

Glen Canyon Dam Technical Work Group Meeting

April 21-22, 2015

Conducting: Vineetha Kartha, TWG Chair
Shane Capron, TWG Vice-Chair

Convened: 9:30 a.m.

Committee Members/Alternates Present:

Jan Balsom, NPS/GRCA
Cliff Barrett, UAMPS
Charley Bullets, Southern Paiute Consortium
Kerry Christensen, Hualapai Tribe
Kevin Dahl, National Parks Conservation Assn.
Bill Davis, CREDA
Kurt Dongoske, Pueblo of Zuni
Craig Ellsworth, WAPA
Evelyn Erlandsen, State of Arizona
Paul Harms, State of New Mexico

Glen Knowles, Bureau of Reclamation
Ted Kowalski, Colo. Water Conservation Board
Jerry Myers, Federation of Fly Fishers
Jessica Neuwerth, State of California
Don Ostler, State of Wyoming
Larry Stevens, Grand Canyon Wildlands Council
Bill Stewart, Arizona Game and Fish Dept.
Jason Thiriot, State of Nevada
Michael Yeatts, Hopi Tribe
Kirk Young, FWS

Committee Members Absent:

Jerry Lee Cox, Grand Canyon River Guides
Chris Harris, State of California
Chip Lewis, Bureau of Indian Affairs

Robert King, State of Utah
Steve Wolff, State of Wyoming

Grand Canyon Monitoring and Research Center:

Helen Fairley, Social Scientist
Kyrie Fry, Communications Coordinator

Scott VanderKooi, Biology Program Manager

Interested Persons

Brandon Albrecht, Bio-West
Mark Anderson, NPS/GLNRA (phone)
Mary Barger, Bureau of Reclamation
Rob Billerbeck, NPS (phone)
Howard Brandenburg, American Southwest
Ecological Research
Peter Bungart, Hualapai Tribe
Bill Chada, Bureau of Reclamation
Terri Cook, freelance science writer
Marianne Crawford, Bureau of Reclamation
Brian Healy, NPS
Beverley Heffernan, Bureau of Reclamation

Leslie James, CREDA
John Jordan, Federation of Fly Fishers/TU
Ora Marek-Martinez, Navajo Nation Historic
Preservation Office
Mark McKinstry, Bureau of Reclamation
Lisa Meyer, WAPA (phone)
Joe Miller, Trout Unlimited
Jenika Raub, Salt River Project (phone)
Dr. Sarah Rinkevich, DOI Tribal Liaison
Seth Shanahan, SNWA
Rosemary Sucec, NPS/GLNRA (phone)
Todd Tietjen, SNWA

Meeting Recorder: Linda Whetton

Welcome and Administrative: Ms. Kartha welcomed the members and the public. Introductions were made and a quorum determined.

1. Approval of January 20-21, 2015, Meeting Minutes – A request was made to include stakeholder comments. The minutes will be revised and approved at the next meeting.
2. Review of Action Items (**Attachment 1**).
3. Ad Hoc Group Updates.
 - o Administrative History AHG (**Attachment 2a**) – Mr. Jason Thiriot. An RFP is in development for the purpose of gathering oral histories from current and former program members. Members are encouraged to take the training courses (http://gcdamp.com/index.php?title=Training_Page).
 - o Species of Management Concern – Mr. Larry Stevens. Meeting notes from the last conference call were distributed (**Attachment 2b**). For the mid-May call each of major participating agencies (NPS, FWS, GCRMC, AZGFD) will provide a 5-minute overview of which species are being monitored, how, and at what schedule. The ad hoc members need to review the lists of native and non-native species of management concern and be prepared to either refine the existing prioritization process or develop a new process for ranking those species.
4. New Ad Hoc Group to Discuss Native Fishes and Humpback Chub Mainstem Locations – Mr. Kirk Young.

A meeting was held to discuss mainstem augmentation translocations and criteria were developed. The group will report to the TWG of their work for consideration in the FY18-20 work plan. A new ad hoc group will be formed when more information is available.

5. Selection of new GCMRC Center Chief – Mr. Scott VanderKooi. The vacancy announcement is open through May 7. A new duty for this position will be leader of SBSC river research and restoration program. No AMP funding will be used to fund this work.
 - o Barbara Ralston has accepted a position with USGS as a bureau approving official for the western United States. She starts her new job in early May.
6. Updates:
 - o Tribal Consultation Plan – Ms. Sarah Rinkevich. The tribal representatives are reviewing the Plan.
 - o Programmatic Agreement Update – Ms. Mary Barger. The PA should go out next week along with a “comment and response” document.
 - o LTEMP EIS – Mr. Glen Knowles. The team is striving hard to have a draft out in the next few weeks with a 30-day comment period for the cooperating agencies. The socioeconomic analyses and work on other technical appendices won't be completed in time for the draft. Several members requested the comment period be extended.
 - o Whirling Disease – Mr. Bill Stewart. A positive detection occurred in 2007, nothing noted in 2008-10, but a positive detection again in 2011. Testing for whirling disease will occur on a 3 to 5-year basis. There are no deformities or signs that whirling disease is in the trout populations.
 - o NPS Bison Management Plan – Ms. Jan Balsom. There are still bison on the north rim and the population appears to be exponentially increasing. The NPS, AZGFD, and the Forest Service don't have alternatives but hope to have something out this summer. Tom Sisk's lab at NAU is working on ecological integrity and updating their databases. The EIS is being done through the NPS Washington Office and GRCA is providing technical support.
7. New Business: The next TWG meeting will be held via WebEx on June 11, 2015, at 11 a.m. (MDT). There will be three agenda items: (1) Hydrograph for 2016, (2) FY16 budget, and (3) TWG Chair Election.

Hydrology Update (Attachment 3) – Ms. Katrina Grantz. The April forecast for unregulated inflow into Lake Powell was 52% of average, and by mid-month it was 47%. Snowpack peaked in early March at 74% and is currently about 56% of average. Basin conditions are very dry.

- Lake Powell operations are in the upper elevation balancing tier at 8.23 maf. The hydrology is determined in the April-Month Study and projects the end of the water year storage and necessary adjustments. If releases continue at 8.23 maf, balancing Lakes Powell and Mead will be necessary with equalization releases.
- If the forecast continues to decrease and projections in August indicate Lake Powell will go below 3,575 feet, then the operating tier for WY 2015 would be the mid-elevation release tier and a 7.48 maf release scenario. Currently, there's a 50/50 percent chance for next year being 7.48 maf or 9.0 maf. There is less variability at Lake Mead and that it is very close to the shortage conditions for calendar year 2016.
- Dam Maintenance Schedule. There are eight hydropower units available at GCD. Maintenance that takes units offline is continual. Management attempts to keep the maximum number of units online in November for a potential HFE.

2016 Hydrograph – Ms. Katrina Grantz.

- The objective is to retain sand inputs high in the system in anticipation of a potential fall HFE.
- August and September are typically the months of greatest sand inputs.
- Water has been shifted the past 5 years from the standard pattern to lower August and September releases, in order to retain sand inputs high in the system for a potential HFE in November. Water would be moved from August to other equal value months for hydropower (Dec/Jan).
- Decreasing releases in the 1,000kaf to 800af range can significantly decrease sand transport. Less difference is seen at low flow volumes. The operating tiers for 2016 range from a minimum probable of 7.48 maf, a most probable at 9.0 maf, and a maximum probable at 9.0 maf. The following DOI-DOE is the proposed 2016 hydrograph:

Annual Release Volume	June	August	September
Less than 9.0 maf	600 – 650 kaf	800 kaf	600 kaf
9.0 maf – less than 9.5 maf	800 kaf	900 kaf (was 850)	700 kaf
9.5 maf – less than 10 maf	900 kaf	900 kaf	700 kaf
10 maf and greater	900 kaf or more	900 kaf or more	800 kaf or more

The joint agencies determined the overall improvement to hydropower and the improvement to the annual sediment transport was worth the adjustment to July and August volumes. There was minimal difference to temperature. If the volume is higher, and equalization is triggered there will be a 11.7 maf release. Flexibility is limited and a high volume release could decrease volumes in August and September. The next steps are to consider feedback from the TWG, continue working with the DOI-DOE agencies, and have the AMWG consider at the May meeting, a final recommendation to the Secretary in August.

Razorback Sucker Monitoring and Research in Lower Grand Canyon and the Colorado River

Inflow Area of Lake Mead (Attachment 4a) – Mr. Mark McKinstry. Razorback Suckers were listed as endangered species in 1991, critical habitat was designated in 1994, a recovery plan developed in 1998, and recovery goals set up in 2002. The recovery goals require two populations in the Upper Basin, the Green and Upper Colorado River or the San Juan River and two populations in the Lower Basin. It has not been defined where, but discussions with FWS and other program participants indicate one of those places will probably be designated as the Lake Mead and Lower GRCA population. In 1995 a Reclamation BiOp on operation of GCD required a workshop and development of a management plan for RBS in GRCA. The workshop was completed. In 2006 there was a BiOp to the Park Service with their CRMP to conduct surveys in Lower Gorge and Lake Mead interface for spawning RBS. Most of the work that is currently being done in Lake Mead would fulfill this conservation measure for Park Service. In 2008 BOR had a BiOp on the shortages and coordinated reservoir operations to “examine the potential habitat in the Lower GRCA for RBS and institute an augmentation program.” There has been 18 years of study (1996-2014) which has resulted in 180 fish being sonic-tagged, 1300 total captures of fish in Lake Mead, 860 unique fish, and 492 individuals have been aged from 2-36 years which indicates that recruitment is occurring. This is the only known population of fish in the basin that’s recruited.

Adult RBS Monitoring (Attachment 4b) – Mr. Brandon Albrecht. Based on past studies and recent movements of sonic-tagged Razorback Suckers from Lake Mead into the lower Grand Canyon (LGC) section of the Colorado River, questions regarding this population have spurred further interest into the presence of wild individuals and their relationship between the river and reservoir. For more than 20 years, Razorback Suckers were thought to be extirpated within the Grand Canyon. This collaborative and holistic study included efforts to continue monitoring Razorback Sucker (all life stages) within the Colorado River inflow of Lake Mead with the inclusion of sonic telemetry, small-bodied fish community, and larval fish community sampling from Lava Falls downstream to Pearce Ferry, in the LGC (RM 180-280). The specific objectives outlined for these efforts included; (1) conducting larval and small-bodied fish studies to quantitatively assess annual fish reproduction, spawning, and nursery areas in the LGC, (2) determining if Razorback Suckers were present in the study area and if they associated with habitat found within the LGC through telemetry and opportunistic adult sampling, and (3) identifying habitat associations, relative spawning and reproductive effort, and population trends of Razorback Sucker in the CRI.

Conclusions:

- RBS are present at the CRI (5th year) and immature RBS have been captured at CRI (age 3)
- RBS were not captured during the LGC small-bodied sampling in 2014, but recently Age-0 juveniles were located in Iceberg Canyon
- Telemetry identified movement between the river and lake and it is likely that movement is occurring above Lava Falls which is above the study area
- GRTS sampling high native catch rates

- Capture of other small sucker species indicates capturing small, wild RBS may happen in the future
- Age-0 HBC are common from Lava Falls to Pearce Ferry (entire study reach)
- It appears that the combination of both habitats cumulatively allow for natural RBS recruitment – dynamic!

Larval Fish Monitoring – Mr. Howard Brandenburg (**Attachment 4c**). The results of the larval community sampling documented reproduction by Razorback Sucker and Humpback Chub during the 2014 survey of the lower Grand Canyon. Larval Razorback Sucker were captured four out of six months of the survey. The April survey had the highest density and it increased in the lower portion of the study area. Larval Razorback Sucker were distributed throughout the study area during the May and June survey including larval Razorback Sucker at the top of the study area, upstream of Lava Falls Rapid. Three Razorback Sucker larvae were captured in July. Larval Razorback Sucker captured represented all larval ontogenetic stages (protolarvae, mesolarvae, and metalarvae). Mesolarvae (flexion and postflexion) constituted 97.2% of the total Razorback Sucker catch. There have not been recently transformed juvenile in the 2014 captures.

Conclusions:

- Larval RBS are present throughout the study area from Lava Falls to Pearce Ferry
- Spawning is occurring above Lava Falls
- RBS are present at 32 of 50 sites
- The April distribution is skewed to downstream
- Spawning had occurred prior to the first (April) sampling effort
- HBC are present throughout the study area from Lava Falls to upstream of Pearce Ferry
- HBC were present at 27 of 50 sites
- Distribution increased monthly
- HBC are in samples throughout the study period

Recommendations:

- Continue small-bodied and larval fish sampling within the LGC.
 - Consider spatial (upstream) and temporal (earlier) expansion of larval study
- Discuss options for determining the extent of spawning
 - Age larval fish using otoliths
 - Determine spawning dates
 - Correlate with flow and water temperature

Budget – GCMRC and BOR for FY2016

- Reclamation Overview (**Attachment 5a**) – Mr. Glen Knowles. The FY 2016 budget needs to be approved and a recommendation developed on the June 11 webinar. The FY 2016-17 budget:

Fiscal Year	Budget	Reclamation Portion	GCMRC Portion
2016	\$11,077,616 (3% CPI)	\$2,180,075	\$8,897,541
2017	\$11,409,944 (3% CPI)	\$2,245,477	\$9,164,467

- GCMRC Budget (**Attachment 5b**) – Mr. Scott VanderKooi. The following was provided

Fiscal Year	Proposed Budget	Anticipated AMP Funding	USGS/SBSC/GCMRC Indirect Cost Rates
2016	\$9.9 million	\$9.1 million	21.3%
2017	\$9.8 million	\$9.3 million	27.4%

- There are shortages in the budget. Monitoring and research activities are prioritized however some of projects are shortened, start times are delayed, and some are removed from GCDAMP funding. Money may be saved through the FY 16-17 workplan as a result of shortfalls in the outyears.
- GSA renegotiated the GCMRC lease with the City of Flagstaff. The lease rates won't go up until they move into the new building. The burden rate will remain around 13% for FY15-16. It's unsure what the rate will be for FY17 because it will depend on when the move occurs, but is currently projected for 27%. There could be cost savings of approximately \$150,000 for FY15 and \$500,000 for FY16.

GCMRC: Socioeconomics Studies (Attachment 6) – Mr. Scott VanderKooi. As part of the Triennial BWP, there are three separate elements focused on:

- Project 13.1 - Economic values of recreational resources in GLCN and GRCA. Anytime the Federal Government proposes to survey the public for information, an OMB process is required. The Federal Register notice announcing the intent ended about a month ago. There have been questions and comments from stakeholders and Lucas Bair has responded to those. Lucas is currently gathering contact information for recreational users.
- Project 13.2 - Tribal perspectives for values of resources downstream of GCD. Gathering information from tribes and tribal members is sensitive, more groundwork is necessary and the start date postponed. Lucas continues to work with the tribes.
- Project 13.3 - Applied decision methods for the GCDAMP. Lucas is working with Dr. Charles Yackulic on development of a bioeconomic model to identify the economically preferred management strategy for established nonnative fish in relation to HBC survival.

Lake Mead Water Quality (Attachment 7) – Dr. Todd Tietjen. The Southern Nevada Water Authority was founded as a cooperative agency in 1991. Water quality at Lake Mead is pretty good. However, last summer there were dissolved oxygen (DO) issues. In the past, the conditions in the Colorado River have replenished much of the oxygen during years without complete mixing. Oxygen is of interest to other stakeholders (LMNRA, NDOW, etc.) as there are water quality standards to be met, and the SNWA drinking water treatment process is optimized to treat oxygenated waters. In 2014 temperatures were much warmer which due to the density of the inflowing river water placement in the lake. The warmer water kept the Colorado River water at the surface for a longer period of time. By mid-May 2014 low oxygen conditions started occurring but the cold water from the river replenished the oxygen. By June the DO percent saturation was down in the low 20% and by the end of the month the first anoxic measurements were recorded. This continued for the next several months, it started to improve by September due to lake cooling but in October there was still an extensive reach with low DO concentrations. By December things improved except the Colorado River water was not moving to the bottom of the lake. This could compound the problem this year because starting at 40% rather than 60-80%, makes it more likely to reach anoxic conditions. With warmer river temperatures, either through drought, regional warming and climate change or through experimental manipulation, this is likely to continue.

Conclusions:

- Upstream temperatures can have significant impacts on DO concentrations in Lake Mead
- Cold river temperatures can alleviate or reduce low DO conditions
- Higher river temperatures keep the Colorado River higher in the water column
- Significant repeated anoxic conditions in upper Lake Mead have the potential to significantly alter phosphorous dynamics

Proposed AMP Socioeconomics Program (Attachment 8) – Ms. Leslie James. In 2013 and 2014, four aspects of economic analysis moved forward through the LTEMP EIS process:

- a regional impact analysis under Argonne National Laboratories (ANL)
- an economic analysis of the net value of recreation led by Dr. David Harpman (USBR)
- an economic analysis of hydropower at ANL
- a non-use value survey led by Dr. Bruce Peacock (NPS)

A socioeconomics program that includes recreation, tribal and decision analysis, led by Mr. Lucas Bair (GCMRC), has been in the FY 2015-17 Triennial Work Plan. The SEAHG is currently evaluating and updating the current activities and status of Table 1 and 2. The TWG has reviewed the Information Needs and Program Elements of the AMP socioeconomic program as updated 2/6/15 and presented to AMWG on 2/26/15. The TWG recommends that the SEAHG and GCMRC: (a) continue to provide, develop and recommend information to the TWG on implementation of the AMP socioeconomic program, including status, costs and timing of the program elements, and (b) work with AMP stakeholders and who

may be conducting socioeconomic analyses in other forums, to enhance collaboration on AMP socioeconomic program information.

Traditional Ecological Knowledge – Ms. Sarah Rinkevich. Referring to the paper, “Problems with Integrating Traditional Ecological Knowledge into Contemporary Resource Management” (**Attachment 9a**), the author points out the question should not be so much as “how” to integrate TEK into resource management but how to integrate the TEK “holders.” She suggested the TWG think about that concept.

- Southern Paiute Vegetation and Cultural Resource Monitoring Program (**Attachment 9b**) – Mr. Charley Bullets. Eighteen sites were monitored on separate trips. Monitoring includes the elders observations of the scenery, plants, nutrients and the surrounding area. Results from four consecutive monitoring trips in South Canyon show an increase in sediment as well as a vegetation change and the effects of the tamarisk beetle.
- Using TEK and Historical/Repeat Photographs to Monitor Ecological Change along the River Corridor – Mr. Peter Bungart. The Hualapai monitoring trips involve checking on archaeological sites, providing opportunity for new participants to learn about the canyon, and visiting plant gathering places. Since the HFE Protocol was implemented, it also includes the HFEs effect. TEK has been passed through generations and it integrates the TEK holders in determining how they can actively participate in helping make management decisions and return to being stewards of the land. Photo matching has been done since the early 1970s and most recently includes HFE effects.
- GCMRC Project 12 (**Attachment 9c**) – Ms. Helen Fairley. Plants have cultural, biological and scientific values. Native Americans traditionally used (and still rely on) plants for food, medicine, ceremonies and utilitarian items. Plants contribute to the value of many Traditional Cultural Properties. Project 12 attempts to link TEK with western science through compiling a variety of existing information that documents changes in the abundance and distribution of culturally-valued riparian plants of mutual interest to tribes and scientists, then assesses how those changes affect TCPs and other cultural values.

Public Comment: None

Adjourned: 4 p.m.

Glen Canyon Dam Technical Work Group Meeting

April 21-22, 2015

Conducting: Vineetha Kartha, TWG Chair
Shane Capron, TWG Vice-Chair

Convened: 8:10 a.m.

Committee Members/Alternates Present:

Jan Balsom, NPS/GRCA

Cliff Barrett, UAMPS

Charley Bullets, So. Paiute Consortium

Kerry Christensen, Hualapai Tribe

Kevin Dahl, National Parks Conservation Assn.

Bill Davis, CREDA

Kurt Dongoske, Pueblo of Zuni

Craig Ellsworth, WAPA

Evelyn Erlandsen, State of Arizona

Paul Harms, State of New Mexico

Loretta Jackson-Kelly, Hualapai Tribe

John Jordan, Int'l Federation of Fly Fishers/TU

Glen Knowles, Bureau of Reclamation

Ted Kowalski, Colo. Water Conservation Board

Jerry Myers, Federation of Fly Fishers

Jessica Neuwerth, State of California

Don Ostler, representing Wyoming & New Mexico

Larry Stevens, Grand Canyon Wildlands Council

Bill Stewart, Arizona Game and Fish Dept.

Jason Thiriot, State of Nevada

Michael Yeatts, Hopi Tribe

Kirk Young, FWS

Committee Members Absent:

Kerry Christensen, Hualapai Tribe

Jerry Lee Cox, Grand Canyon River Guides

Chris Harris, State of California

Chip Lewis, Bureau of Indian Affairs

Robert King, State of Utah

Steve Wolff, State of Wyoming

Grand Canyon Monitoring and Research Center:

Helen Fairley, Social Scientist

Kyrie Fry, Communications Coordinator

Scott VanderKooi, Biology Program Manager

Interested Persons

Brandon Albrecht, Bio-West

Mark Anderson, NPS (phone)

Mary Barger, Bureau of Reclamation

Rob Billerbeck, NPS (phone)

Howard Brandenburg,

Peter Bungart, Hualapai Tribe

Bill Chada, Bureau of Reclamation

Marianne Crawford, Bureau of Reclamation

John Hamill, Int'l Federation of Fly Fishers/TU

Brian Healy, NPS

Beverley Heffernan, Bureau of Reclamation

Leslie James, CREDA

Ora Marek-Martinez, Navajo Nation

Mark McKinstry, Bureau of Reclamation

Lisa Meyer, WAPA (phone)

Joe Miller, Trout Unlimited

Clayton Palmer, WAPA (phone)

Jenika Raub, Salt River Project (phone)

Dr. Sarah Rinkevich, Joint Tribal Liaison

Seth Shanahan, SNWA

Carol Silva, Center for Energy, Security
& Society (phone)

Hank Jenkins-Smith, Center for Energy,
Security & Society (phone)

Rosemary Sucec, NPS (phone)

Todd Tietjen, SNWA

Meeting Recorder: Linda Whetton

Welcome and Administrative: Ms. Kartha welcomed the members and the public. Introductions were made and a quorum determined. With three critical items for discussion at the next TWG meeting (2016 budget, 2016 hydrograph, and TWG Chair election), it was decided to hold the meeting via a webinar on June 11.

Hydropower Non Market Study (Attachment 10a) – Mr. Hank Jenkins-Smith. Hydropower is broadly perceived to be a stable, domestic, and renewable form of energy, yet studies of social preferences indicate there is a willingness to pay to *reduce* reliance on hydropower. GCD was proposed as a basis for evaluating assets on valuation of nonmarket effects with changes in GCD operations. A pilot study demonstrates the public willingness to pay for changes in dam operations is more complex than has been portrayed in earlier CV studies. Prior measures of non-market and non-use values for changes in the operation of the GCD may have substantially over-estimated public WTP for such changes. A broader implication is that the characterization and measurement of non-market values for hydropower

operations, and for the operation of the systems of generators on dams in major U.S. rivers, will require an approach that recognizes that operations have institutional arrangements which communities and individuals have adapted to. Changes may disrupt communities, their ways of life, and may therefore engage societal non-market values in ways not captured in traditional studies. If policy makers are to take into account fairness and the social externalities associated with those communities that have adapted to existing institutional arrangements of management of modern rivers, a more balanced and inclusive approach of measurement of non-market values is required.

Non Market Values Hydropower & Water – Mr. Clayton Palmer. The SEAHG identified a need for information on market, non-market and non-use values associated with Glen Canyon electrical power. On August 12, 2012, LTEMP co-leads sent a letter that "... There are a few studies that the team envisions a role for . . . such as a non-use survey for hydropower. . ." Western tasked Dr. John Loomis to explore the economic theory of the basis for non-market values of hydropower and water including a literature search on research related to non-market values for hydropower and water. Western also tasked the University of Oklahoma and Sandia National Laboratory with: (1) The conceptual development of key concerns about the basis for understanding and measuring non-market values for hydropower, and (2) An analytical report based on OU Data that evaluates the implications of these key concerns and variations in non-market valuations of hydropower. Western provided a report (**Attachment 10b**) which was peer reviewed by GCMRC. Western is now engaged in further exploration and the implications of evaluating hydropower. A summary will be provided for the LTEMP EIS as well as additional work relative to the dollars obligated on a task as described to Sandia National Laboratories. A science plan will be developed for further study.

ACTION ITEM: A SEAHG conference call will be arranged with Mr. Jenkins-Smith before the next AMWG meeting to field additional questions on his study. Time will also be set aside for a Project 13.3 update from Lucas Bair and Charles Yackulic.

Glen Canyon Tailwater Fishery – Integrating Fish and Channel Mapping Data (**Attachment 11**) – Dr. Ted Melis.

- Channel topography collected during Nov 2014 HFE. Additional data are still being collected and merged with Project 3 to fill in "holes."
- Topography from a greater height in the 2009 overflight showed imagery after vegetation was removed.
- Two data sets must be merged for a full channel topographic map (yet to be completed in 2015) and the project should be completed in 2015.

The multi-beam crew collected data in the "hidden slough" area. Approximately 95% of the channel has been imaged using the multi-beam system. Additional line-by-line editing of the data is required to get rid of artifacts and errors, but for the most part this data set is considered very clean and should be ready to work with in summer 2015. The data will be used to help design experimental hydrographs for LTEMP trout management flows. Side-sonar may be used to map bed textures in the tailwater fishery segment and aquatic vegetation in Glen Canyon.

Conclusions:

- Channel Mapping- fish & flow modelling is progressing toward answering integrated management questions
- Lees Ferry tailwater fishery - trout abundance & condition is influenced by dam operations & downstream movements
- Achieving sediment conservation objectives in Marble Canyon may be an effective strategy for mitigating trout below Lees Ferry by retaining new fine sediment and avoiding sand deficits.
- Flows that promote sandbars and limit sand export during periods of higher average sand inputs & lower average annual dam releases (2013-14) appear to have limited larger rainbow trout success in Grand Canyon.
- Warmer fall water temperatures, sandier channel bed areas, and more turbidity in fall/winter is associated with recent declining trout downstream

Trout Individual Based Model (IBM) (Attachment 12) – Dr. Kirk LaGory. The IBM was developed by Steve Railsback of Humboldt State University and Bret Harvey with the USFS. It has been applied successfully to a number of fisheries-related problems within the Colorado Basin. The benefits of IBM models are: (1) they can identify critical uncertainties that affect model results, (2) help understand consequences of beliefs and assumptions, (3) aid in planning adaptive management experiments and foresee consequences, and (4) guide designing good management policies. The application of inSTREAM-SD was originally developed at Flaming Gorge Dam as a tool to address ongoing management issues such as the effects of fluctuations on trout, effects of winter double-peaking on trout, and how the effects vary with the hydrologic condition. Initial simulations prompted development of a 5-year study plan to perform analysis of condition data from 1990-2014 to examine effects of flows on condition, test effects of fluctuation on drift abundance and foraging behavior and diet. The results of the study were used to change operations and update the model. The inSTREAM-SD could be used at GCD to evaluate a number of effects of equalization flows on trout production, effects of LSSF on trout production, effects of HFEs on trout production, and understanding factors leading to current population status.

Next steps:

- Determine level of interest in application at Glen Canyon
- Can the model be modified for application at the Glen Canyon scale?
- Identify reaches of interest within Glen Canyon
- Assess availability of data
- Identify important modeling questions to be addressed by the model

GCMRC’s Online Mapping and GIS Resources (Attachment 13) – Mr. Tom Gushue, GIS Coordinator at GCMRC. The GIS team has been involved in fisheries work, geomorphology, sandbar monitoring, and photogrammetry of 1984 B&W aerial photography. Cross-referencing fish data from 10-15 years ago has supported fish monitoring efforts. Additional information can be found at:

ScienceBase Data Catalog (USGS)	https://www.sciencebase.gov/catalog/item/55366b
Links to custom, web-based applications that highlight GCMRC science	http://www.gcmrc.gov/dasa/
Web accessible folder for downloading	http://www.gcmrc.gov/geospatial/data/

Recent Trout Data from Lees Ferry (Attachment 14) – Mr. Bill Stewart. Last October the AZGFD received calls about dying fish at Lees Ferry. Long-term monitoring has been done since 1991 and the entire length of Lees Ferry is surveyed three times a year. Lake Powell turns over about the end of November and the dissolved oxygen levels start to ramp up. Warmer water temperatures occurred this past fall and the DO levels started to get low and contributed to the fish dying at Lees Ferry.

Current Status:

- Spring e-fishing CPUE declining since 2012, but still above mid-2000 levels
- Spring fish condition lowest since 1991
- Anger catch rates dropping, but still high for boat anglers, low for walk-in anglers

Lees Ferry and Marble Canyon Rainbow Trout Update – Mr. Scott VanderKooi

Preliminary Findings:

- Rainbow Trout
 - Decline in abundance at all Natal Origins sampling reaches (Sept. 2014 – Jan. 2015)
 - Low redd counts to date, similar to 2010
 - >80 % decline in abundance in Glen Canyon since spring 2012
 - Initially due to declines in numbers of small fish, but recent changes due to fewer large fish
- Initial observations from April trip
 - Continued declines in catches in most reaches; greatest change upstream, little change near LCR confluence
 - Apparent shift in size/age structure, now dominated by small/young fish
 - Condition of smaller fish appears to be good, need to review data to confirm

Lees Ferry Recreational Trout Fishery (Attachment 15) – Mr. John Hamill. Two years ago recreational fishing interests involved in this program recognized the need for a Lees Ferry trout fishery plan. The NPS CFMP provided some goals recognizing the importance of the fishery and allowing for stocking under certain conditions but it didn't include enhancement or maintenance of a quality trout fishery. There may have been jurisdictional issues among the federal agencies that prevented developing a plan, consequently the recreational fisheries decided something had to be done. In consultation with AZGFD, GCMRC, and the Lees Ferry guides, goals and a set of recommendations were developed.

Conclusions:

- Proactive effort to identify actions to maintain/enhance the trout fishery without impacting native fish downriver.
- Recommendations effectively balance Colorado River resource values below Glen Canyon Dam
- Tier off the NPS Fishery Plan and GCD AMP Desired Future Conditions
- Plan will guide input to the EIS and Fish and Wildlife Coordination Act Report
- A draft plan will be available for review by May 1, and finalized by June 15.

The AZGFD will incorporate this plan into their management plan and take to the Arizona Game and Fish Commission.

Concerns:

- Be careful about considering equalization flows and spring HFEs in a future plan when recruitment can't be controlled.
- Document and systematically identify what the habitat needs are and determine if those conditions are available. Information isn't in the literature.
- Need to look at other methods than mechanical removal.
- Jurisdiction with the NPS is there; the recommendations seem to be in conflict.
- Two recommendations have management actions that go against Zuni values in the Canyon. Trout reproduction in Lees Ferry is encouraged, but how will they be kept there?
- If the young fish are doing well how long do we wait to see if the population is coming back?

Public Comment: None

Adjourned: 2:20P

Next Meeting:

(Th) June 11, 2015 via webinar
11AM MDT and 10AM AZ Time

Respectfully submitted,

Linda Whetton
Upper Colorado Region
Bureau of Reclamation

Key to Glen Canyon Dam Adaptive Management Program Acronyms

ADWR – Arizona Dept. of Water Resources	HMF – Habitat Maintenance Flow
AF – Acre Feet	HPP – Historic Preservation Plan
AGFD – Arizona Game and Fish Department	IG – Interim Guidelines
AIF – Agenda Information Form	INs – Information Needs
AMP – Adaptive Management Program	KA – Knowledge Assessment (workshop)
AMWG – Adaptive Management Work Group	KAS – Kanab Ambersnail (endangered native snail)
AOP – Annual Operating Plan	LCR – Little Colorado River
ASMR – Age-Structure Mark Recapture	LCRMCP – Lower Colorado River Multi-Species Conservation Program
BA – Biological Assessment	LTEMP – Long-Term Experimental and Management Plan
BAHG – Budget Ad Hoc Group	LTEP – Long Term Experimental Plan
BCOM – Biological Conservation Measure	MAF – Million Acre Feet
BE – Biological Evaluation	MA – Management Action
BHBF – Beach/Habitat-Building Flow	MATA – Multi-Attribute Trade-Off Analysis
BHMF – Beach/Habitat Maintenance Flow	MLFF – Modified Low Fluctuating Flow
BIA – Bureau of Indian Affairs	MO – Management Objective
BO – Biological Opinion	MRP – Monitoring and Research Plan
BOR – Bureau of Reclamation	NAU – Northern Arizona University (Flagstaff, AZ)
BWP – Budget and Work Plan	NEPA – National Environmental Policy Act
CAHG – Charter Ad Hoc Group	NHPA – National Historic Preservation Act
CAP – Central Arizona Project	NNFC – Non-native Fish Control
GCT – Grand Canyon Trust	NOI – Notice of Intent
CESU – Cooperative Ecosystems Studies Unit	NPCA – National Parks Conservation Association
cfs – cubic feet per second	NPS – National Park Service
CFMP – Comprehensive Fisheries Management Plan	NRC – National Research Council
CMINS – Core Monitoring Information Needs	O&M – Operations & Maintenance (USBR Funding)
CMP – Core Monitoring Plan	PA – Programmatic Agreement
CPI – Consumer Price Index	PBR – Paria to Badger Creek Reach
CRBC – Colorado River Board of California	PEP – Protocol Evaluation Panel
CRAHG – Cultural Resources Ad Hoc Group	POAHG – Public Outreach Ad Hoc Group
CRCN – Colorado River Commission of Nevada	Powerplant Capacity = 31,000 cfs
CRE – Colorado River Ecosystem	R&D – Research and Development
CREDA – Colorado River Energy Distributors Assn.	RBT – Rainbow Trout
CRSP – Colorado River Storage Project	RFP – Request for Proposal
CWCB – Colorado Water Conservation Board	RINs – Research Information Needs
DAHG – Desired Future Conditions Ad Hoc Group	ROD Flows – Record of Decision Flows
DASA – Data Acquisition, Storage, and Analysis	RPA – Reasonable and Prudent Alternative
DBMS – Data Base Management System	SA – Science Advisors
DOE – Department of Energy	Secretary – Secretary of the Interior
DOI – Department of the Interior	SCORE – State of the Colorado River Ecosystem
DOIFF – Department of the Interior Federal Family	SHPO – State Historic Preservation Office
EA – Environmental Assessment	SOW – Statement of Work
EIS – Environmental Impact Statement	SPAHG – Strategic Plan Ad Hoc Group
ESA – Endangered Species Act	SPG – Science Planning Group
FACA – Federal Advisory Committee Act	SSQs – Strategic Science Questions
FEIS – Final Environmental Impact Statement	SWCA – Steven W. Carothers Associates
FRN – Federal Register Notice	TCD – Temperature Control Device
FWS – United States Fish & Wildlife Service	TCP – Traditional Cultural Property
FY – Fiscal Year (October 1 – September 30)	TEK – Traditional Ecological Knowledge
GCD – Glen Canyon Dam	TES – Threatened and Endangered Species
GCES – Glen Canyon Environmental Studies	TMC – Taxa of Management Concern
GCT – Grand Canyon Trust	TMF – Trout Management Flows
GCMRC – Grand Canyon Monitoring & Research Center	TWG – Technical Work Group
GCNP – Grand Canyon National Park	UCRC – Upper Colorado River Commission
GCNRA – Glen Canyon Nat'l Recreation Area	UDWR – Utah Division of Water Resources
GCPA – Grand Canyon Protection Act	USBR – United States Bureau of Reclamation
GIS – Geographic Information System	USFWS – United States Fish & Wildlife Service
GLCA – Glen Canyon Nat'l Recreation Area	USGS – United States Geological Survey
GRCA – Grand Canyon National Park	WAPA – Western Area Power Administration
GCRG – Grand Canyon River Guides	WY – Water Year
GCWC – Grand Canyon Wildlands Council	
HBC – Humpback Chub (endangered native fish)	
HFE – High Flow Experiment	