to preserve tribal rights and ensure survival of Indian nations' rights to property and liberty so that the Indian nations will endure as separate nations; (3) acts to constrain government actions that go against basic trust responsibilities principles. The tribes are self-governing, sovereign entities. They adopt tribal law that stems out of their inherent sovereign powers, and enact state law that is applicable within the reservation. There are limited situations where state laws can apply on the reservation (taxation of consumers on the reservation and other exceptions). There is a dual system of federal and tribal law on the reservation.

**Contemporary Relevance of Trust Responsibility Doctrine:** In 1994, President Clinton reaffirmed with 300 tribal leaders the fulfillment of the federal government's trust responsibility. Indian nations may sue under the Administrative Procedures Act for violations of the trust responsibility (e.g., resource mismanagement compensation), and usually seek injunctive relief. They can also sue for damages in a Court of Claims (e.g., federal "trustee" mismanagement of tribal assets), authorized under the Indian Claims Commission Act.

**Indian Nations, Natural Resources and the Trust Responsibility:** Indian nation survival depends on its ability to maintain and protect its lands. The Executive Branch exercises a "trustee" role in lands management, regulated by the trust responsibility. Federal agencies are engaged in resource management outside of the reservations, and statutes exist which require the agencies to act in the best interests of the Indian nations. The federal government must respect its trust obligations when engaging in actions off the reservation which uniquely impact tribal members or property on the reservation.

**Cultural Resources and the Trust Responsibility:** The government has a trust responsibility to preserve tribal cultures. Environmental impacts also impact tribal cultures, religions and ways of life. The cultural resource is sometimes viewed as "intangible," but is linked inseparably to the environmental resource. Federal statutes and executive orders exist that recognize tribal interests in protecting cultural resources and cover the role of the federal trust responsibility thereto (e.g., NEPA, American Indian Religious Freedom Act, Archaeological Resources Protection Act, NAGPRA).

**Endangered Species Act:** An executive order exists on the ESA in relation to the tribes wherein the territorial jurisdiction of the tribes is different than the surrounding state jurisdiction, and it recognizes the government-to-government relationship. It affirms that the ESA has important

national and uniform goals and purposes but it involves the tribes more on a state level.

Indian's Prior Rights and the Colorado River Compact: Generally, the concept of tribal "reserved rights" stems from the treaties. It is the right sufficient to ensure the continued survival of the Indian nations on those lands. The tribes reserved anything they did not expressly give away. Water rights are a fundamental part of that. The federal government in the exercise of its trust responsibilities—in some specific cases—committed itself to represent both the tribes and interests of other parties (irrigators, etc.) simultaneously, but the conflict of interest does not require them to undo a series of acts if a case had previously been finally adjudicated (example used was from an unspecified Nevada case).

Current Litigation relative to Tribal Rights: Dr. Tsosie quoted several current cases in which actions are pending. The Supreme Court has been in a very conservative phase in its current opinions in dealing with Indian tribes, with a predisposition to restrict Indian rights. Dr. Tsosie feels that the court has been ignoring substantial precedent due to a lack of adequate knowledge of the nature of federal Indian law.

PA/GCMRC Integration Report: (Attachment 10) Kurt Dongoske presented a discussion paper that he and Mike Yeatts developed which explains the relationship between the PA and GCMRC's process with the TWG in planning future research in the Grand Canyon. It reviews commonalities and differences between the GCD PA and the management objectives of the GCMRC Cultural Resources program. It identifies a need for integration of a process to integrate functioning of the GCMRC Cultural Resources Program and the GCD PA Program. Mr. Dongoske reviewed the GCD PA stipulations. He reviewed the NHPA Section 106 which deals with effects of federal actions on historic properties. PA's may be developed to help streamline federal agencies' compliance with Section 106. The Advising Council on Historic Preservation, through the PA, may allow the federal agency to deviate from the regulations. This type of process was established with how to treat the effects of GCD operations on historic properties within the Colorado River corridor in the Glen and Grand Canyons. He reviewed the National Register-eligible properties for which the USBR is responsible, and non-eligible properties which are under the purview of the GCMRC. The GCMRC can only make recommendations on whether the work product (e.g., remedial work) has sufficiently met the USBR's compliance responsibility. Outside organizations may sub-contract for work activities (not including TCPs). A process needs to be developed and implemented which will integrate the compliance work plan into the GCMRC's long-term budget process to develop out year activities. Integration has partially begun via the Cultural Resources Management Objectives and Information Needs which include PA work in a broad sense.

Three components are included in the process:

1. Work associated with National Register properties, necessary to maintain compliance. The scope of these monitoring activities do not significantly change from year to year and could be submitted to the USBR for incorporation into the GCMRC's planning schedule. Remedial activities which are known at time of proposal submission can be included in the work plans otherwise provided following the current time line specified in the remedial action plan.

2. Work associated with National Register eligible properties that are contracted through the GCMRC. These large, research and mitigative projects could be better achieved through the GCMRC Cultural Resources Program. They could be forwarded to the GCMRC by the USBR during the RFP development stage. The USBR in consultation with the PA group can develop and evaluate the proposals for a specific project submitted to the GCMRC to ensure USBR compliance needs are met. If a PA signatory wants to bid on an RFP, they must remove themselves from the RFP development and review process. The USBR determines if the final work product fulfills legal compliance.

3. Work associated with non-National Register-eligible properties is under the purview of the GCMRC. These types of work would follow the GCMRC's timelines and review processes. Topics for consideration can be developed by the GCMRC or submitted by an outside group (tribe). The tribe may have other specific monitoring needs for the cultural resources that do not meet the criteria for a National Register-eligible property.

*Recommendation:* Kurt Dongoske requested comments on approaches to the planning process as soon as possible. Comments received will be discussed at the April TWG meeting. Kurt Dongoske will take those comments to the PA Signatories meeting.

Ruth Lambert reviewed the FY98 Reclamation PA Percent of Funding by Category (Attachment 11). The list included proposed work for FY98 broken down into Administration, Ongoing Monitoring, Remedial Action and In-kind/Section 110 categories, and parties involved. Dave Cohen suggested that beginning in FY2000, the USBR/PA work and GCMRC research work should be listed as separate budgets because the responsibilities are different.

*Recommendation:* Discussion regarding the separate budgets issue will be put on the next TWG agenda.

### **BHBF ISSUES**

**Hydrologic Forecasts:** (Attachments 12a, 12b, 12c) Randy Peterson reviewed several overhead transparencies and distributed spillway gate details, hydrologic conditions, and El Nino information. He reviewed the Basin snow map, the March forecast, 1998 GCD release graph, 24-month study table, 1998 versus 1983 elevation graph, Risk of Spill table, and the forecast, snowpack, inflow graph. Conditions have not significantly changed since mid-February. Basin-wide snowpack is 87% of normal. The NWS forecast and process was reviewed. The outlook for April-July runoff is consistent with the current snowpack. The maximum error of the forecast is 3 MAF at this time of year, and there is a 5% risk of triggering a BHBF. Average daily releases of 20,000 cfs will be run through March. Reduction of flows to an average of 13,000-14,000 cfs is anticipated starting in April 1. We should hit our maximum drawdown of 28 feet by the end of March. Target storage for the end of December 1998 is about 21.5 MAF. By the end of April we will have 15 foot/2 MAF deeper drawdown than we had in 1983. Every month that passes that we are not releasing powerplant capacity increases the risk and results in a loss of flexibility. Currently, Lake Powell is targeted to be 8 feet from full at the end of July. We are being conservative by drawing down 5-10 feet below normal (15 feet below 1983) and our maximum filling is 8 feet from full (normally more than 4 feet from full). It would take widespread, intense

events for the Basin runoff to be changed more than 20%. However, if the snowpack melt is delayed until June it may have significant impact due to faster runoff.

**El Nino Correlation:** Ted Melis gave a preliminary assessment of El Nino and Upper Colorado River Basin flows, including historical observations. There is a lot of variability and uncertainty in the large ENSO events. Each event has its own characteristics as it evolves. Three hypotheses they studied were: (1) is there an El Nino impact in terms of overall flow magnitude; (2) in terms of late timing; (3) both. Dr. Melis reviewed SST Anomalies since 1950 in the El Nino Region (middle of the Pacific Ocean where the atmosphere and the ocean are linked.). SST anomalies have increased. Klaus Walter and Michael Timlan have recently developed a Multi-variate ENSO Index which incorporates SST and atmospheric conditions. We are following the same forecast path (96% of normal) as June 1983 (98% of normal). Randy Peterson reviewed Robert T. Adams' Colorado Precipitation Study from 1931-1996 which concludes that in El Nino years there is no difference in spring precipitation. He reviewed ENSO data, current NWS analysis, El Nino/La Nina segregations, Regression Plots for precipitation versus SOI (atmospheric pressure) in upcoming months and also for just ENSO years. Randy Peterson and Ted Melis analyzed the correlation between El Nino years and the ENSO index in place during that period and found no correlation. They are trying to determine the seasonal spring precipitation characteristics which affect the runoff. A week or two of a certain situation will not drive the runoff significantly, but a seasonal pattern will. There seems to be the indication of a correlation that as the SOI increases the strength during the winter period, the spring precipitation is greater. The current SOI strength is 2.6 or better and that would predict 130% of normal. We will not make releases on an expectation of the SOI precipitation prediction. The NRCS in Portland has predicted 130% of normal spring precipitation, which indicates they have probably conducted a study such as this one. Dr. Melis reviewed historic flow volume at Lees Ferry and timing of the peak from 1922-1962, and found no correlation regarding timing. Antecedent conditions for this year have been wet basin-wide. An event may probably be more of a precipitation factor than a streamflow factor. Dr. Melis discussed wind patterns and the jet stream configuration (winter to spring), and showed a plot provided by Roger Pulwarty from January 1998 (which is similar to the 1983 jet stream configuration). Multi-variate analyses may be more helpful to the TWG in managing the operations of the river.

**BHBF Resource Criteria Ad Hoc Group:** (see Ad Hoc Group reports in these minutes).

**Compliance:** Tony Morton discussed compliance for a possible 1998 BHBF. The draft Biological Assessment is completed and the final will be provided to USFWS by March 23, 1998. Debra Bills will respond with a draft Biological Opinion by April 21, 1998, and a final BO by April 28, 1998. RPA negotiations will be entered into, and the USBR would accept the BA and RPAs by May 5, 1998. Bill Davis asked if the TWG can become involved in ESA actions. Input may be solicited on writing the BA from outside the USBR and the USBR is responsible for that document. The USFWS does not release draft BO's but the USBR may make a decision to release the draft BO. Debra Bills always actively seeks assistance when writing the BO's and there is ample opportunity to give input to a draft BO. USFWS used to have consultation teams which drafted BO's as a group. They consisted of technical experts who had some input on a specific resource. She reinforced that it is still a USBR document submitted to the USFWS and remains a

USFWS final document (not a TWG document). The final document is available to the public. It is not expedient to begin the TWG-involvement process at this time for this document, but may be helpful for future consultations. Tony Morton stated that this process can be implemented for this consultation and still stay on schedule.

*Recommendation:* Tony Morton will send out the final BA to the TWG. Comments should be submitted to Debra Bills and Tony Morton simultaneously and within two weeks. The BA will be posted on the AMWG/TWG web site. Tony Morton will work with Debra Bills to investigate alternatives for the TWG to become involved in the consultation process. The topic will be added to the next TWG agenda. Debra Bills will ask USFWS about initiating a consultation team.

**KAS Stocking:** Robert Winfree reported on the ten primary stocking locations that are identified in an AGFD document. Some sites are used heavily by visitors, used for management purposes (e.g., water supply for GCNP), or within the area of influence of dam operations. Restrictions likely to be imposed on those sites are if the snails are located there, they will have to be protected. Agencies involved in protection need to discuss the issue and site descriptions in details before stocking occurs. Draft and final compliance documents will be prepared by AGFD is providing background material by April 1, 1998 for NPS (the action agency) finalization of the EA by April 15, 1998. Comments are received within the first two weeks of May. A draft FONSI (assuming a FONSI) finalizes compliance activities in late May/early June. Stocking will be done by the NPS biologist working with AGFD biologist working with USFWS. Logistical support will be provided by GCMRC, financial support will be provided by the USBR AMP, and staff support for site selection and subsequent activities will be determined by the EA process. The TWG discussed funding details for the stocking. Current NPS regulations include reintroduction extirpated species, but not on introductions in places where natural conditions have caused their extirpation or where they have never been before. It is liberally reviewing its regulations, but there is probably no scientific evidence that this species has lived in these locations before. A question was asked if any of these areas have traditional value to the tribes and if there are restrictions on access by the tribes, if the tribes have been consulted. Robert Winfree was unsure if tribes have been consulted, and management concerns about tribal access should be added to the EA. Tony Morton stated that the KAWG agreed that NPS would be doing the EA and the USBR will do the BA.

*Recommendation:* The TWG will be added to the mailing list to receive the EA. The tribes must be involved in discussions if the sites are associated with sacred tribal sites. The NPS and USFWS need to recognize their legal responsibilities in this regard. Robert Winfree will notify NPS. Time is of the essence, so anyone at the TWG meeting involved in KAS restocking, tribal, or compliance activities shall meet today at lunch to discuss the issues.

**Selective Withdrawal:** (Attachment 13) Barry Gold announced that a panel has been arranged to present biological issues related to selective withdrawal. Bruce Moore (for Dave Trueman) reviewed the selective withdrawal process history and objectives. Preliminary data from recent hydraulic model runs indicates that there is a 30-foot zone (above the new intake) they can draw from, and can deliver up to 15-degree (Centigrade) water for up to 80 days. Presentations included:

GCMRC Temperature Modeling. Jeanne Korn (GCMRC) presented a synthesis of data on warming of water including seasonal warming trends, flow effects on warming water, and selective withdrawal to warm the water to a desired temperature before it reaches a desired site to benefit fish spawning and survival. Lower flows (5,000 cfs versus 15,000 cfs) tend to have more of a warming effect on the river water. 15,000 cfs is too high of a volume to maximize warming. No data is available for a steady 5,000 cfs. Flow regime has an effect on water temperature. Overall warming is greatest in June. A release temperature of at least 14 degrees Centigrade would be required to achieve the 16 degree (lower end of) optimal spawning period for the HBC. However, the release temperature would have to be sustained and an attempt made to achieve a mid-range optimal spawning temperature so the larvae can grow to a size to enable survival in the colder temperatures. She identified a need to readdress a warming model. Jeanne Korn summarized that warming is dependent on ambient temperature, is affected by flow regime, and warming rates are affected by reach. In the pre-dam era the warmest water month was July. She is currently preparing a report which will be available in the near future.

Temperature Requirements of Aquatic Biota. Alan Haden (NAU) and Joe Shannon (NAU) reviewed possible effects of warming the water on the aquatic foodbase. The presentation included optimal/acceptable water temperature ranges, seasonal warming preferences, potential effects on algae, diatoms and *Gammarus lacustris*, interaction effects and possible alternatives to whole river alternatives. The best scenario is a 7.6 degree change on an annual basis (14 degree Fahrenheit). The critical temperature for the majority of the biomass is a 12-18 degree temperature change. Conclusions: there will be uncertain impacts to the aquatic foodbase, temperature and discharge needs to be coordinated, additional comprehensive field experiments are needed to better define the impacts both from a thermal and hydrograph regime. Simply warming the water probably will not have positive results. The biomonitoring needs to be kept at a meaningful level for good management decisions (no major changes). He suggested more *in situ* field experiments across trophic levels.

GCES Phase II Biology. Duncan Patten presented a summary of GCES Phase II biological research, including research activities and their implications for selective withdrawal, potential effects on the aquatic foodbase, Lees Ferry Trout fishery, native fish, riparian vegetation, and recommendations for future monitoring and research directions. Temperature, and volume of suspended sediment and light penetration is significant regarding the influences on interrelated factors such as fish activity, behavioral patterns, primary production, predation, etc. Warming the water for 2-3 spawning seasons may increase numbers of native fish, but a following decrease of water temperature will probably decrease those natives and be back to the same status. The native fish are long-lived and may not need to reproduce every year. Temperature may have a slight effect (increase and decrease) on riparian vegetation due to a new dry zone due a decrease in inundation from flow fluctuations. By warming the canyon, more evaporation occurs, resulting in more air moisture. We may add a slight water stress on the riparian which may affect those vegetation areas further away from the river. As sediment deposits stabilize, riparian vegetation begins to increase at a greater rate. There are linkages among different components, and all of them should be considered when modifying dam operations or water quality.

Fisheries Data Integration Report. Rich Valdez and Steve Carothers presented results of the SWCA Data Integration Project. The review included implications of findings on timing,

magnitude and frequency of warming the water, potential effects on the LCR and other aggregations of HBC, tributary versus mainstem population effects, and native versus non-native interactions. The data integration report is due back from peer reviewers on April 10, 1998 and SWCA will finalize it in approximately one month. A small scale test control of non-native predatory fish was discussed. AGFD wrote a proposal on this potential project last summer. The staff requirements to do the EA were not available at that time. Rich Valdez discussed on the temperature control potential response by LCR mainstem-area HBC. He reviewed the HBC population details. Spawning temperature range is 16-23 degrees Centigrade. Egg hatching temperature range is slightly higher. Current hypothesis is the HBC spawning is adapted into the temperature regime of the LCR. There appears to have been mainstem spawning which occurred during temperatures in May/June/July months, so there may be two different periods of spawning both according to water temperature. The fish in the mainstem are maturing normally at the colder temperatures, but they are not spawning (either not dropping eggs or the dropped eggs are not surviving). Optimal growth for young fish appears to be 14 degrees Centigrade, but this degree of heat may not be needed when compared to pre-dam temperatures and lag time with current temperature withdrawal. The baseline is the steady flow experiment and the biologists and the resultant findings could not be quantitatively evaluated in the report, but it does cover what they know, don't know and need to know.

Lees Ferry Trout Fishery. (Attachment 14) Bill Persons and Tim Hoffnagle reviewed optimum/acceptable temperature ranges for rainbow trout, when water should/should not be warmed, and possible implications regarding disease and parasites affecting native and non-native interactions. They are still working on the fishery management objectives. He showed a diagram from a Michigan hatchery environment which showed that an environmental temperature of approximately 15 degrees was optimum for rainbow trout. They can tolerate 20 degrees down to zero; warmer than that may be lethal. Increase of temperature from the dam of 3-5 degrees may be beneficial for some aspects of rainbow trout biology. It will likely increase the growth rate (they grow better at 15 degrees rather than 10 degrees). Trout need a cold water period of about 12 degrees for about 6 months to develop gonads. Spawning temperatures will remain in an acceptable range for rainbow trout, and their eggs will probably hatch sooner. Disease and parasites problems exist in rainbow trout (trout nematodes) and native fish. Increased water temperatures increase the possibility of more disease/parasite problems. Nematodes manifest themselves heavily in stressed fish. Until the warm water research is done, we will not know. Increased temperatures will probably result in increased competition and predation between rainbow trout and non-natives, and several other species. Overall, there is no known adverse impact of increased temperatures, but mostly unknowns.

Lessons from Flaming Gorge. Larry Crist reviewed selective withdrawal activities at Flaming Gorge and their relevance to GCD, including degree, frequency, time of year, and length of time of warmed water. Also effects on the aquatic foodbase, native and non-native fish spawning. There was an immediate effect from the temperature warming, a number of species began reproducing in the river where they had not before. Some non-natives also began reproducing. They also saw movement of some fish further up into the canyon than before the modification. He reviewed a summary of recent electrofishing. 60% of the native fish community are reproducing. Several non-native fish communities are also reproducing. They have little or no information on pre-dam non-native fish reproduction to enable a comparison. 13.5 degrees warming is the target

temperature to release. The water warms up to 21 degrees as it travels further down the river. Upper river temperatures are cooler but the habitat is only slightly different. He summarized that the fisheries saw some increased use by native fish that moved upstream, an immediate reproduction response from some of the native fish which were not reproducing in the river prior to the temperature modification, an immediate and dramatic influence on trout growth and reproduction in tailwater areas. Some non-natives (red shiners, etc.) began reproducing in the lower river and have not moved into the upper river. A significant number of non-native white shiners are reproducing and hybridizing throughout the river. He summarized invertebrate work from historic data which shows little or no change in total numbers of macroinvertebrates close to the dam.

**Public Comment:** The Chairperson requested public comments; there were none.

**Action Items/Deadlines/Future Agenda Items:**

**Action Items:** The Chairperson reviewed action items identified at this meeting which are stated under "Recommendations" following the topic and discussion items in these minutes.

**Upcoming Meetings/Field Trips:**

**April 7-8: 9:30am-5pm; 8am-4pm TWG Meeting at ADWR - Phoenix**

**May 16-17: TWG Field trips on Lake Powell on May 16; field trip downriver on May 17.**

**May 18-19: 12:00 pm-5:00pm; 8:00am-12:00pm - TWG Meeting at USGS Flagstaff Field Center - Flagstaff**

**May 19, 1:30 p.m. to 5 p.m.:** Joint/overlap meeting with conceptual modeling workshop.

**June 9-10: 9:30am-5pm; 8am-4pm meet at ADWR - Phoenix:**

- Finalize documents for AMWG.
- Conceptual Model presentation.

**July 23, 1998: 8:00am to 4:00pm- Embassy Suites (44<sup>th</sup> & McDowell Roads) - Phoenix:**  
One day TWG meeting following the AMWG meeting on July 21-22, 1998

**Public Comment:** The Chairperson asked for public comment at the end of each major topic. No comments were received.

There being no further business, the Chairperson adjourned the meeting.

Respectfully submitted,

Serena Mankiller, GCMRC Secretary

## Key to Acronyms

ADWR - Arizona Department of Water Resources  
AGFD - Arizona Game & Fish Department  
AGU - American Geophysical Union  
ASU - Arizona State University, Tempe, AZ  
AMWG - Adaptive Management Work Group  
AOP - Annual Operating Plan  
BA - Biological Assessment  
BHBF - Beach/Habitat-Building Flow  
BHTF - Beach/Habitat Test Flow  
BIA - Bureau of Indian Affairs  
BO - Biological Opinion  
BOR - Bureau of Reclamation  
CAPA - Central Arizona Project Assn.  
CRBC - Colorado River Board of California  
CRCN - Colorado River Commission of Nevada  
CREDA - Colorado River Energy Distributors Assn.  
CRSP - Colorado River Storage Project  
CWCB - Colorado Water Conservation Board  
DOI - Department of the Interior  
EA - Environmental Assessment  
EIS - Environmental Impact Statement  
ENSO - El Nino Southern Oscillation  
ESA - Endangered Species Act  
FACA - Federal Advisory Committee Act  
FWS - United States Fish & Wildlife Service  
FY - Fiscal Year  
GCD - Glen Canyon Dam  
GCMRC - Grand Canyon Monitoring and Research Center  
GCNRA - Glen Canyon National Recreation Area  
GCPA - Grand Canyon Protection Act  
HBC - Humpback Chub (endangered native fish)  
HPP - Historic Preservation Plan  
IEDA - Irrigation and Electrical Districts Association of Arizona  
KAS - Kanab Ambersnail (endangered native snail)  
KAWG - Kanab Ambersnail Work Group  
LCR - Little Colorado River  
MAF - Million Acre Feet  
NAGPRA - Native American Graves Protection and Repatriation Act  
NAU - Northern Arizona University (Flagstaff, AZ)  
NEPA - National Environmental Policy Act  
NHPA - National Historical Preservation Act  
NPS - National Park Service  
NRCS - National  
NWS - National Weather Service  
PA - Programmatic Agreement  
Reclamation - United States Bureau of Reclamation  
RFP - Request For Proposal  
RPA - Reasonable and Prudent Alternative  
SAB - Science Advisory Board  
SHPO - State Historic Preservation Officer  
SOI - Southern Oscillation Index  
SST Anomaly - Sea Surface Temperature Anomaly  
TCP - Traditional Cultural Property  
TES - Threatened and Endangered Species  
TWG - Technical Work Group (Glen Canyon)  
UCR - Upper Colorado Region (of the USBR)  
UCRC - Upper Colorado River Commission  
UDWR - Utah Division of Water Resources  
USBR - United States Bureau of Reclamation  
USFWS - United States Fish & Wildlife Service  
USGS - United States Geological Survey  
WAPA - Western Area Power Administration

