

# **Glen Canyon Dam Adaptive Management Work Group Webinar May 22, 2019**

**Start Time:** 9:00 am MDT

**Conducting:** Tim Petty, Assistant Secretary for Water and Science, Department of the Interior and Secretary's Designee

**Facilitator:** Mary Orton, The Mary Orton Company, LLC

**Recorder:** Rosana Nesheim, Galileo Project, LLC

## **Motions**

### **Motion to Approve March 6-7, 2019 Meeting Minutes**

Steve Wolff moved, and Vineetha Kartha seconded, a motion to approve the minutes as they were distributed on May 20, 2019. There was no objection to approving the minutes by consensus.

## **Action Items**

- AMWG members and alternates are invited to contact Sarah Rinkevich (Sarah\_Rinkevich@fws.gov) no later than May 31 with interest in this summer's Integrated GCDAMP Stakeholder River Trip. This trip will launch on July 25 and take out August 2.
- TWG will take up the issue of the HFE Assessment for further discussion and for a report in August to AMWG.

## **Presentations and Discussion**

Details of the presentations summarized below are included in PowerPoints and other documents available on the AMWG website as noted below.

## **Welcome and Administrative**

**Presenter:** Tim Petty, Assistant Secretary for Water and Science, Department of the Interior and Secretary's Designee

## **Quorum and Introductions**

Mary Orton announced that a quorum was present with the attendance of AMWG members and alternates listed below in the Attendees section. Other attendees introduced themselves. Dr. Tim Petty, AMWG Secretary's Designee, introduced the newly appointed Adaptive Management Group Chief and Glen Canyon Adaptive Management Program Manager Lee Traynham. Lee has previously provided support to the Office of the Assistant Secretary for Water and Science and has a background in technical and public policy.

## **Approval of March 6-7, 2019 Meeting Minutes**

Steve Wolff moved, and Vineetha Kartha seconded, a motion to approve the minutes as they were distributed on May 20, 2019. There was no objection to approving the minutes by consensus. The final version of the notes is available on the [AMWG website](#).

## **Action Item Tracking Report**

Lee Traynham reported that three action items had been marked "closed" after the last meeting and so will be deleted from the next iteration of the report. She reported that one name had been

submitted in response to the request for names of people who could address AMWG on the subject of hydropower in the greater context of regional energy, and that name will be followed up on for the August meeting. Of the remaining action items:

- Planning for the next 20 years of LTEMP is a high priority for Reclamation, and, now that the Adaptive Management Group Chief position has been filled, Reclamation intends to make substantive progress on this issue this fiscal year (by September 30, 2019).
- The temperature control paper should be sent to AMWG by the end of the fiscal year (by September 30, 2019).
- The HFE Assessment report will be made by GCMRC during today's meeting.
- Reclamation will send to the Secretary's Designee information on the \$95,000 in tribal support in the coming weeks and this issue will be reported on during the August AMWG meeting.
- AMWG members and alternates are invited to contact Sarah Rinkevich ([Sarah\\_Rinkevich@fws.gov](mailto:Sarah_Rinkevich@fws.gov)) no later than May 31 if they have interest in attending this summer's Integrated GCDAMP Stakeholder river trip, which will launch on July 25 and take out August 2.

### Attachment 1: Action Item Tracking Report

#### **Progress on Nominations and Reappointments**

Lee reported that there were no new appointments since several were announced at the March 2019 meeting. Reclamation has received many nomination packets and expects that all nominees will be responded to no later than June 2019. Shortly thereafter, a new Federal Register Notice for nominees will be opened. Applicants will have a 30-day window to respond with nomination packages. Brent Rhees added that the Federal Register Notice would contain instructions on how to submit nominations.

#### **Secretary's Designee's Guidance Document**

**Presenter:** Tim Petty, Assistant Secretary for Water and Science, Department of the Interior and Secretary's Designee

#### **Presentation Summary**

Tim Petty reminded the group he had proposed in March to issue a new guidance document for the AMWG, and said he would incorporate previous such documents from Assistant Secretaries Jennifer Gimbel and Anne Castle as those continue to be part of the record. The guidance document will address the TWP, the LTEMP Implementation Plan, and operational flexibility. He thanked those who had submitted suggestions for the document. He expects to issue a signed document in the next month or so and hopes to discuss it further at the August AMWG Meeting.

#### **Discussion/Q & A**

- Larry Stevens commented that the original intent of the guidance document was for the AMWG members and stakeholders to understand how much progress AMWG is making towards science and technical goals. He added that he would like to see the document emphasize the progress AMWG is making and what AMWG does or does not need to pursue in the future. Tim responded that he is working to incorporate progress on the science and lessons learned. The guidance document will also include future direction from the LTEMP, the Final EIS, and the ROD.
- Brent Rhees stated that he understands that, although the guidance document is addressed to himself as the Designated Federal Officer, Deputy Regional Director Kathy Callister as

Reclamation lead over the AMP, and Scott VanderKooi as Chief of GCMRC, the document would provide guidance and a path forward to the overall AMWG program.

## Basin Hydrology and Dam Operations

**Presenter:** Heather Patno, Hydraulic Engineer, Bureau of Reclamation

### **Presentation Summary**

Although water year 2018 was the third driest water year for the basin, and water year 2019 started with dry conditions in January and February, the area is now significantly above average in SWE for this time of year. Now that we are in runoff, the SWE has declined significantly. Reservoir storage is greater than in 2018, and Upper Basin inflow forecasts for April to July 2019 are all above average.

The most probable unregulated inflow into Lake Powell is 12.13 maf, 111% of average. Releases in WY 2019 are projected to be in the upper elevation balancing tier and 9.0 maf at Lake Powell. The most probable Lake Powell elevation at the end of CY 2020 is 58% full.

Reclamation has started installing new transformers at Glen Canyon Dam and this installation will extend into 2020. Despite this, they will be able to meet equalization releases as required.

Heather showed the hourly release pattern with macroinvertebrate production (“bug”) flows patterns for May through August 2019, and the Lake Powell release temperature forecast and its implications for downstream temperatures.

### **Discussion/Q & A**

- Brent Rhees asked if the forecasted elevations for Lake Mead account for the Drought Contingency Plan (DCP), which had been signed two days prior by the seven Basin States. Heather responded that the current forecasted elevations do not; however, Reclamation will incorporate it into the 24-month study projections going forward.

### **Attachment 2: Basin Hydrology and Operations PowerPoint**

## Proposed FY 2020 Budget and Work Plan

**Presenters:** Vineetha Kartha, State of Arizona, Technical Work Group Vice Chair; Lee Traynham, Chief, Adaptive Management Group, Bureau of Reclamation; and Scott VanderKooi, Chief, Grand Canyon Monitoring and Research Center

### **Presentation Summary**

Vineetha explained that TWG’s job is to develop, for recommendation to the AMWG, a three-year budget and work plan that is responsive to the guiding principles and documents of the GCDAMP, and then recommend to AMWG any adjustments to the second and third years. Budgets and subsequent adjustments are then considered by AMWG for recommendations to the Secretary. AMWG recommended to the Secretary the three-year, FY 2018-20 budget and work plan in June 2017; the program is now approaching the third year of that budget cycle when some adjustments might be anticipated. The BAHG and TWG have been working with Reclamation and GCMRC to consider those possible adjustments. The BAHG began its review in April and will continue with a goal of forming a recommendation for the TWG to consider. The TWG will then provide the recommendation to the AMWG in time for its August meeting.

Lee stated that the GCDAMP budget landscape has changed since the three-year budget and work plan was approved in 2017. The program is now working with appropriated dollars, which mean significant changes:

- A budget request is required three years in advance.
- GCMRC and Reclamation must spend or obligate all funds by the end of each fiscal year; the program can no longer roll excess funds into, nor carry over funds in, the Native Fish Contingency Fund or the NHPA Section 106 Contingency Fund.
- Funding will no longer automatically increase based on the CPI.
- A continuing resolution in the absence of a signed federal budget will impact the program.

Reclamation requested over-target appropriated funds for the GCDAMP, of which 20% would go to Reclamation and 80% to GCMRC. The President released his FY 2020 budget in March, and the amount for Reclamation is consistent with what was in the FY 2020 budget and work plan approved in 2017. Congress still needs to appropriate the funding. Lee presented the numbers requested for the program and how the funding would be divided into the various Reclamation line items.

Scott reviewed the projects GCMRC expects to fund during FY 2020. He then reviewed proposed changes from the budget approved in 2017. With regard to anticipated increases in USGS overhead rates due to GCMRC's move into a newer building, GCMRC expects to occupy the new building in Fall 2021 and its overhead rates will increase at that time—later than anticipated. With the resulting funds availability for FY 2020, GCMRC will propose increased salaries to retain key capacity and staffing levels for some projects, as well as some increases to cooperative agreements to partially offset previous reductions. GCMRC's proposed budget also acknowledges that the native fish contingency fund and other projected carry-over funds will likely be unavailable.

### **Discussion/Q & A**

- Larry Stevens asked if GCMRC is responsible for information management and presentation of the Lake Powell water quality program despite it not being directly part of GCMRC's operation. Scott responded that work is funded outside of the AMP, and GCMRC and Reclamation have joint information management and reporting responsibility.
- Steve Wolff asked if it was true that the House version of the current budget moved the GCDAMP back to funding from hydropower revenues, and whether, if that passed, that would change the budget scenario. Lee said it was true, but that the Senate had not yet released its version. If a reconciled budget signed by the President contains hydropower funding, that might change how GCDAMP looks at its budget for FY 2020. Lee said the link in slide five of the budget presentation PowerPoint takes the user to the House version of the draft budget and section 307 contains that information. Brent Rhees commented that it is good news that the President and Congress are aware of the need and are looking for solutions, and expressed hope that the House and Senate would come together to develop legislation to fund the program. He added that, although a change to hydropower revenues would not likely impact Reclamation, the impacts might be more significant for WAPA and GCMRC. Scott stated that if that provision passes, GCMRC would return to the flexibility associated with the hydropower revenues.
- Leslie James asked whether the Trout Management Flow project was specific to the Josh Korman contract. Scott responded that some of that project was to be done by GCMRC and some by Josh Korman.

[Attachment 3: FY 2020 Proposed Budget PowerPoint](#)

## Update on Macroinvertebrate Production Flows ('Bug Flows')

**Presenters:** Ted Kennedy, Grand Canyon Monitoring and Research Center; and Emily Omana Smith, Biologist, Adaptive Management Group, Bureau of Reclamation

### **Presentation Summary**

Emily provided an overview of the process for evaluating, planning for, and implementing experiments as outlined in the LTEMP ROD. For 2019, Reclamation considered the following three scenarios: 1) No experiments; 2) Bug Flows from May to August; and 3) Trout Management Flows (TMF) from May to August. The Implementation/Planning Team recommended a second year of Bug Flows, which DOI approved on April 24. The Team considered TMF but did not recommend them for 2019 due in part to the potential for confounding effects with the bug flows experiment. GCMRC agreed to continue research to inform experimental design of possible future TMF, and Reclamation agreed to partner with USFWS to convene a technical team to further discuss the possibility of such flows in the future.

Ted reported that, during the 2018 bug flows, GCMRC observed a four-fold increase in caddisfly numbers throughout the Grand Canyon with the use of citizen science light-trapping data. GCMRC also observed higher emergence of adults on weekends vs. weekdays in Glen Canyon, with the same pattern observed in the larger Grand Canyon. Steady flows on weekends (bug flows) facilitated the emergence of adult life stages that were targeted.

GCMRC will continue bug flows, with a similar experimental design, every weekend from May through August 2019. GCMRC expects to continue using citizen light-trapping data sets and to monitor drift throughout the Grand Canyon during May and September river trips. During the May 2019 river trip, Ted observed that bug activity was low to modest in downstream areas, and speculated that might have been partially due to foul weather; however, GCMRC confirmed higher emergence rates in upstream areas in Glen Canyon. GCMRC expects to have Lees Ferry data available for the June TWG meeting and is planning additional intensive weekday-weekend studies at Lees Ferry from June 13 to 17 and from August 22 to 26.

### **Discussion/Q & A**

- There were no questions or additional discussion.

**Attachment 4: 2019 Bug Flows: LTEMP Planning Process and Preliminary Observations PowerPoint**

## High Flow Experiment Assessment

**Presenter:** Scott VanderKooi, Chief, Grand Canyon Monitoring and Research Center

### **Presentation Summary**

At the August 2018, GCMRC agreed to do the following:

- (1) conduct a scientific assessment of the effects of past experimental high flows (including powerplant capacity flows) at Glen Canyon Dam on high valued resources of concern to the GCDAMP (i.e., recreational beaches, aquatic food base, rainbow trout fishery, hydropower, humpback chub and other native fish, and cultural resources); and*
- (2) present initial findings in a written summary at the 2019 Annual Reporting Meeting and the March 2019 AMWG meeting for review and discussion.*

*A next step would be for GCMRC to identify experimental flow options that would consider high valued resources of concern to the GCDAMP (defined above), fill critical data gaps, and reduce scientific uncertainties.*

Scott reported that since the 2012 HFE protocol, GCMRC has analyzed five events. He reported on the HFE assessment panel discussion that occurred in March at the Annual Reporting Meeting. He reviewed the impact of dam operations and HFEs, including results and implications, on a variety of key resources including sediment and water quality, sandbars, riparian vegetation, archeological sites, aquatic ecology (food base), native and non-native fish including humpback chub, rainbow and brown trout, and socioeconomics and hydropower. (See details in the PowerPoint presentation referenced below.)

The detailed reports from the Annual Reporting Meeting will be made available once GCMRC ensures 508 accessibility. Once all presenters' peer-reviewed abstracts are approved for posting—expected shortly—GCMRC will make all abstracts available.

Scott suggested that there be discussion at the June TWG meeting for the last part of the action item. This reads, “A next step would be for GCMRC to identify experimental flow options that would consider high valued resources of concern to the GCDAMP..., fill critical data gaps, and reduce scientific uncertainties.”

#### **Discussion/Q & A**

- Jan Balsom commented that she is encouraged by the results of the HFEs, particularly the sand issues, which appeared to be consistent with predictions. Jan added that she appreciated Scott including HFE implications in his presentation. She stated that GCMRC might need to start thinking about assessing equalization flows, which have different effects and are an opportunity for more in-depth reviews. She thought it was important to think about how GCDAMP could best use lower volumes to produce resource benefits. Scott agreed that it was important to think about operations in a broad sense, and that each HFE can have its own consequences and impact different resources in different ways. He added that it was important to continue thinking about projected experiments and to be prepared to monitor and understand the effects of different dam operations.
- Larry Stevens thanked Scott for the presentation. He stated that one of the original goals of the HFEs was to modify shallow shoreline environments for the benefit of native fish. He said that he was aware the fall timing of HFEs did not allow young native fish to use those shoreline environments and wondered if GCMRC had come across any evidence that shoreline modification was an effect of HFEs. Scott responded that it was, but the effect was temporary. One of the original goals of the HFEs was to provide backwater habitats for humpback chub with the belief that it was a critical habitat for the survival of young fish in the Colorado River; however, GCMRC has since observed that a lot of the species are flexible in terms of habitat selection, using a variety of available habitats. Therefore, they believe that backwater habitats are not as important as originally thought. Scott stated that under hydropower operations, there are daily variations and daily tides; therefore, many habitats are ephemeral, even on a daily basis.
- John Hamill thanked Scott for the presentation and for putting the HFE assessment together on short notice. He was encouraged to see the results, and he noted that the angling community continues to believe in the benefits of spring HFEs and in the additional testing of spring flows. John asked if GCMRC and TWG needed additional direction for pursuing discussions on the action item. Scott said he thought starting those discussions with TWG would be beneficial, and added that TWG Chair Seth Shanahan had included it in the draft June TWG meeting agenda.

- Rob Billerbeck asked if the lack of a link between HFEs and brown trout would lead to new hypotheses and if there could be other dam operations related to brown trout population behavior not yet considered. Scott responded that GCMRC knew little about the brown trout population dynamics in Glen Canyon, and he would not be surprised if many factors are influencing those populations. Scott added that GCMRC is trying to learn more and is working with NPS to accelerate learning through marking and releasing fish. Scott thought it would take several years to understand what factors drove these populations.

Tim Petty thanked Scott, and asked AMWG if there were any objection to the TWG following up on the remaining items in the action item. There was none. Vineetha Kartha clarified that a report on this item would be included in the TWG chair report at the AMWG August meeting.

#### [Attachment 5: High Flow Experiment Assessment Summary PowerPoint](#)

### AMWG Next Steps

**Presenter:** Tim Petty, Assistant Secretary for Water and Science, Department of the Interior and Secretary's Designee

#### **Presentation Summary**

The next AMWG meeting is scheduled for August 21-22, 2019, in Flagstaff, Arizona, venue to be determined. GCMRC will prepare a no-host barbeque for meeting participants the evening of August 21. The major agenda topics are as follows:

- Recommendation to the Secretary on FY2020 budget and workplan
- HFE assessment report from TWG
- Basin hydrology and dam operations
- GCMRC science updates
- Stakeholder's Perspective
- Tribal Liaison Report

Members were requested to send any additional proposed agenda items to Lee Traynham (ltraynham@usbr.gov) by noon, June 19, 2019.

Lee reminded members who are interested in the participating in the Integrated Stakeholder River Trip to contact Sarah Rinkevich by May 31.

Tim said he was encouraged by the presentations and thanked all the presenters. He said he wanted to recognize Mary Orton's great work as she headed off to retirement. He noted she has been with the program for 20 years as facilitator, since 1999, and has worked with AMWG, TWG, and various ad hoc groups. She is a great moderator with valuable insights, thoughts, expertise, and analysis. She has moved the program along in ways that have greatly benefited the Grand Canyon. Her leaving is a loss to the program and she is welcome to come back any time.

Tim also offered his thanks to Brent Rhees, who is still trying to retire and who continues to respond to DOI's requests for him to stay. He will probably be retiring in the next few weeks. He has been the Upper Colorado Regional Director since 2015, and is concluding 39 years of federal service. He thanked Brent for all his many accomplishments.

### Public Comment

No public comments were offered.

**Meeting Adjourned at 11:55 am, MDT**

## Webinar Attendees

### AMWG Members and Alternates

Jan Balsom, NPS-GRCA  
Clifford Barrett, UAMPS  
Eric Bobelu, Pueblo of Zuni  
David Brown, GCRG  
Charley Bullets, Southern Paiute Consortium  
Kathleen Callister, Reclamation  
Kevin Garlick, UAMPS  
John Hamill, IFFF/Trout Unlimited  
Leslie James, CREDA  
John Jordan, IFFF/Trout Unlimited

Vineetha Kartha, State of Arizona  
Chip Lewis, Bureau of Indian Affairs  
John McCLOW, State of Colorado  
Tim Petty, Assistant Secretary of the Interior and  
Secretary's Designee  
Daniel Picard, Reclamation  
Brian Sadler, WAPA  
Larry Stevens, GCWC  
Steve Wolff, State of Wyoming

### USGS/GCMRC Staff

Helen Fairley  
Ted Kennedy  
David Lytle

Michael Moran  
Scott VanderKooi

### Bureau of Reclamation Staff

Tara Ashby  
Paul Davidson  
Brent Esplin  
Ron Klawitter  
Emily Omana Smith

Heather Patno  
Brent Rhees, Designated Federal Officer  
Shana Tighi  
Lee Traynham

### Interested Persons

Richard Begay, Navajo Nation  
Aubrey Bettencourt, DOI  
Rob Billerbeck, NPS  
David Braun, Science Advisors Executive Coordinator  
Peter Bungart, Hualapai Tribe  
Kelly Burke, GCWC  
Winkie Crook, Hualapai Tribe  
Kevin Dahl, NPCA  
Rene Fleming, City of St. George  
Michelle Garrison, Colorado Water Conservation  
Board  
Jessica Gwinn, USFWS  
Amy Haas, Upper Colorado River Commission  
Jeff Humphrey, USFWS  
Surabhi Karambelkar, University of Arizona  
Robert King, State of Utah  
Laurie Mangum, City of St. George  
Craig McGinnis, ADWR  
Lisa Meyer, WAPA  
Eric Millis, State of Utah

Rosana Nesheim, Galileo Project, LLC (recorder)  
Jessica Neuwerth, State of California  
Christina Noftsker, New Mexico Interstate Stream  
Commission  
Mary Orton, The Mary Orton Company, LLC  
(facilitator)  
Amy Ostdiek, State of Colorado  
Clayton Palmer, WAPA  
Theresa Pasqual, Joint Tribal Liaison  
Bill Persons, IFFF/Trout Unlimited  
Georgiana Pongyesva, Hopi Cultural Preservation  
Office  
Richard Powskey, Hualapai Tribe  
Kerry Rae, DOI  
Peggy Roefer, **Colorado River Commission of Nevada**  
**State of Colorado**  
William Shott, NPS-GLCA  
Rodney Smith, DOI Solicitor's Office  
Jim Stroger, IFFF/Trout Unlimited  
Kiel Weaver, DOI

## Abbreviations

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

**Glen Canyon Dam Adaptive Management Program: AMWG Webinar May 22, 2018**

TES – Threatened and Endangered Species  
TMC – Taxa of Management Concern  
TMF – Trout Management Flows  
TWG – GCDAMP Technical Work Group  
TWP – Triennial Budget and Work Plan  
UAMPS – Utah Associated Municipal Power Systems  
UCRC – Upper Colorado River Commission

UDWR – Utah Division of Water Resources  
USFWS – United States Fish & Wildlife Service  
USGS – United States Geological Survey  
WAPA – Western Area Power Administration  
WY – Water Year