

U.S. Department of the Interior  
Bureau of Reclamation  
Upper Colorado Basin Region



# Glen Canyon Dam Adaptive Management Program

## Glen Canyon Dam Adaptive Management Work Group Meeting

**Wednesday, February 9, 2022**  
**9:30 a.m. – 4:30 p.m. MST**

**Thursday, February 10, 2022**  
**9:30 a.m. – 4:30 p.m. MST**

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# Administrative Items

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## Meeting Packet Order

<b>Tabs</b>	<b>Documents</b>
	Packet Cover/Meeting Information
<b>Administrative Items</b>	<ul style="list-style-type: none"> <li>• Meeting Packet Order</li> <li>• Federal Register Notice</li> <li>• WebEx Participant Information</li> <li>• AMWG Ground Rules</li> </ul>
<b>AMWG Supporting Documents</b>	<ul style="list-style-type: none"> <li>• AMWG &amp; TWG Committee Membership List</li> <li>• AMWG Charter 2021</li> <li>• AMWG Operating Procedures</li> </ul>
<b>Draft Agenda</b>	<ul style="list-style-type: none"> <li>• Agenda for February 9 – 10, 2022 Meeting</li> </ul>
<b>Draft Minutes &amp; Action Items</b>	<ul style="list-style-type: none"> <li>• Draft Minutes from August 2021 Meeting</li> <li>• Action Item Tracking Report</li> </ul>
<b>Supplemental Materials</b>	<ul style="list-style-type: none"> <li>• Potential GCDAMP &amp; Other Meetings in 2022</li> <li>• Dr. Petty Memo – Program Guidance</li> <li>• TWP Process Document</li> <li>• LTEMP ROD Table 4 – Experimental Treatments</li> </ul>

Federal Register Notice:

<https://www.federalregister.gov/documents/2022/01/13/2022-00507/public-meeting-of-the-glen-canyon-dam-adaptive-management-work-group>

For updates, please see: <https://www.usbr.gov/uc/progact/amp/amwg.html>

## Participant WebEx Information

Topic: AMWG – Day 1

**Wednesday, February 9, 2022 – 9:30 am, Mountain Standard Time**

Event Number: 2764 737 4054

Event Password: Feb9

Event Address:

<https://rec.webex.com/rec/j.php?MTID=m2c4bb5a96cb62db32dbc28e2f608767e>

Phone #: 415-527-5035



Topic: AMWG – Day 2

**Thursday, February 10, 2022 – 9:30 am, Mountain Standard Time**

Event Number: 2764 343 6382

Event Password: Feb10

Event Address:

<https://rec.webex.com/rec/j.php?MTID=md4caa110511fe90f209f9c96705fa4c6>

Phone #: 415-527-5035

# Glen Canyon Dam Adaptive Management Work Group

## Ground Rules

- ✚ Arrive on time OR 10-15 minutes early to confirm WebEx connectivity and check your mic and audio settings.
- ✚ Remain MUTED when not actively speaking. Turn down cell phone ringers and other background sounds.
- ✚ Dial \*6 to unmute if joined via phone.
- ✚ Commit to FULL participation.
- ✚ Do homework before meeting begins.
- ✚ Use raise hand feature in WebEx or \*3 on phone.
- ✚ Always state your name and affiliation before making a comment.
- ✚ Be concise. Stick to the topic.
- ✚ Help keep the meeting on schedule.
- ✚ Note: The meeting is being recorded.



# AMWVG Supporting Documents

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# Glen Canyon Dam Adaptive Management Work Group

## Committee Membership List

(Updated: 1/26/2022)

SECRETARY'S DESIGNEE	ALTERNATE SECRETARY'S DESIGNEE	Designated Federal Officer
Wayne Pullan (Acting) Regional Director Upper Colorado Basin Regional Office Bureau of Reclamation 125 S. State Street, Room 8100 Salt Lake City, UT 84138 T: (801) 524-3606 F: (801) 524-3855 EM: <a href="mailto:wpullan@usbr.gov">wpullan@usbr.gov</a>	<b>VACANT</b>	Daniel Picard, Alternate Deputy Regional Director Upper Colorado Basin Regional Office Bureau of Reclamation 125 S. State Street, Room 8100 Salt Lake City, UT 84138 T: (801) 524-3602 F: (801) 524-3855 EM: <a href="mailto:dpicard@usbr.gov">dpicard@usbr.gov</a>

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3-NATIONAL PARK SERVICE (Grand Canyon National Park)	
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## Native American Tribes:

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<b>8-PUEBLO OF ZUNI</b>	
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VACANT (member)	

## Seven Basin States:

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12-CALIFORNIA	
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15-NEW MEXICO	
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16-UTAH	
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17-WYOMING	
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### Environmental Groups:

18-ENVIRONMENTAL GROUP	
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19-ENVIRONMENTAL GROUP	
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### Recreational Industry:

20-RECREATIONAL INDUSTRY	
David Brown (member) Grand Canyon River Guides P.O. Box 1934 Flagstaff, AZ 86002 T: (801) 694-1228 EM: <a href="mailto:bravedown@yahoo.com">bravedown@yahoo.com</a>	Ben Reeder (alternate) Grand Canyon River Guides 4507 South Russell Street Salt Lake City, UT 84117 T: 801-860-1070 EM: <a href="mailto:benreeder33@gmail.com">benreeder33@gmail.com</a>

21-RECREATIONAL INDUSTRY	
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22-FEDERAL POWER PURCHASE CONTRACTORS	
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25-DEPARTMENT OF ENERGY (DOE) – WESTERN AREA POWER ADMINISTRATION (WAPA)	
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**Glen Canyon Dam Adaptive Management Program  
 Technical Work Group  
 Membership List  
 (Updated: 1/26/2022)**

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<b>7-HOPI TRIBE</b>	
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<b>11-SAN JUAN SOUTHERN PAIUTE TRIBE</b>	
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15-NEVADA	
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17-UTAH	
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<b>18-WYOMING</b>		
<b>VACANT</b>	Charlie Ferrantelli (alternate, 10/25/18) State Engineer's Office 122 W. 25 <sup>th</sup> Street – Herschler Building 1E Cheyenne, WY 82002 T: (307) 777-6151 F: (307) 777-5451 EM: <a href="mailto:charlie.ferrantelli@wyo.gov">charlie.ferrantelli@wyo.gov</a>	Mel Fegler (alternate, 10/30/2021) State Engineer's Office 122 W 25 <sup>th</sup> Street Cheyenne, WY 82002 T: (307) 777-7803 EM: <a href="mailto:mel.fegler@wyo.gov">mel.fegler@wyo.gov</a>

**Environmental Groups:**

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<b>20-ENVIRONMENTAL GROUPS</b>	
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**Recreation Interests:**

<b>21-RECREATIONAL INTERESTS</b>	
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<b>22- RECREATIONAL INTERESTS</b>	
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**Federal Power Purchase Contractors:**

<b>23-COLORADO RIVER ENERGY DISTRIBUTORS ASSOCIATION (CREDA)</b>	
William E. Davis (member, 11/3/10) EcoPlan Associates, Inc. 701 W. Southern Avenue, Suite 203 Mesa, AZ 85210 T: (480) 733-6666 F: (480) 733-0661 EM: <a href="mailto:wdavis@ecoplanaz.com">wdavis@ecoplanaz.com</a>	Leslie James (alternate, 11/3/10) CREDA 10429 S. 51 <sup>st</sup> Street, Suite 230 Phoenix, AZ 85044 T: (480) 477-8646 F: (480) 477-8647 EM: <a href="mailto:creda@creda.cc">creda@creda.cc</a>

<b>24-UTAH MUNICIPAL POWER AGENCY (UMPA)</b>	
Clifford Barrett (member, 11/3/10) 845 Lakeview Stansbury Park, UT 84074-1912 T: (435) 882-0164 EM: <a href="mailto:cibarre@q.com">cibarre@q.com</a>	VACANT

**Other Stakeholders:**

<b>25-ARIZONA GAME AND FISH DEPARTMENT</b>	
Ryan Mann (member, 11/21/16) Arizona Game and Fish Department 5000 W. Carefree Highway Phoenix, AZ 85086 T: (623) 236-7538 EM: <a href="mailto:rmann@azgfd.gov">rmann@azgfd.gov</a>	Dave Rogowski, PhD (alternate, 7/7/15) Arizona Game and Fish Department 506 N. Grant Street, Suite L Flagstaff, AZ 86004 T: (928) 226-7677 EM: <a href="mailto:drogowski@azgfd.gov">drogowski@azgfd.gov</a>

<b>26-DEPARTMENT OF ENERGY (DOE) – WESTERN AREA POWER ADMINISTRATION (WAPA)</b>	
Shane Capron (member, 6/4/12) 299 South Main Street, Ste, 200 Salt Lake City, UT 84111 T: 720-799-3441 EM: <a href="mailto:capron@wapa.gov">capron@wapa.gov</a>	Craig Ellsworth (alternate, 6/4/12) WAPA, CRSP Management Center 150 Social Hall Avenue, Suite 300 Salt Lake City, UT 84138 T: 801-524-3344 EM: <a href="mailto:ellsworth@wapa.gov">ellsworth@wapa.gov</a>

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**U.S. Department of the Interior  
Bureau of Reclamation**

**Glen Canyon Dam Adaptive Management Work Group**

**CHARTER**

1. **Committee's Official Designation.** Glen Canyon Dam Adaptive Management Work Group (AMWG).
2. **Authority.** The Grand Canyon Protection Act (Act) of October 30, 1992, Public Law 102-575; Federal Advisory Committee Act (FACA), as amended, 5 U.S.C. Appendix 2.
3. **Objectives and Scope of Activities.** The Glen Canyon Dam Adaptive Management Program (AMP) provides for monitoring the results of the operating criteria and plans adopted by the Secretary of the Interior (Secretary), and for research and studies to suggest appropriate changes to those plans and operating criteria.

The AMP includes the AMWG. The AMWG provides advice and recommendations to the Secretary relative to the operation of Glen Canyon Dam. The Secretary's Designee is the Assistant Secretary for Water and Science who serves as the Chair. The AMWG recommends suitable monitoring and research programs and makes recommendations to the Secretary. The AMWG may recommend research and monitoring proposals outside the Act which complement the AMP process, but such proposals will be funded separately, and shall not deter from the focus of the Act.

Under Section 1802(a) of the Act, "[t]he Secretary shall operate Glen Canyon Dam in accordance with the additional criteria and operating plans specified in Section 1804 [of the Act] and exercise other authorities under existing law in such a manner as to protect, mitigate adverse impacts to, and improve the values for which Grand Canyon National Park and Glen Canyon National Recreation Area were established, including but not limited to, natural and cultural resources and visitor use." Under Section 1802(b) of the Act, "[t]he Secretary shall implement this section [of the Act] in a manner fully consistent with and subject to the Colorado River Compact, the Upper Colorado River Basin Compact, the Water Treaty of 1944 with Mexico, the decree of the Supreme Court in Arizona v. California, and the provisions of the Colorado River Storage Project Act of 1956 and the Colorado River Basin Project Act of 1968 that govern allocation, appropriation, development, and exportation of the waters of the Colorado River basin."

4. **Description of Duties.** The duties or roles and functions of the AMWG are in an advisory capacity only and all tasking shall be directed by the Designated Federal Officer (DFO). They are, as applicable, to:
  - a. Establish AMWG operating procedures.

- b. Advise the Secretary in meeting environmental and cultural commitments including those contained in the Record of Decision for the Glen Canyon Dam Long-Term Experiment and Management Plan Final Environmental Impact Statement and subsequent related decisions.
- c. Recommend the framework for the AMP policy, goals, and direction.
- d. Recommend resource management objectives for development and implementation of a long-term monitoring plan, and any necessary research and studies required to determine the effect of the operation of Glen Canyon Dam on the values for which Grand Canyon National Park and Glen Canyon National Recreation Area were established, including but not limited to, natural and cultural resources, and visitor use.
- e. Review and provide input on the report identified in the Act to the Secretary, the Congress, and the Governors of the Colorado River Basin States. This annual report includes discussion on dam operations, the operation of the AMP, status of resources, and measures taken to protect, mitigate, and improve the resources defined in the Act.
- f. Annually review long-term monitoring data to provide advice on the status of resources and whether the AMP goals and objectives are being met.
- g. Review and provide input on all AMP activities undertaken to comply with applicable laws, including permitting requirements.

At the conclusion of each meeting or shortly thereafter, provide a detailed recommendation report, including meeting minutes, to the DFO.

5. **Agency or Official to Whom the Committee Reports.** The AMWG reports to the Secretary through the Secretary's Designee.
6. **Support.** The logistical and support services for the meetings of the AMWG will be provided by the Bureau of Reclamation.
7. **Estimated Annual Operating Costs and Staff Years.** The estimated annual operating costs associated with supporting the AMWG's functions are \$400,000, including all direct and indirect expenses. It is estimated that four full-time equivalent (FTE) employees will be required to support the AMWG.
8. **Designated Federal Officer.** The DFO is the Bureau of Reclamation, Upper Colorado Region, Regional Director who is a full-time Federal employee appointed in accordance with Agency procedures. The DFO or alternate will approve or call all AMWG and subcommittee meetings, prepare and approve all meeting agendas, attend all AMWG and subcommittee meetings, adjourn any meetings when the DFO determines adjournment to be in the public interest and chair meetings when directed to do so by the Secretary.



**9. Estimated Number and Frequency of Meetings.** The AMWG is expected to meet approximately twice a year, and at such other times as designated by the DFO.

**10. Duration.** Continuing.

**11. Termination.** The AMWG will terminate 2 years from the date the charter is filed, unless prior to that date, it is renewed in accordance with the provisions of section 14 of the FACA. The AMWG will not meet or take any action without a valid current charter.

**12. Membership and Designation.** Members and alternate members of the AMWG appointed by the Secretary will be comprised of, but not limited to, the following:

a. Secretary's Designee, who will serve as Chairperson for the AMWG.

b. One representative each from the following entities:

- (1) The Secretary of Energy (Western Area Power Administration)
- (2) Arizona Game and Fish Department
- (3) Hopi Tribe
- (4) Hualapai Tribe
- (5) Navajo Nation
- (6) San Juan Southern Paiute Tribe
- (7) Southern Paiute Consortium
- (8) Pueblo of Zuni

c. One representative each from the Governors from the seven basin States:

- (1) Arizona
- (2) California
- (3) Colorado
- (4) Nevada
- (5) New Mexico
- (6) Utah
- (7) Wyoming

d. Representatives each from the general public as follows:

- (1) Two from environmental organizations
- (2) Two from the recreation industry
- (3) Two from contractors who purchase Federal power from Glen Canyon Powerplant

e. One representative from each of the following DOI agencies as ex-officio non-voting members:

- (1) Bureau of Reclamation

- (2) Bureau of Indian Affairs
- (3) U.S. Fish and Wildlife Service
- (4) National Park Service

Members will be appointed to the AMWG by the Secretary, with input and recommendations from the above-referenced agencies, States, Tribes, contractors for Federal power from Glen Canyon Dam, environmental organizations, and other stakeholders. Each member may also recommend an alternate member for appointment by the Secretary. Members and alternates of the AMWG will be appointed for a 3-year term

Members of the AMWG serve without compensation, except that the DFO, in their sole discretion, may choose to allow compensation for the Technical Work Group subcommittee chairperson according to applicable authorities. While away from their homes or regular places of business, members engaged in AMWG or subcommittee business approved by the DFO may be allowed travel expenses, including per diem in lieu of subsistence, in the same manner as persons employed intermittently in Government service under section 5703 of title 5 of the United States Code.

A vacancy on the AMWG will be filled in the same manner in which the original appointment was made.

### **13. Ethics Responsibilities of Members:**

- a. **Federal Employees.** Federal members who are appointed to the AMWG are appointed in their official capacity as Federal employees. This means that when these Federal employees act in their capacity as an AMWG member, they will be subject to the ethics statutes and regulations that apply to them as Federal employees, including the avoidance of conflict of interest.
- b. **Non-Federal Employees.** Non-Federal members of the AMWG and subcommittee appointed as representatives are not subject to Federal ethics statutes and regulations. However, no non-Federal AMWG or subcommittee member will participate in any AMWG or subcommittee deliberations or votes relating to a specific party matter before the Department or its bureaus and offices including a lease, license, permit, contract, grant, claim, agreement, or litigation, in which the member or the entity the member represents has a direct financial interest.

**14. Subcommittees.** Subject to the DFO's approval, subcommittees may be formed for the purpose of compiling information or conducting research. However, such subcommittees must act only under the direction of the DFO and must report their recommendations to the full AMWG for consideration. Subcommittees must not provide advice or work products directly to the Agency. Subcommittees will meet as necessary to accomplish their assignments, subject to the approval of the DFO and the availability of resources.

**15. Recordkeeping.** The records of the AMWG, and formally and informally established subcommittees of the AMWG, shall be handled in accordance with General Records Schedule 6.2 or other approved Agency records disposition schedules. These records shall be available for public inspection and copying, subject to the Freedom of Information Act, 5 U.S.C. 552.



\_\_\_\_\_  
Secretary of the Interior

**SEP 17 2021**

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Date Signed

**SEP 17 2021**

\_\_\_\_\_  
Date Filed

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February 9, 2011

GLEN CANYON DAM  
ADAPTIVE MANAGEMENT WORK GROUP  
OPERATING PROCEDURES

## FOREWARD

The Grand Canyon Protection Act (Act) of October 30, 1992, (Public Law 102-575) directs the Secretary of the Interior (Secretary) to "establish and implement long-term monitoring programs and activities that will ensure that Glen Canyon Dam is operated in a manner consistent with that of section 1802" of the Act. "The monitoring programs and activities shall be established and implemented in consultation with the Secretary of Energy; the Governors of the States of Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming; Indian tribes; and the general public, including representatives of academic and scientific communities, environmental organizations, the recreation industry, and contractors for the purchase of Federal power produced at Glen Canyon Dam." In order to comply with the consultation requirement of the Act, the Glen Canyon Dam EIS recommended formation of a Federal Advisory Committee. To fulfill this recommendation, the Glen Canyon Dam Adaptive Management Work Group (AMWG) was established. The AMWG Charter imposes the following criteria: (1) the AMWG shall operate under the Federal Advisory Committee Act (Public Law 92-463); (2) the Chairperson shall be designated by the Secretary; (3) the Secretary's Designee, shall also serve as the Designated Federal Official under the Federal Advisory Committee Act; (4) the Bureau of Reclamation will provide the necessary support in talking accurate minutes of each meeting; and (5) the AMWG shall continue in operation until terminated or renewed by the Secretary of the Interior under the Federal Advisory Committee Act.

## OPERATION

1. Meetings. The AMWG is expected to meet semiannually. The Secretary's Designee may call additional meetings as deemed appropriate. A minimum of one meeting will be held annually. All meetings shall be announced by notice in the Federal Register and by news release to local newspapers.

Thirteen members must be present (either in person or on the telephone) at any meeting of the AMWG to constitute a quorum.

Robert's Rules of Order will be generally followed, except some flexibility will be allowed as needs dictate.

The Bureau of Reclamation is responsible for arranging meetings and for other duties associated with operation of the AMWG. They will arrange for meeting location, provide staff for the Designee, prepare minutes and Federal Register Notices, and other operational requirements of the AMWG.

Meetings of the AMWG will generally be held in Phoenix, Arizona, to allow for better travel accessibility for the members as well as provide greater opportunity for the public to attend. However, the Secretary's Designee may decide upon a different location as he/she deems appropriate.

The AMWG may make recommendations to the Secretary of the Interior in response to future legislation or appropriations that may affect or impact the Glen Canyon Dam Adaptive Management Program. This may be accomplished when an AMWG member requests to the Chair, an issue to be addressed either at a regular meeting of the AMWG, at a special meeting or during a conference call. AMWG members will discuss the issue and if appropriate, make recommendations on the issue to the Secretary of the Interior in a timely manner. When any other potentially controversial topics are identified by any AMWG member, they should notify the Chair so that this procedure can be implemented.

2. Chairperson. The Chairperson will be the Secretary's Designee, who will preside over the meetings of the AMWG. In the absence of the Chairperson, a senior level Interior representative will act as Chairperson for the AMWG. The Chairperson or designated alternate must be present before a meeting of the AMWG may convene. The Chairperson or his/her alternate is authorized to adjourn an AMWG meeting at any time.

The Secretary's Designee will also be responsible for sending a formal summary report after each Advisory Committee meeting directly to the Secretary of the Interior with copies of subject summary report to be provided to all AMWG members.

3. Members. Membership shall follow the guidelines in the AMWG Charter. Members of the AMWG will be designated by the Secretary of the Interior. They shall serve for a term of four years. Members may be re-designated to serve for more than one term.

4. Alternate Committee Members. Each AMWG member may designate an alternate to serve for the same term as the member. Alternates must be identified to the Chairperson in writing. Alternates must meet the same qualifications as the member. Alternates will have authority to participate in AMWG business, including quorum and voting privileges. A list of members and alternates shall be maintained and made available to AMWG members.

5. Agenda. At least 30 days prior to any meeting of the AMWG, a draft of the proposed agenda and related information will be sent to the group members. Members shall review the agenda and return comments and proposed agenda items to the Designee within two weeks of the agenda mailing date. The final agenda will be sent to the members 15 days prior to the meeting. The Secretary's Designee shall approve the agendas.

6. Voting. The maker of a motion must clearly and concisely state and explain his or her motion. Motions may be made verbally or submitted in writing in advance of the meeting. Notice of motions to be made by any member of the AMWG should be announced in the Federal Register and presented on the agenda. Any motions proposed by any member in meetings must be related to an agenda topic and will be considered only if a simple majority of members present agree to hear it. After a motion there should be presentations by staff followed by a discussion and a call for questions. The public will be given opportunity to comment during the question period as allowed by the Chairperson. Any member of the public, who has asked to address the AMWG, shall have a minimum of two minutes to comment. The Chairperson can limit the total time allowed to the public for comments. Comments shall address the motion and not be repetitive to presentations, group discussions or other comments previously presented. The motion must be fully documented for the minutes and restated clearly by the Chairperson before a vote is taken.

The group should attempt to seek consensus but, in the event that consensus is not possible, a vote should be taken. Voting shall be by verbal indication or by raised hand. Approval of a motion requires a 60 percent majority of members present and voting. The views of any dissenting member or minority group shall be briefly incorporated into the information transmitted to the Secretary along with the majority recommendation. In addition, at his/her discretion, the Secretary's Designee may ask any individual at the meeting for the rationale related to their vote. Voting shall occur only with the formal meetings of the group.

7. Minutes. Detailed minutes of each meeting will be kept. The minutes will contain a record of persons present and a description of pertinent matters discussed, conclusions reached, and actions taken on motions. Minutes shall be limited to approximately 5-15 pages. The corrections and adoption of the minutes will be by vote of the AMWG at the next subsequent meeting. The Secretary's Designee shall approve all minutes. The Bureau of Reclamation is responsible for recording and disseminating minutes to AMWG members, generally within two weeks of the subject meeting, but in no event longer than 30 days.

9. Public Involvement. No later than 15 days prior to each meeting of the AMWG, a notice will be published in the Federal Register. Meetings will be open to the public and advertised in local newspapers. Interested persons may appear in person, or file written statements to the AMWG. Public comments can be on any issue related to operation of the Glen Canyon Dam. A specific time for public comment will be identified in the agenda. Advance approval for oral participation may be prescribed and speaking time may be limited. Minutes of the AMWG meetings and copies of reports submitted to the AMWG will be maintained for public review at the Bureau of Reclamation's Upper Colorado Regional Office in Salt Lake City, Utah, and at the Library of Congress in Washington, D.C. They will also be posted to the Bureau of Reclamation web site [www.uc.usbr.gov/amp](http://www.uc.usbr.gov/amp)).

10. Payment of Travel. While engaged in the performance of official business at AMWG and AMWG sub-group meetings (regular, ad hoc, and Protocol Evaluation Panel meetings) away from home or their regular places of business, all AMWG members or AMWG sub-group members shall, upon request, be reimbursed for travel expenses in accordance with current Federal Travel Regulations. Alternates representing the official committee member may also receive compensation for travel expenses.

11. Open/Closed Meetings. If any member proposes discussion of a sensitive issue felt to require a closed session, he or she should so state in a proposal submitted to AMWG members in sufficient time to include it in the agenda published in the Federal Register Notice announcing the next meeting. A closed executive session may be held during a regular meeting but should be used rarely. Any sensitive cultural issues will require consultation with Native Americans prior to meeting.

Telephone conference meetings must have a notice in the Federal Register 15 days prior to the call. There must be adequate opportunity for the general public to listen to the conference call.

The AMWG may conduct business outside of formal meetings through telephone polls conducted by the Chairperson or his/her designee. In emergency situations, telephone polls can be requested by the AMWG member to act on clearly defined written motions for AMWG approval. Following approval by the Chairperson, a telephone poll will be conducted within

seven working days. During a telephone poll, all members will be contacted and requested to vote. Approval of a motion requires 60 percent majority of all members voting. The Chairperson is responsible for documenting in writing how each member voted and distributing the record to all AMWG members.

12. Reports and Record Keeping. The Annual Report (AR) required by the Grand Canyon Protection Act shall be reviewed by the AMWG. The State of the Natural and Cultural Resources in the Colorado River Ecosystem report developed by the Grand Canyon Monitoring and Research Center will be attached to the AR and shall contain information on the condition of the resources impacted by the operation of Glen Canyon Dam. The AR shall be concise, containing critical resource issues and recommendations to the Secretary on future dam operations.

Bureau of Reclamation staff will supply GSA the required information to complete the summary report for Federal Advisory Committees.

13. Committee Expenses and Cost Accounting. An accounting of the expenses for operation of the AMWG shall be maintained by Reclamation. Expenses and other information will be submitted to GSA as required by FACA. Committee expenses are limited to approximately \$500,000 annually.

## SUB-GROUPS

1. Formation. The AMWG may form sub-groups in order to facilitate the mission of the AMWG as identified in the Act and the AMWG Charter. Sub-groups will be formed for completion of specific tasks or for specified periods of time. Sub-group members will be named by the members of the AMWG for their own organization, or by the Secretary's Designee. Effort shall be made to keep sub-groups small. Sub-groups will be formed or dissolved by a vote of the AMWG.

2. Requirements. Sub-groups may choose their chairperson from among the AMWG named sub-group members. The chairperson of any sub-group may convene group meetings at his or her discretion. Sub-groups may develop their own operating procedures. One standing sub-group of the AMWG will be Glen Canyon Dam Technical Work Group (TWG). The TWG membership shall consist of one representative from each organization represented in the AMWG, with the exception that two members from the National Park Service representing the Grand Canyon National Park and the Glen Canyon Recreational Area, and one representative from the US Geological Survey. All sub-groups will elect their own officers. Names of all sub-group members will be announced to the AMWG at regular meetings and will be attached to the minutes. Sub-group members may designate alternates.

3. Charge. Sub-groups will receive their charges from the AMWG. Sub-groups will work only on issues assigned them by the AMWG. They will not be empowered to follow other issues on their own. They are encouraged to submit issues to the AMWG they feel worthy of consideration and discussion, but the AMWG must approve work on all new issues. The AMWG may require the sub-groups to develop plans and direct them to come to a consensus or majority opinion at their discretion. Sub-groups shall determine their own operating procedures, which must be reduced to writing and included with the AMWG and sub-group records.



4. Reporting. Sub-groups will report at least annually to the AMWG at the request of the Chairperson. Sub-groups shall report only to the AMWG. They shall provide information as necessary for preparing annual resource reports and other reports as required for the AMWG.

5. Ad Hoc Groups. Ad hoc groups may be created by the Secretary's Designee or as a subcomponent of a sub-group. These groups may meet to discuss assignments from the AMWG or sub-group. Ad hoc meetings will not require Federal Register notices. Minutes are recommended but not required. Ad hoc groups shall report to the AMWG or the main body of the sub-group, depending upon which gives the assignment.

**Adopted by vote of the AMWG on February 9, 2011, in Phoenix, Arizona.**

Approved: Armen J. Coste Aug. 19, 2011  
Chairperson Date

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# Draft Agenda

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**Glen Canyon Dam Adaptive Management Program  
Adaptive Management Work Group Meeting, February 9-10, 2022**

**Wednesday, February 9, 2022**

Day 1 Webinar Information:

Link: <https://rec.webex.com/rec/j.php?MTID=m2c4bb5a96cb62db32dbc28e2f608767e>

Telephone: 415-527-5035 Passcode: 2764 737 4054

D R A F T A G E N D A

START TIME <sup>1</sup> (Duration)	Wednesday, February 9, 2022 Topic and Presenter and Purpose <sup>2</sup>
8:30 PST/ 9:30 MST (:45)	<p><b>Welcome and Administrative:</b> Wayne Pullan, Acting Secretary's Designee to the Adaptive Management Work Group</p> <ul style="list-style-type: none"> <li>▪ Introductions and Determination of Quorum (13 members)               <ul style="list-style-type: none"> <li>○ Facilitator: Mike Harty and Kearns &amp; West team</li> </ul> </li> <li>▪ Approval of <a href="#">August 2021 Meeting Minutes</a></li> <li>▪ Review <a href="#">August meeting evaluation</a></li> <li>▪ Administrative Updates               <ul style="list-style-type: none"> <li>○ <a href="#">AMWG Charter</a></li> <li>○ AMWG Membership Status</li> <li>○ Action Item Tracking Report</li> </ul> </li> </ul>
9:15 PST/ 10:15 MST (:45)	<p><b>Basin Hydrology and Operations:</b> Heather Patno, Hydraulic Engineer, Bureau of Reclamation</p> <ul style="list-style-type: none"> <li>▪ Presentation (30 minutes)</li> <li>▪ Q&amp;A and discussion (15 minutes)</li> </ul> <p><u>Additional Information:</u> 1) <a href="#">24-Month Study</a>, 2) <a href="#">Current GCD operations</a>  <u>Purpose:</u> To increase understanding of water supply, forecasted hydrologic conditions, and projected reservoir conditions and operations for the current and upcoming water years</p>
10:00 PST/ 11:00 MST (:15)	<p><b>BREAK</b></p>
10:15 PST/ 11:15 MST (:45)	<p><b>2022 GCDAMP Annual Reporting Meeting Update – Part 1:</b> Mike Moran, Acting Chief, Grand Canyon Monitoring and Research Center</p> <ul style="list-style-type: none"> <li>▪ Presentation 1 – Spring Disturbance Flow, Ted Kennedy (15 minutes)</li> <li>▪ Presentation 2 – Nutrients, Bugs, &amp; Bug Flow Synthesis, Ted Kennedy (15 minutes)</li> <li>▪ Q&amp;A and discussion (15 minutes)</li> </ul> <p><u>Purpose:</u> To provide information regarding project work completed in FY21 and to inform work to be completed under the 2021-2023 triennial budget and work plan.</p>

START TIME <sup>1</sup> (Duration)	Wednesday, February 9, 2022 Topic and Presenter and Purpose <sup>2</sup>
11:00 PST/ 12:00 MST (1:30)	<b>LUNCH</b>
12:30 PST/ 1:30 MST (:45)	<p><b>Potential Water Year 2022 Experiments:</b> Lee Traynham, Bureau of Reclamation; Mike Moran, Grand Canyon Monitoring and Research Center</p> <ul style="list-style-type: none"> <li>▪ Presentation (15 minutes)</li> <li>▪ Q&amp;A and discussion (30 minutes)</li> </ul> <p><u>Purpose:</u> To discuss recent findings and possible LTEMP experiments that may be conducted in 2022.</p>
1:15 PST/ 2:15 MST (:30)	<p><b>Exploration of Potential FLAHG Charge:</b> TBD</p> <ul style="list-style-type: none"> <li>▪ Presentation (10 minutes)</li> <li>▪ Discussion (20 minutes)</li> </ul> <p><u>Proposed Motion:</u> <a href="#">Direction to FLAHG</a></p> <p><u>Purpose:</u> To consider a proposed motion to direct the FLAHG to develop options for future consideration.</p>
1:45 PST/ 2:45 MST (:15)	<b>BREAK</b>
2:00 PST/ 3:00 MST (:30)	<p><b>GCDAMP Tribal Liaison Report:</b> Jamescita Peshlakaj, Tribal Liaison</p> <ul style="list-style-type: none"> <li>▪ Presentation (20 minutes)</li> <li>▪ Q&amp;A and discussion (10 minutes)</li> </ul> <p><u>Purpose:</u> To report on the GCDAMP Partner Tribes' activities and meetings as well as each Tribe's concerns, challenges, and accomplishments.</p>
2:30 PST/ 3:30 MST (:45)	<p><b>2022 GCDAMP Annual Reporting Meeting Update – Part 2:</b> Mike Moran, Acting Chief, Grand Canyon Monitoring and Research Center</p> <ul style="list-style-type: none"> <li>▪ Presentation 1 – Sediment, Paul Grams (15 minutes)</li> <li>▪ Presentation 2 – Vegetation/Terrestrial, Joel Sankey/Emily Palmquist (15 min)</li> <li>▪ Q&amp;A and discussion (15 minutes)</li> </ul> <p><u>Additional Information:</u> GCMRC 2021 Annual Report</p> <p><u>Purpose:</u> To provide information regarding project work completed in FY21 and to inform work to be completed under the 2021-2023 triennial budget and work plan.</p>
3:15 PST/ 4:15 MST (:15)	<b>Public Comment</b>

START TIME <sup>1</sup> (Duration)	Wednesday, February 9, 2022 Topic and Presenter and Purpose <sup>2</sup>
3:30 PST/ 4:30 MST	<b>ADJOURN FOR THE DAY</b> <ul style="list-style-type: none"><li>• <b>Please fill out evaluation form if you will not join tomorrow.</b></li></ul>

<sup>1</sup> Every effort will be made to adhere to the schedule and agenda, but on occasion, for unforeseen reasons, some modifications may occur.

<sup>2</sup> Action may be by consensus or a vote; and either may be a recommendation to the Secretary of the Interior or feedback to presenter(s) or to subordinate groups.

DRAFT

## Glen Canyon Dam Adaptive Management Program Adaptive Management Work Group Meeting, February 9-10, 2022

**Thursday, February 10, 2022**

Day 2 Webinar Information:

Link: <https://rec.webex.com/rec/j.php?MTID=md4caa110511fe90f209f9c96705fa4c6>

Telephone: 415-527-5035 Passcode: 2764 343 6382

### D R A F T   A G E N D A

START TIME <sup>1</sup> (Duration)	Thursday, February 10, 2022 Topic, Presenter, and Purpose <sup>2</sup>
8:30 PST/ 9:30 MST (:15)	<p><b>Welcome and Administrative:</b> Wayne Pullan, Acting Secretary's Designee to the Adaptive Management Work Group</p> <ul style="list-style-type: none"> <li>▪ Introductions and Determination of Quorum (13 members)</li> </ul>
8:45 PST/ 9:45 MST (:45)	<p><b>Federal Agency Updates (2-3 minutes each):</b></p> <ul style="list-style-type: none"> <li>▪ ESA Update: Humpback chub, Razorback sucker (<i>FWS</i>)</li> <li>▪ Non-native Aquatic Species Management Plan (<i>NPS</i>)</li> <li>▪ LTEMP Litigation (<i>DOI Solicitors Office</i>)</li> <li>▪ GCDAMP Program Funding short-term and long-term (<i>BOR, WAPA</i>)</li> <li>▪ Staffing Updates, Building Status (<i>GCMRC</i>)</li> <li>▪ Additional Items</li> </ul> <p><u>Additional Information:</u> 1) <a href="#">H.R. 4502</a>, <a href="#">H.R. 4549</a>, <a href="#">S. 2605</a> 2) <a href="#">FRN Humpback chub</a> 3) <a href="#">FRN Razorback sucker</a> 4) <a href="#">NPS Expanded Management Plan</a>, 5) <a href="#">Brown Trout Incentivized Harvest</a> 6) <a href="#">Infrastructure Investment and Jobs Act</a></p> <p><u>Purpose:</u> To share updates regarding current activities on the Colorado River that are pertinent to the GCDAMP.</p>
9:30 PST/ 10:30 MST (:45)	<p><b>Stakeholder Updates (2-3 minutes each):</b></p> <ul style="list-style-type: none"> <li>▪ States: AZDWR, AZGFD, CA, CO, NM, NV, UT, WY</li> <li>▪ Tribes: Hopi, Hualapai, Navajo Nation, Pueblo of Zuni, Southern Paiute</li> <li>▪ NGOs: Environmental (x2), Federal Power Purchasers (x2), Recreation (x2)</li> </ul> <p><u>Purpose:</u> To share updates regarding current stakeholder activities on the Colorado River that are pertinent to the GCDAMP.</p>
10:15 PST/ 11:15 MST (:15)	<b>BREAK</b>



START TIME <sup>1</sup> (Duration)	Thursday, February 10, 2022 Topic, Presenter, and Purpose <sup>2</sup>
10:30 PST/ 11:30 MST (:45)	<p><b>2022 GCDAMP Annual Reporting Meeting Update – Part 3:</b> Mike Moran, Acting Chief, Grand Canyon Monitoring and Research Center</p> <ul style="list-style-type: none"> <li>▪ Presentation 1 – Archeological and Cultural Resources, Joel Sankey (15 minutes)</li> <li>▪ Presentation 2 – Fishes, Charles Yackulic (15 minutes)</li> <li>▪ Q&amp;A and discussion (15 minutes)</li> </ul> <p><u>Additional Information:</u> GCMRC 2021 Annual Report <u>Purpose:</u> To provide information regarding project work completed in FY21 and to inform work to be completed under the 2021-2023 triennial budget and work plan.</p>
11:15 PST/ 12:15 MST (1:30)	<b>LUNCH</b>
12:45 PST/ 1:45 MST (:30)	<p><b>Technical Work Group Chair Report:</b> Seth Shanahan, Technical Work Group Chair</p> <ul style="list-style-type: none"> <li>▪ Presentation (20 minutes)</li> <li>▪ Q&amp;A, discussion (10 minutes)</li> </ul> <p><u>Purpose:</u> To update AMWG members on the TWG meetings held October 2021 and January 2022.</p>
1:15 PST/ 2:15 MST (:30)	<p><b>Emerging Issues – Temperature Management and Predicted Effects:</b> TBD</p> <ul style="list-style-type: none"> <li>▪ Presentation (10 minutes)</li> <li>▪ Q&amp;A and discussion (20 minutes)</li> </ul> <p><u>Proposed Motion:</u> <a href="#">Recommendation to Secretary and Direction to TWG</a> <u>Purpose:</u> Review forecasted temperatures and potential effects to downstream resources. Consider a draft motion to support mitigation efforts and study.</p>
1:45 PST/ 2:45 MST (:15)	<b>BREAK</b>
2:00 PST/ 3:00 MST (:30)	<p><b>Stakeholder’s Perspective—Hopi Tribe:</b> Stewart Koyiyumptewa and Jakob Maase</p> <ul style="list-style-type: none"> <li>▪ Presentation (20 minutes)</li> <li>▪ Q&amp;A and discussion (10 minutes)</li> </ul> <p><u>Purpose:</u> Provide an introduction to the Hopi Tribe, outlining the Tribe’s values, priorities, and major activities related to the Colorado River and the Glen Canyon Dam Adaptive Management Program.</p>

START TIME <sup>1</sup> (Duration)	Thursday, February 10, 2022 Topic, Presenter, and Purpose <sup>2</sup>
2:30 PST/ 3:30 MST (:45)	<p><b>Facilitated Discussion: LTEMP Process for Flow Experiments:</b> Mike Hearty, Kearns and West</p> <p><u>Purpose:</u> To review the existing process for planning and implementation of LTEMP Experiments and to solicit feedback and suggestions for improvement from stakeholders.</p>
3:15 PST/ 4:15 MST (:10)	<p><b>Public Comment</b></p>
3:25 PST/ 4:25 MST (:05)	<p><b>WRAP-UP:</b> Wayne Pullan, Acting Secretary's Designee to the Adaptive Management Work Group</p> <ul style="list-style-type: none"> <li>▪ Next AMWG meeting dates:           <ul style="list-style-type: none"> <li>○ May 18, 2022 (webinar)</li> <li>○ August 17-18, 2022</li> <li>○ January ??-??, 2023 (Annual Reporting and TWG Meetings)</li> </ul> </li> </ul>
3:30 PST/ 4:30 MST	<p><b>ADJOURN</b></p> <ul style="list-style-type: none"> <li>• <b>Please fill out the meeting evaluation sheet at this link.</b></li> </ul>

<sup>1</sup> Every effort will be made to adhere to the schedule and agenda, but on occasion, for unforeseen reasons, some modifications may occur.

<sup>2</sup> Action may be by consensus or a vote; and either may be a recommendation to the Secretary of the Interior or feedback to presenter(s) or to subordinate groups.

# Draft Minutes & Action Items

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# Glen Canyon Dam Adaptive Management Program Adaptive Management Work Group Meeting August 18-19, 2021

## Wednesday, August 18, 2021

**Start Time:** 8:30 AM Pacific Daylight Time (PDT)

**Conducting:** Wayne Pullan, Secretary's Designee to the Adaptive Management Work Group (AMWG) and AMWG Chair.

**Recorder:** Carliane Johnson, SeaJay Environmental, LLC.

**Facilitator:** J. Michael Harty, Kearns & West, Inc.

## Welcome and Administrative

### Opening Remarks

**[Wayne Pullan, AMWG Chair]** Joining this meeting are Daniel Picard, Deputy Regional Director and Acting Designated Federal Officer to the Adaptive Management Work Group (AMWG); Kerry Rae, Chief of Staff to the Assistant Secretary for Water and Science; and Christina Kalavritinos, Senior Advisor to the Assistant Secretary of Water and Science.

### Introductions and Determination of Quorum

**[Michael Harty, Facilitator]** Roll call was taken, and a quorum reached with 19 members represented.

### Approval of May 19, 2021, Meeting Minutes

**[Wayne Pullan, AMWG Chair]** The draft was distributed on July 2, 2021. **[Todd Adams, Utah Division of Water Resources]** Motion made to approve the [May 19, 2021 minutes](#). **[Sara Price, Colorado River Commission of Nevada (CRCN)]** Seconded the motion. **[Wayne Pullan, AMWG Chair]** May AMWG meeting minutes were passed by consensus.

### Administrative Updates

- **Summary of May Meeting Evaluation** **[Terra Alpaugh, Kerns & West]** provided the results of the [May AMWG Meeting Evaluation](#).
- **Nominations and Appointments** **[Wayne Pullan, AMWG Chair]** Department of Interior (DOI) is currently processing [22 nominees for AMWG members and alternates](#). There have also been eight new appointments to the Technical Work Group (TWG).
- **Action Item Tracking Report** **[Wayne Pullan, AMWG Chair]** There are five action items, two of which are recommended for closure:
  - **Monitoring Metrics** – GCMRC is presenting a draft plan on Day Two of this meeting.
  - **Budget Prioritization** – the DOI Bureaus are working on identifying high priority issues and will deliver findings to the Budget Ad Hoc Group.
  - **Temperature Projections for Minimum Hydrology** – the Bureau of Reclamation (Reclamation) staff are proposing to close this action item because the projections will be included in the Hydrology and Operations PowerPoint from now on.

- Funding Updates – Reclamation is proposing to close this action item, because it has now been incorporated as a standing agenda item.
- FY22 River Trip Invitation to Secretary Haaland – planning for this trip is advancing cautiously because of COVID; everyone will be informed as the plan progresses.

## Review of Colorado River Operations Agreements

**[PRESENTATION]** **[Rodney Smith, DOI Solicitor's Office]** The focus of this presentation is Colorado River water law, including the US-Mexico treaty. The overview included definitions, the 1922 Compact, the 1948 Upper Colorado River Basin Compact, and various Congressional acts, guidelines, and agreements.

### Questions

**[Larry Stevens, Grand Canyon Wildlands Council (GCWC)]** Where do recreation, fish and wildlife, and other concerns fall within the enabling suite of objectives? **[Rodney Smith, DOI]** They are in the 1956 Act in reference to the creation of the Dam and are more specifically enumerated in the Grand Canyon Protection Act. The Long-term Experimental and Management Plan (LTEMP) then tried to address those objectives.

**[Alicyn Gitlin, Sierra Club]** If the Colorado River Storage Project (CRSP) specifies that power is to be produced "incident to" the other uses, why was there such a priority on sending drinking water downstream to Lake Powell to protect power production? It seems that the water would be more valuable if kept higher in the watershed, where evaporation is less of a risk and there are more potential uses. **[Lee Traynham, Reclamation]** This will be discussed in the next session related to drought. **[Rod Smith, DOI]** The Drought Response Operations Agreement (DROA) is concerned with protecting infrastructure more broadly: there are a finite number of outlets at the dam that need to be protected; in the DROA provision being referred to, the outlet of concern is related to hydropower production.

### Introduction of Additional Reclamation Staff Members

**[Wayne Pullan, AMWG Chair]** Additional staff include Jacklynn (Jaci) Gould who was recently named as Director of the Lower Colorado Basin Region. Carly Jerla was selected as Senior Water Resources Program Manager. Katrina Grantz is now Assistant Regional Director in the Upper Colorado Basin Region.

**[Katrina Grantz, Assistant Regional Director]** This is an overview of this year's drought response operations and the DROA that was initiated in collaboration with the states and tribes to protect critical elevations in Lake Powell. The lowest elevation at which power can still be generated is at 3,490 feet. Falling below that level has the potential to lead to cavitation, debris entrapment, and severe damage to the facility. Continued generation of power is critical to the dam's operation as well as for funding environmental compliance efforts. One purpose of the DROA is to protect the target elevation of 3,525 feet, which is 35 feet above the minimum power pool elevation. There are two key tools to help Reclamation do this: 1) Adjust the timing of deliveries from Lake Powell to Lake Mead within the confines of the LTEMP Record of Decision (ROD), and 2) make supplemental deliveries from the upper reservoirs (Flaming Gorge, Blue Mesa, and Navajo). In July 2021, under the emergency provisions of the DROA, Reclamation initiated supplemental water deliveries to Lake Powell, which will continue through the end of the year and total 181 KAF. Reclamation and the Upper Basin states have started developing a plan to address releases longer term, which should be in place by April 2022 and will be done in coordination with stakeholders.

## Basin Hydrology, Water Quality, and Operations

**[PRESENTATION] [Heather Patno, Hydraulic Engineer, Reclamation]** As of August 15, the Upper Basin is in a decreasing storage base flow period. Lake Powell hit its historical low on July 24, and its elevation is expected to continue to decrease through next spring. There would need to be continued precipitation for the remainder of the fall to have a beneficial initialization for next year's water accumulation and retention. Peak runoff occurred in March 2021. This is now the second driest water year on record. Lake Mead has been determined to be in Level 1 Shortage Conditions. The water reductions for Arizona, Nevada, and Mexico are shown in the table in the presentation. The maintenance schedule was also shown using the August 24-month study most probable elevations. The five-year outlook is expected in late August or early September. Reclamation is also currently working on a website with a new visualization tool.

### Q&A and discussion

**[Sara Price, CRCN]** Regarding the slide showing the 30-year average from 1981-2010. When will this be replaced with the 1991-2020 average in the 24-month study? This would eliminate the wetter hydrology in the 1980s from the average. **[Heather Patno, Reclamation]** The Colorado Basin River Forecast Center (CBRFC) will calibrate its model to the new averages during the water year 2020. The shift to the 1991-2020 averages is expected to begin in October 2021. The water volume forecast will likely be lower because it will not include the wetter years from the 1980s.

**[Larry Stevens, GCWC]** Reclamation has long recognized the possibility of system failure. How much has system management flexibility decreased following the 1996 ROD in response to a single year drought, such as in 2002? **[Rod Smith, DOI]** It is a different issue. Heather is referring to an annual amount of water. The distinction that was being highlighted in the Review of Colorado River Operations Agreements presentation is that the ROD and what was updated in LTEMP in 2016 do not affect the annual release volume. Any hourly, monthly, or daily changes would not affect low water coming in or going out on an annual aggregate basis. To the extent there is management flexibility, that has probably increased over time.

**[Peter Bungart, Hualapai Tribe]** Do we know how many Glen Canyon Dam units can be expected to be online to support a fall High Flow Experiment (HFE)? **[Heather Patno, Reclamation]** There will be four units available in November.

**[Jan Balsom, National Park Service (NPS)]** Is there any potential to delay the November maintenance schedule to allow for more units? **[Heather Patno, Reclamation]** Transformer replacements are being executed by a contractor, so the constraints of that contract and delays would need to be considered. Will bring up this question with Glen Canyon Dam facilities personnel to see what flexibility is available, but it would be within those limitations.

**[Chip Lewis, Bureau of Indian Affairs (BIA)]** At the 95% confidence interval, what is the plus/minus number of feet for the 24-month most probable elevation of Lake Powell? Basically, what is the statistical accuracy of the models? **[Heather Patno, Reclamation]** There is an 80% range between minimum and maximum probable – which means there is a 10% probability that flows will be wetter and 10% probability that they will be drier. Within that 80% probability range, there is also uncertainty about what the monsoon season might bring and what the soil moisture condition might be, as well as significant variability between January and April about the forecast volume.

## Panel Discussion—Federal Agency Leaders Discuss Drought

- NPS: **[Billy Shott, Glen Canyon National Recreation Area (GLCA), Superintendent]** The impacts to the park fall in the following five categories:
  1. Fiscal and Other Supporting Resources. Drought decreases visitation, which reduces visitor and franchise fees. This impacts general construction, utilities, boat access, and research and monitoring work.
  2. Administration Policy and Law. NPS' normal business practices are characterized by lengthy contracting and review processes to ensure the appropriate use of appropriated funds. There are other funding sources that kick in to support response to and rehabilitation after natural disasters like fires and floods. Those funding sources are not accessible in drought and low water events, meaning that NPS is constrained in their ability to respond nimbly. They are looking at ways to categorize drought as a natural disaster in order to enable more timely response to both public and natural resource needs.
  3. Safety and Wellness are being impacted. There is increased risk exposure for employees and visitors as NPS is forced to move marinas, change maintenance schedules, and maintain the significant aid-to-navigation system that NPS is obligated to maintain by law.
  4. Publicity and Communication. There is a need to communicate with the public about how quickly drought impacts have arisen and that climate change and drought impacts are not short-term issues.
  5. NPS's Mission is to maintain natural resources and provide enjoyment. In addition to the focus on fee reductions, this includes many other concerns such as exposed cultural sites, erosion, effects of warmer water, encroachment, and grazing.
- NPS: **[Rob Billerbeck, Colorado River Coordinator]** The **[PRESENTATION]** described the NPS Units and the natural resources that are affected by the Colorado River drought. The NPS does not manage the water through its Units, which makes it difficult to manage its resources. The NPS has many concerns about the impacts from climate change, and the biological and physical effects of changing water levels. While NPS does not have control over water policy, it wants to be part of decision-making through multi-agency planning processes.
- Reclamation: **[Katrina Grantz, Upper Colorado Basin, Assistant Regional Director]** Reclamation's Upper Colorado Basin Region directly operates and manages the initial units of CRSP, which include Glen Canyon Dam, Flaming Gorge Dam, Navajo Dam, and the Aspinall unit on the Gunnison. Reclamation's mission is to manage, develop, and protect water and related resources. The Interim Guidelines in 2007 determined which users would reduce use and helped enhance voluntary actions to reduce water use. The reservoirs are hitting their lowest levels since they were filled. In July 2021, as runoff conditions worsened, drought operations were initiated: the upstream units of CRSP will deliver an additional 181,000 acre-feet to Lake Powell by the end of 2021. Downstream releases will be reduced in 2022 due to declining reservoir levels. In the Lower Basin, this represents the first shortage declaration. Drought impacts have environmental and economic dimensions; these include greater risks to endangered and threatened species and reduced environmental program funding because of falling revenue generated through the sale of hydropower, primarily through Glen Canyon Dam.



- U.S. Fish and Wildlife Service (USFWS): [**Jess Newton, Arizona Fish and Wildlife Conservation Office, Project Leader**] The USFWS mission is to conserve, protect, and enhance fish and wildlife and their habitats. For the Grand Canyon, this boils down to a focus on the fisheries. The main impacts of drought on the resources are to water quality. Warming temperature shifts have had a beneficial effect on humpback chub recruitment and growth, but future projections of more warming are concerning for favoring predatory, non-native species. The problems in the tributaries are the lack of flood flows to clean out the sediment and poor recruitment. Have seen positive effects from translocations.
- U.S. Geological Survey (USGS): [**Michael Chotkowski, Interior Region 8, Science Coordinator**] The drought in the Colorado River basin is longstanding and now includes a deep drought in California. Because USGS's mission is research and monitoring, it is not directly affected by the drought; however, the agency provides support to partners directly impacted by drought conditions. USGS is deeply engaged in the Colorado River Basin and elsewhere both locally through GCMRC and nationally through its modeling products.
- Western Area Power Administration (WAPA): [**Tim Vigil, CRSP Management Center, Senior Vice President and Manager**] WAPA delivers hydropower under the CRSP Act of 1956. Revenue from the sale of electricity pays for WAPA's operations, for Reclamation's equipment on the dams, and funds environmental programs. WAPA is very concerned about the water elevation in Lake Powell and has been suffering from drought effects on hydropower production for a long time. Currently undertaking a new rate process, which would increase rates and reduce purchased power. Glen Canyon accounts for about 75% of CRSP generation. Because of the current situation, maintenance is reduced and costs deferred. End users represent five million people across six states.

The following five topic areas were discussed by the panel:

- 1) **Lessons Learned:** *The current drought has persisted now for over 20 years. What has your agency learned about the effectiveness of actions taken during that time period? How can those lessons learned be applied to the current and future droughts?* [**Jess Newton, USFWS**] USFWS has some tools that can help through the severe times. One is translocations, which have shown that the fish survive better and grow faster. Have also learned that temperature is a huge driver for native species, and it may be a preventative for non-native species. If a tool for temperature can be developed, that can have huge benefits although there are engineering and cost considerations. [**Billy Shott, GLCA**] The lessons learned are still being developed. NPS needs to engage in a longer-term management effort and take the opportunity to project existing data into sustainable investments in the future (i.e., two to five decades). [**Michael Chotkowski, USGS**] Conducting scientific investigations alongside management is important for learning about potential management implications. One example is temperature regimes on fish populations. Some effects are predictable, but some have elements of surprise. This information needs to be known to aid management decisions. Another lesson learned is that extended periods of low flow allow sandbars and beaches to build up. Quantifying that would allow managers to make future operational decisions on flow regimes. [**Katrina Grantz, Reclamation**] One lesson is the importance of maintaining strong relationships and close communication with partners, which allows for quick adaptation to changes.

- 2) **Funding.** *There has been a lot of news about appropriations and infrastructure funding to support drought response in the West. Will your agency receive any of those funds? How will you spend them? Does your agency have the resources it needs to address drought impacts?* **[Tim Vigil, WAPA]** The proposed Infrastructure Investment and Jobs Act has a provision on WAPA's reserve balances, which is a result of the drought. The Senate bill would provide \$500 million in borrowing authority for WAPA to use for purchase power and wheeling. It would have to be paid back in ten years and at the Treasury rate. This is something WAPA can use if there is a dire situation such as going below the minimum power pool. There could be other bills related to drought that could affect WAPA. **[Katrina Grantz, Reclamation]** Reclamation is working closely with WAPA to address concerns about the Basin Fund. Sufficient funding is anticipated in FY22, but the long-term funding outlook remains a concern. With respect to major retrofits to CRSP facilities that might mitigate drought impacts to downstream resources, if there are projects that people feel strongly about, please share this with Reclamation. **[Billy Shott, GLCA]** NPS has \$600 million in projects that have been started and has identified another \$20-30 million to address long-term drought issues. The problem is implementation. Current business functions do not always allow for rapid planning, designing, or building. This process needs to be streamlined.
- 3) **Collaboration:** *As you think about what is needed for an effective, holistic response to the drought, looking outside your own agency, what should the priorities be for other levels of government – state and local, non-governmental organizations (NGO)s, and the broader public? Feel free to share activities that support or dovetail with federal efforts or those that need to be taken independently.* **[Rob Billerbeck, NPS]** A lot of the past processes were developed over years of collaboration; that firm foundation and strong relationships are helping speed processes that have taken years in the past. For example, Reclamation's response to hydrology changes had to occur in a compressed timeline. That was able to occur because of the collaboration between agencies, and it helped everyone understand how water levels will affect recreational facilities. This has been a new approach. This informed conversations around NPS docks, such as the one at Curecanti/Blue Mesa Reservoir, which is a major \$8 million concrete facility that supports a restaurant and other services that provide about \$44 million in local economic benefits. It takes a great deal to move them, which needed to be done in weeks. Collaboration cannot take years anymore. **[Katrina Grantz, Reclamation]** Collaboration has been excellent and has helped tremendously. The [WaterSMART Grant Program](#) works with local groups and water districts to conserve water, which is another opportunity for collaborative solutions.
- 4) **Public Information Tools:** *I would like to keep tabs on drought conditions and impacts in real time, but it's challenging to find good information. What tools and information sources does your agency make available that can help?* **[Mike Chotkowski, USGS]** USGS can provide the underlying data that Reclamation and others rely on to operate facilities. The [Water Dashboard](#) provides real-time, provisional data on nationwide stream gages for surface water. GCMRC can recommend [Grand Canyon-specific research projects](#) or reach out to other USGS offices for specific data. GCMRC monitoring stations app is available at: [https://www.gcmrc.gov/discharge\\_qw\\_sediment/stations/GCDAMP](https://www.gcmrc.gov/discharge_qw_sediment/stations/GCDAMP). Another USGS web tool that might be useful is <https://waterwatch.usgs.gov/>. **[Rob Billerbeck, NPS]** NPS climate website has extensive plans for adaptation, as well as our climate change research and monitoring and

our installation of new electrical vehicle charging stations at our visitor centers across the country See: <https://www.nps.gov/subjects/climatechange/index.htm>. **[Katrina Grantz, Reclamation]** Reclamation has a new drought portal that synthesizes data across the West. See: <https://www.usbr.gov/addressing-drought/index.html>. See also the webpages for the [Upper Colorado Basin Water Operations](#), the [Glen Canyon Dam Operations](#), the [24-Month Study](#), and the [5-Year Projections](#).

- 5) **Future Outlook:** *What do you see as the long-term outlook/implications of continued drought for the resources that are the focus of the AMWG?* **[Katrina Grantz, Reclamation]** Reclamation is expanding its approach and sharing information on a wider range of conditions in addition to maximum and minimum probable forecasts. This information will be released in early September, probably when the 5-year projections are released. It will likely take four or more consecutive years of above-average snowpack and inflow to restore the system as it was before the drought. Therefore, Reclamation is planning for continued dry conditions, lower reservoir levels, reduced releases, and warmer water. Working with partners to develop additional drought response plans by the end of 2021 with implementation by 2022. Committed to continued collaboration to address the ongoing drought. **[Billy Shott, GLCA]** There is still so much uncertainty. For example, in Lake Powell operations, the difference between the high and low probability estimates is 120 feet. The rainbow trout fishery is one example of many species for which exact impacts are not known, but changes are anticipated. **[Rob Billerbeck, NPS]** Recreational “sport” fish and endangered fish are of concern throughout the whole system. The system is highly variable, but the focus needs to be on the overall trend of water availability from climate change because there is not likely to be above-average snowpack again for four to five years in a row. **[Jess Newton, USFWS]** The planning needs to be done for a future negative scenario because there are likely going to be increasing threats to endangered species.

### Tribal Partners Report

**[Jakob Maase, Hopi Tribe]** The Hopi are currently on their river trip. This is now the second to final phase for re-opening the reservation. Will also start hiring the archivist and the temporary ethnography positions soon. **[Peter Bungart, Hualapai Tribe]** As of July 30, no longer employed by the Hualapai Tribe but is still representing the tribe in the AMWG. Expect that Richard Powskey (AMWG alternate) will be the AMWG representative in the future. Dr. Martina Dawley is Peter’s replacement at the Hualapai Department of Cultural Resources and will likely be participating in the GCDAMP. The tribe is on a new lock-down due to COVID-19. The Cultural Department is still planning a river trip in September. **[Erik Stanfield, Navajo Nation]** Navajo Nation has increased its restrictions because of COVID-19, which caused the cancellation of the yearly monitoring trip. Still trying to do some smaller, land-based, monitoring trips to the Little Colorado River, Lees Ferry, and to the San Juan arm. The Navajo Nation has established a Climate Change Office with four staff members, which includes consideration of drought effects. **[Arden Kucate, Pueblo of Zuni]** Pandemic restrictions were lifted, but some are being reinstated. Currently, everyone is back to work. A Zuni river trip is planned for August 21-30. During the 2018 river trip, 22 sites out of 24 visited were showing adverse impacts from human visitation. The tribe met in July to discuss tribal knowledge and the matrix to work out some of these concerns. With the lack of snow and water resources, environmental and natural stewardship based on past National Environmental Policy Act (NEPA) documentation is becoming questionable for the future. For example, the benefits of warm water versus cold water to native fish. These are critical areas for the Zuni tribe,

and their traditional knowledge should be incorporated. **[Daniel Bullets, Southern Paiute Consortium]** A mask mandate was implemented for all tribal buildings and stores. Have not had any closures yet but they are expected in the fall and winter. The tribe's 10-day monitoring river trip occurred in June. "White algae," which looks like fish guts, was seen throughout the trip and is concerning. Even though the park was closed, there was a lot of use where people could hike down to the river. People on private boats were talking about rock climbing at Deer Creek, which they are not supposed to do. The trip was a success, and a report will be submitted to Reclamation.

#### **Q&A and discussion**

**[Daniel Picard, Reclamation]** Hoping to fill the AMWG Tribal Liaison position soon. The [application period](#) closes August 26.

**[Ernie Rheume, Reclamation]** There will be a meeting this Friday (August 20) with the Assistant Secretary for Water and Science, the Commissioner, leadership from the Upper and Lower Colorado Basins, and all of the Colorado River tribes. The purpose is to kick off a forum for Reclamation and the tribes to exchange information about decisions being made on the Colorado River. This initial meeting will include hydrology reports, the DROA, and other pressing topics. Reclamation is looking for feedback from the tribes. It is expected these meetings will be held monthly. Reclamation is also working on building tribal capacity on modeling activities, including assessing training needs or providing technical help to the tribes, so that they can better engage with all the information that Reclamation has on the Colorado River. **[Arden Kucate, Pueblo of Zuni]** Will that request for feedback go to all the Southwest tribes close to the Colorado River? **[Ernie Rheume, Reclamation]** Yes, it will go to everyone.

#### **Basin Fund Status and Long-term Funding Considerations for Hydropower Revenues and Appropriations**

**[PRESENTATION]** **[Brian Sadler, CRSP Administrative and Technical Services Manager, WAPA]** Recent projections show revenues will not cover operations and maintenance expenses in 2021, which means forgoing the scheduled repayment obligations. This is unprecedented and is because of the continuing drop of Lake Powell's elevation with decreasing generating efficiency. To mitigate the corresponding decrease expected to the CRSP Basin Fund, WAPA is considering deferring projects, increasing rates, and reducing funding to Reclamation for environmental programs.

**[PRESENTATION]** **[Kathleen Callister, Resources Management Division Manager, Reclamation]** Reclamation needs both an Authorization (an Act of Congress) and Appropriations (to provide funding) to conduct its programs. The GCDAMP is authorized under Public Law (P.L.) 102-575 (refer to Sections 1807 and 1808) and P.L. 106-377 (Section 204). Neither is in a sunset clause, so GCDAMP is in a good position with its Authorization. Funding for GCDAMP is in the President's budget, which included \$21.4 million for "Colorado River Activities." Right now, both the Senate and House Appropriations bills have language that authorizes these funds. For GCDAMP in FY22, funding levels are expected to remain the same at \$11.36 million. The FY24 budget request is being developed now.

#### **Discussion**

**[John Hamill, FFI/TU]** Is there a potential to increase power generation at Glen Canyon by retrofitting the bypass tubes with turbines? Could that also address temperature and dissolved oxygen concerns?

**[Wayne Pullan, Reclamation]** Reclamation was close to implementing a temperature control device at

one time but could not push that through; retrofitting the bypass tubes is very expensive. More information will be provided on Day 2 of this meeting. **[Matt Rice, American Rivers]** Is there the potential to make the rate adjustment match the increased costs? **[Brian Sadler, WAPA]** WAPA is proposing to reduce generation to eliminate most of the purchase power expected over the next couple of years. That is one of the goals of this rate proposal, which is based on expenses and what is being charged for that energy.

## FY 2022 Budget and Work Plan

**[PRESENTATION]** **[Seth Shanahan, Southern Nevada Water Authority (SNWA) and TWG Chair]** The last TWG meeting was in June when the Budget Ad Hoc Group (BAHG) provided its recommendation to the TWG. This will be presented as a motion to AMWG for its consideration.

**[PRESENTATION]** **[Lee Traynham, Reclamation]** GCDAMP's anticipated funding for FY22 is \$11.36 (80% to GCMRC and 20% to Reclamation). FY22 budget is expected to be short but anticipate making up that difference from FY21 funds. If there are remaining funds, Reclamation would like to use up to \$50,000 to conduct a dissolved oxygen risk assessment. Other emerging issues to consider if funding is available are fish passage prevention, temperature control, humpback chub status and trigger response, and archiving/updating the LTEMP models.

**[PRESENTATION]** **[Mike Moran, Acting Chief, GCMRC]** The projects in GCMRC's budget were shown. The BAHG had requested for GCMRC to prioritize its projects if end-of-year funding is made available. The priorities were detailed in the presentation. It is expected there will be \$203,000 in carryover funding that will be used to balance the FY22 budget. The Lake Powell Water Quality Project is listed in the Triennial Budget and Work Plan (TWP), but it is not funded through GCDAMP. An update was also provided on the new building and its expected overhead rates.

## Discussion

**[Jan Balsom, NPS]** What is being done on the project regarding fish passage and the issue to exclude non-natives? There is an urgency as water temperatures keep shifting. **[Lee Traynham, Reclamation]** The best plan for controlling non-natives is preserving lake elevations. The risks are much greater when elevations get closer to 3,490 feet. The Technical Services Center (TSC) had looked at some creative ideas, but the solution is not readily apparent. Any physical barrier becomes a significant maintenance effort, and some non-natives are already present below the dam. **[Clarence Fullard, Reclamation]** There are efforts being pursued regarding fish passage with the TSC and Utah State University to better understand the risks and explore exclusion ideas. More to come later.

**[Larry Stevens, GCWC]** Will there be a monitoring system to be able to recognize changes or novel patterns? The foodbase is much more dynamic than previously thought with more seasonality patterns with the macrophytes. As the water warms, there will be more potential for disease. Water quality issues during monsoons can also affect bacterial levels. How can this be tracked better? **[Mike Moran, GCMRC]** It is hoped that normal monitoring by GCMRC would catch effects from temperature and disease. If not, maybe there can be an evaluation to respond to a spike in some other way. **[Larry Stevens, GCWC]** Perhaps include this as an agenda item in the next TWG meeting. **[Jan Balsom, NPS]** Ken Hyde or Billy Shott can address water quality issues in Lake Powell. The NPS also has a new Public Health Officer at Grand Canyon who can be made aware of concerns about bacteria. **[John Hamill, FFI/TU]** It is troubling to see temperature control and fish passage being delayed. There needs to be

more urgency to address these issues, because it takes time for the agencies to get going on them. **[Lee Traynham, Reclamation]** These were flagged, but that was not intended to imply they would be delayed. It was to show that additional funding was not being requested for these items in FY22, but should be on our radar as a potential need. There are many challenges and Reclamation is interested in hearing solutions that others might have. **[Larry Stevens, GCWC]** Fish parasites are also a possible concern with increased warming, which might not be detected through monitoring.

## FY 2022 Budget and Work Plan Recommendation

**[Seth Shanahan, SNWA and TWG Chair]** The [TWG motion](#) that was approved by consensus was presented to the AMWG.

### Discussion

**Larry Stevens, GCWC]** With all the uncertainty, it might be advisable to develop an Ad Hoc Committee for contingency planning purposes to quickly respond to emergency situations. This would be tangentially related to the BAHG, if funding is also needed. **[John Hamill, FFI/TU]** Could the TWG be tasked to do this? **[Larry Stevens, GCWC]** The responsibilities would need to be clear, but a committee that meets monthly might be quicker to respond than the quarterly TWG. **[Leslie James, CREDA]** If there is end-of-year funding, could this be held in the Basin Fund, or could it be applied to the GCMRC Water Quality Project to mitigate impacts of other power revenue funding? The authority to find alternative funding sources already exists and needs to be considered going forward. **[Lee Traynham, Reclamation]** It is a constant struggle to find cost efficiencies in these programs and to incorporate them long-term. Reclamation feels confident in the funding for FY22, but the outlook beyond that is uncertain. There is a need to consider end-of-year funds to address and mitigate the uncertainty in future years. This has been discussed in the BAHG.

**[Larry Stevens, GCWC]** Moved the motion. **[Sara Price, CRCN]** Seconded the motion.

The following motion was approved by consensus:

*The Adaptive Management Work Group recommends for approval to the Secretary of the Interior the Fiscal Year 2022 budget as described in the attached worksheets, with the following revisions:*

*First, the addition of the following prioritized list of Grand Canyon Monitoring and Research Center projects to be considered as appropriate sources of funding become available (e.g. Triennial Work Plan carryover funds from prior years or through annual review of the Triennial Work Plan or other Reclamation considerations).*

- 1. Juvenile Chub Monitoring-West (2023).*
- 2. Additional Trout Recruitment and Growth Dynamics Site (2023).*
- 3. Aquatic Vegetation Removal Pilot in Lees Ferry (202?) (Subject to additional proposal detail and completion of compliance requirements).*
- 4. Decision Analysis - Project O.11 and Bug Flow Review (Additional proposal detail requested following Science Advisor review).*
- 5. Aquatic Food Base – Project O.1 (2022).*
- 6. Sediment Mapping Below Diamond Creek - Project O.2 (2022).*

*Second, the addition of a Dissolved Oxygen Risk Assessment to be completed by Reclamation in 2022 as appropriate sources of funding become available.*

## Public Comment

None.

**Meeting adjourned at: 3:35 PM PDT**

## Thursday, August 19, 2021

**Start Time:** 8:30 am PDT

**Conducting:** Wayne Pullan, AMWG Chair

**Recorder:** Carliane Johnson, SeaJay Environmental, L.L.C.

**Facilitator:** J. Michael Harty and Kearns & West team.

## Welcome and Administrative

- Introductions and Determination of Quorum. **[Michael Harty, Facilitator]** Roll call was taken, and a quorum reached with 18 members represented.
- Revisit any outstanding items from the previous day. **[Lee Traynham, Reclamation]** One item was temperature control and concerns about decreasing lake levels. This [link](#) is to a presentation to the TWG about temperature control devices. The 2016 LTEMP biological opinion includes a conservation measure for Reclamation to evaluate a control device under a broad range of conditions (i.e., warming and cooling, high and low flows, and high and low reservoir levels). The earliest conversations (back to 1978) focused on high lake levels and the need to provide a warming device. Recently, the TSC prepared a [summary report](#) about the range of temperature control devices and technologies as well as associated challenges and opportunities. The focus of the conversation has changed in recent years to providing cooler water but have found that these options are more limited. One opportunity is to look at the bypass tubes, which are below the penstock intakes and could access cooler water. One of the challenges is that the potential cooling capacity of this alternative is very limited. Reclamation is also hoping the GCDAMP can help refine the temperature objectives. It has been fortunate to have a “just right” temperature regime below Glen Canyon Dam that has reduced challenges with non-natives, which are prevalent in the Upper Basin, and has allowed humpback chub to recruit. Continuing to maintain this “just right” temperature regime is going to be challenging. Refining the objectives for temperature targets downstream of Glen Canyon Dam will inform the most appropriate solutions. **[Nick Williams, Reclamation]** Adding power generation to the river bypass could provide limited temperature control capability. With the addition of power generation, the bypass tubes would have reduced discharge capacity of an estimated 7,000 cubic feet per second [CFS], compared to 15,000 CFS for the existing bypass structure. Temperature control is limited because changes can only be affected based on the water that can be released at a single, fixed elevation. The last study by Reclamation on bypass generation, published in 1983, estimated a power plant on the bypass would have a maximum capacity with two units at 250 megawatts (MW). That compares to the current power plant, which has a capacity of 1,320 MW. The concept was recently discussed with WAPA including the benefits of bypass generation, e.g., temperature control, water quality, experiments during HFEs, operational flexibility during maintenance, and replacing power generation, such as constructing

a smaller plant to generate power for when the elevation is below the power pool. That could potentially cost nine months and \$1 million to complete an appraisal study and at least \$500 million to build.

## Federal Agency Updates

- WAPA: Glen Canyon Dam Emergency Exception Criteria [**Tim Vigil, WAPA**] This year there have not been any emergency events like last year's rolling blackouts. There was a potential for California to hit a threshold in early June, but this did not happen. There is still a possibility for it to occur in September.
- USFWS: Humpback chub, razorback sucker, Kanab ambersnail Endangered Species Act (ESA) status [**Jess Newton, USFWS**] Jessica Gwinn, USFWS Colorado River Coordinator, has accepted a position in the regional office and her former position is now vacant. The final rule on reclassifying humpback chub from endangered to threatened should be out soon. Revisions to the Recovery Plan will occur after the final rule. A detailed presentation on razorback sucker will be held later in this meeting, which will cover the proposed down-listing and the associated 4(d) rule. The delisting of Kanab amber snail (due to taxonomic reclassification) became effective on July 19, 2021. This species falls under state wildlife agency authority so Arizona Game and Fish (AZGFD) will manage this population, but it is no longer a listed species under the ESA.
- NPS: Non-native Aquatic Species Management Plan [**Ken Hyde, NPS-GLCA**] NPS is still conducting the first year of the incentivized harvest program with 340 brown trout turned in with two-thirds of them 12 inches or larger. Recently checked the upper slough (at -12 miles, just below the dam) for green sunfish. There were young present so will look into transferring them to Lake Powell prior to an HFE and to address tribal concerns. Will start preparing the 12-month review of the incentivized harvest program in November for the technical meetings in January. [**Brian Healy, NPS**] Grand Canyon was not able to translocate humpback chub this summer due to COVID-19 and because of low production of young-of-year in the Little Colorado River. Will continue to suppress brown and rainbow trout this winter and will complete monitoring of the translocation sites this summer.
- DOI Solicitor's Office: LTEMP Litigation [**Rod Smith, DOI**] DOI is still in the procedural phases of the LTEMP litigation. LTEMP was challenged by Save the Colorado and Center for Biological Diversity alleging that the NEPA analysis was wrong based on climate change. DOI has been working on the Administrative Record and discovery issues. The last motions before the court were briefed last spring. Now waiting on the court to make its decision on those motions. Once that is done, then the court will have established the factual basis for the lawsuit and move on to a substantive briefing on the merits of the case. Any interested organizations who would like to become intervenors in support of LTEMP should contact Rod.
- BIA, GCMRC, Reclamation [**Chip Lewis, BIA**] No updates. [**Scott VanderKooi, GCMRC**] Has accepted a new position as Director of Southwest Biological Center but will still be overseeing GCMRC. Mike Moran is GCMRC acting chief. Ted Kennedy is helping with the deputy duties. GCMRC's field season this year has not been disrupted. [**Kathy Callister, Reclamation**] Katrina Grantz is the new assistant regional director along with Daniel Picard. Zac Nelson is the new archeologist. The GCDAMP Tribal Liaison position is now open for applicants.



## Proposed Rule for Downlisting Razorback Sucker

**[PRESENTATION]** **[Julie Stahli, Deputy Director, Upper Colorado River Endangered Fish Recovery Program and Kevin McAbee, Fish Biologist, USFWS]** The decision to down-list the razorback sucker was proposed in 2018. The Recovery Plan will be revised after publication of the rule. A Special Status Assessment (SSA) was done as well as a peer-review process. Details are contained within the presentation.

### Q&A and discussion

**[Jan Balsom, NPS]** Curious about the time lag of the SSA evaluation. How will the recent changes be addressed? For razorback suckers that rely on a stocking program, it does not seem sustainable in light of changing environmental conditions. Maintaining native species is a key component of the NPS mission, too. **[Julie Stahli, USFWS]** There are a variety of reasons why the process might take a long time. The down-listing was not an easy decision for USFWS but it came back to the definitions of threatened versus endangered. There is a need to balance the needs of the species to the changing conditions. For example, Colorado pikeminnow went through a similar process but its trajectory in the Green River was declining, which resulted in the decision to continue to list it as endangered. There have been great improvements in the Upper Basin for razorback sucker resulting in it not being endangered at this time.

### Stakeholder Updates:

- States: **[Dave Rogowski, AZGFD]** Monitoring was completed in Lees Ferry reach last month. The lower slough is open to the river. Did not find any rare non-natives (e.g., no green sunfish, walleye, smallmouth bass, etc.). Rainbow trout fisheries are at low levels right now; the lowest seen in about 20 years. **[Charlie Ferrantelli, Wyoming]** Have been focused on DROA, releases from Flaming Gorge, the Work Group meetings, and public outreach on those releases.
- Tribes: **[Peter Bungart, Hualapai]** Acknowledges the resources devoted to the sediment situation in the Western Canyon (Project O.2) and is looking forward to the study results. **[Kurt Dongoske, Pueblo of Zuni]** The Zuni River trip will launch on Saturday and will follow GCMRC's COVID-19 protocols. Regarding the monitoring metrics, there is concern about the qualitative values of the resources, which should be given commensurate consideration as the quantitative values. Zuni is developing a collaborative mitigation strategy with the NPS on an ancestral site in the Grand Canyon. Also hope to receive funding soon from Reclamation on that proposal.
- Non-Governmental Organizations (NGOs): **[Matt Rice, American Rivers]** American Rivers will be hosting a river trip next week through Gates of Lodore to discuss renegotiation of the basin guidelines. Will continue to support the investigation of returning rivers in Lower Cataract Canyon. **[Kelly Burke, GCWC]** Plans have been approved for the Paria Beach restoration project with NPS and others. **[Kevin Garlick, Utah Municipal Power Agency]** Power purchasers, utilities and municipalities, are working to mitigate costs related to reduction in power generation. It was noted that the replacement of hydrogeneration typically involves a fossil fuel source, which results in higher carbon emissions. **[John Jordan, FFI/TU]** The ongoing study of the temperature control devices was informative. FFI will continue those discussions and work toward implementation. **[David Brown, Grand Canyon River Guides]** The monsoons this past season have been very violent. There was an unfortunate incident in Marble Canyon that killed one person and seriously injured another.

## LTEMP Experiments Considered & Implemented for WY 2021 and WY 2022

**[PRESENTATION]** **[Lee Traynham, Reclamation]** Presented summary of the process by which LTEMP flow experiments were discussed and considered. No flow experiments were recommended for implementation by the Planning and Implementation Team for 2021. However, there were two research-related flows that were implemented in 2021: the spring disturbance flow that was done in conjunction with the apron repair and the overflight data collection effort and associated flow.

**[Ted Kennedy, GCMRC]** The spring disturbance flow was implemented over a ten day duration in March 2021 because of needed dam maintenance. One concern was the potential for the stranding of native fish. Only a few small were observed in isolated pools. An overall update will be reported at the Annual Reporting meeting. **[Michael Moran, Acting Chief, GCMRC]** The other major data collection effort was for the overflight. From the photographs and remote sensing information, a digital elevation model was developed. For experiments that could be occurring in FY22, there is the potential for a fall HFE. Inflows have occurred from July to current with significant sand inputs from the Paria.

**[Lee Traynham, Reclamation]** Reclamation runs the sand budget model, which determines whether the trigger is met for an HFE. The current model suggests a 48-hour HFE could occur in the fall. This means that the trigger has probably been reached, based on the preliminary model run. The Planning and Implementation Team will start meeting next week.

### Q&A and discussion

**[John Hamill, FFI/TU]** Why are trout numbers in Lees Ferry the lowest that AZGFD has observed in 20 years? **[Ted Kennedy, GCMRC]** There are a couple of hypotheses. Brown trout (being piscivorous) might be abundant enough that they are suppressing rainbow trout recruitment. **[Dave Rogowski, AZGFD]** Agrees with this. Not much recruitment of rainbow trout has been seen. One possible explanation is that brown trout numbers are high enough that they are preying on small rainbow trout.

**[John Jordan, FFI/TU]** How does reduced water availability impact the consideration of HFE experiments, both related to water distribution and hydropower generation? **[Brian Sadler, WAPA]** WAPA will need to model the specific proposal. Where the water comes from is taken into consideration, plus the cost of hydropower, which are lower in the shoulder months of November and springtime.

**[Jessica Neuwerth, Colorado River Board of California]** Do HFEs require "borrowing" release volumes from other months, or just shifting release volumes within the month of November? Or does it depend on the duration of the HFE, i.e., shorter HFEs can be accommodated within the November release volumes, but longer HFEs require borrowing water from other months? **[Heather Patno, Reclamation]** Water can be borrowed from other months within the water year.

**[Larry Stevens, GCWC]** Given the maintenance schedule at the dam, how much discharge could be generated if an HFE was to be triggered? **[Heather Patno, Reclamation]** Probably around 26,000 CFS.

**[Billy Shott, GLCA]** Are there ways to determine how a proposed HFE under these parameters would affect the lake levels of Lake Powell? Especially considering the current lake levels are affecting the volume/depth ratios? **[Lee Traynham, Reclamation]** The Planning and Implementation Team will look at proposed hydrographs and how they might impact lake levels; elevation impacts will partly depend on the hydrograph and how water is reallocated within the year to accommodate the HFE.

**[John Hamill, FFI/TU]** Borrowing water from November to support an HFE could raise water temperatures and lower dissolved oxygen, which could significantly affect the Lees Ferry trout fishery. **[Mike Moran, GCMRC]** If water is being released in November and not replaced until later in the year, that could affect the lake. The intakes will come closer to the stratified level in the lake, which is the warm part and would be lower in dissolved oxygen. That could be an issue. **[Jan Balsom, NPS]** Will we see changes in temperature near the penstocks in the timeframe around a potential HFE? **[Ted Kennedy, GCMRC]** HFEs tend to cool the water. The jet tubes act like a giant aerator. Borrowing water in the winter months would need to be modeled. **[Lee Traynham, Reclamation]** The annual releases are fixed. Discussions around borrowing water relate to the monthly pattern. If there is an HFE, LTEMP requires that the total amount of annual water must remain the same.

### GCMRC Science Updates

**[Michael Moran, Acting Chief, GCMRC]** This [\[PRESENTATION\]](#) includes only those projects with the most recent data results and how GCMRC is addressing the drought. Projects discussed were Sandbar Monitoring (Project B) and a recent publication by [Mueller and Grams \(2021\)](#) on morphodynamic modeling; Riparian Vegetation Field Measurements along with the remote sensing (Project C); Humpback Chub (Project G) with estimated numbers in the Little Colorado River likely to be at the lowest ever observed; Rainbow/Brown Trout in Lees Ferry (Project H) with low abundance of rainbow trout and the current population dominated by large fish, increased catch rates of brown trout continue to be observed); and Geospatial and Data Science (Project K). GCMRC could re-focus its work on drought, if requested, but it is constrained and would need to reduce the budget in other areas.

### Q&A and discussion

**[Sara Price, CRCN]** How would it look different to monitor for drought? **[Michael Moran, GCMRC]** Larry mentioned fish disease. **[Ted Kennedy, GCMRC]** During monitoring trips, disease impacts such as lesions would be noted. Feels confident this would be seen and it is not a gap.

**[Sara Price, CRCN]** Would propping the lake up, just enough to address low lake levels, have that much of an effect? **[Kim Dibble, GCMRC]** It does matter. If there is not enough water, it would change the equation. That was the main point of the paper.

**[Larry Stevens, GCWC]** Can GCMRC participate in a Contingency Awareness Ad Hoc committee? **[Ted Kennedy, GCMRC]** This is going to be considered at the next TWG meeting.

**[Jan Balsom, NPS]** At the various water levels, these lower temperature and lower reservoir conditions have not been investigated. What would the conditions be like for aquatic vegetation at these lower release levels? **[Ted Kennedy, GCMRC]** In general, lower flows allow for more biological processes whereas at higher flows, things are just moving through. There are no red flags at lower flows although there might be surprises in store. There will be shifts. For example, dissolved nutrients will decrease while phytoplankton will increase. Regarding a contingency plan ad hoc committee, the ability to mitigate might be the most difficult to do. Perhaps we consider the stressors, the response times, and whether there may be a bottleneck to the response?

**[Amy Mignella, Office of General Counsel, Hopi Tribe of Arizona]** Are any graphics available depicting these perturbations and their likely system consequences? For example, has any modeling been done for zero river flows to work from there to improve conditions? **[Kim Dibble, GCMRC]** This [paper](#) looked

at future scenarios of water temperature and the probability native and non-native species may become common in various river segments in the future due to warming water temperatures. In addition, Charles Yackulic has been working extensively with folks from Utah State University to do more complex modeling of the issues you raised, and they now have additional funding to continue and expand upon that work.

### Technical Work Group Chair Report

**[PRESENTATION] [Seth Shanahan, SNWA and TWG Chair]** The last TWG meeting was in June, which resulted in completion of the FY22 budget for the TWP that was approved yesterday. Next TWG meeting will be held virtually in October, and then possibly an in-person, annual reporting and TWG meeting in Flagstaff in January. The TWG has also been discussing and tracking low elevations in Lake Powell, drought response, budget, experimental actions, science updates, and monitoring metrics. The TWG also continues to discuss temperature control devices and to track many other issues (fish passage, conservation actions, the trigger document, power purchase cost, changes in Little Colorado River, etc.).

### GCDAMP Monitoring Metrics

**[PRESENTATION] [Helen Fairley, Social Scientist, GCMRC]** The purpose of this project is to define “performance metrics” for the GCDAMP. The focus is primarily to evaluate progress towards achieving management goals of the LTEMP. A [draft plan](#) for how to identify the metrics was shared with the TWG in June and AMWG comments are requested by September 17. Preliminary draft metrics are expected to be submitted to the TWG at the October 2021 meeting.

**[Clarence Fullard, Reclamation]** Science Advisor will review similar types of large, multi-science programs, consider the lessons learned, and compare them with the approach to measure LTEMP progress.

### Discussion

**[Larry Stevens, GCWC]** GCWC has submitted extensive comments on the process. The path that Western science takes is to develop a model. Several of the resource areas are very well modeled that can test the monitoring metrics such as sediment flow, water temperature, etc. These are world-class and straightforward. Other resource objectives are either vague or do not fit well into a model. A good exercise might be to prioritize which suite of questions can or cannot currently be applied with a metric.

**[Helen Fairley, GCMRC]** Appreciates this input and would welcome further examples to bring forward.

**[Peter Bungart, Hualapai Tribe]** The situation now is much different than pre-dam conditions. Some tribal values also do not lend themselves to objective metrics. One resource does not necessarily exist in isolation from another. **[Jakob Maase, Hopi Tribe]** There are two phases of this, which is to learn the metrics (i.e., baseline) and the future metrics from that baseline. Cannot turn back the clock to a non-artificial environment, but can establish what is needed for a healthy environment moving forward.

**[Helen Fairley, GCMRC]** In the early 2000s, drafted the Core Monitoring Plan, which took five years and a huge amount of time. The scope of the monitoring in that plan consumed the entire budget, and it was never implemented. This time around, GCMRC tried to constrain the scope and plans to develop a conceptual model that will acknowledge the various eco-drivers that affect the outcomes, but the intent is to keep the focus on the goals rather than all the system variables.

**[Erik Stanfield, Navajo Nation]** Regarding the Science Advisor, do any of the previous large programs have experience working with tribes or other indigenous groups? There are many international programs in New Zealand, Canada and other places that could broaden this thinking. Secondly, it can be valuable to collect qualitative data at the same time as quantifiable data. That would help alleviate some of the tribal concerns if they can assist in the interpretation. **[Clarence Fullard, Reclamation]** It is not too late to send in those other program examples and add them to the list.

**[Jan Balsom, NPS]** It is field season and getting staff input to this plan has been a challenge. The NPS has a lot of different and ongoing monitoring systems. It would be important to work directly with GCMRC.

**[Helen Fairley, GCMRC]** Aware of other monitoring programs including those from the AZGFD, which has also developed metrics. The difficulty is going to be distilling them down to a few that are related to the goals.

**[Leslie James, CREDA]** Is the Core Monitoring Plan going to be culled for some metrics that may be used? **[Helen Fairley, GCMRC]** Not yet. Would not want to lose that effort, but the current effort is being done somewhat differently with a different focus. The goals have also changed since that time, so the metrics need to be relevant to the 2016 LTEMP but would not want to lose that earlier effort.

## Public Comment

None.

## WRAP-UP: Wayne Pullan, Secretary's Designee to the Adaptive Management Work Group

- Service Recognition **[Wayne Pullan, Reclamation]** Gives recognition to John Jordan, FFI/TU, John Hamill, FFI/TU; Jan Balsom, NPS; and Scott VanderKooi, GCMRC.
- FY2022 AMWG and Annual Reporting meeting dates **[Lee Traynham, Reclamation]** Send comments if there are conflicts with the proposed meeting dates. The January meeting will be virtual. The group will be notified if there are plans to conduct in-person meetings.
  - January 11-13, 2022
  - February 9-10, 2022
  - May 18, 2022 (webinar)
  - August 17-18, 2022

**Meeting adjourned at 3:05 PM**

## Meeting Attendees

### AMWG Members, Alternates, and Leadership

Jan Balsom, NPS-GRCA

Cliff Barrett, UMPA (Alternate)

Richard Begay, Navajo Nation

Peter Bungart, Hualapai Tribe

Charlie Ferrantelli, State of Wyoming (Alternate)

Kevin Garlick, UMPA

Michelle Garrison, State of Colorado (Alternate)

Paul Harms, State of New Mexico (Alternate)

Leslie James, CREDA

John Jordan, FFI/TU

Charles "Chip" Lewis, BIA

Jakob Maase, Hopi Tribe

John McClow, State of Colorado

Jessica Neuwerth, CRBC

Peggy Roefer, CRCN (Alternate)

Matt Rice, American Rivers

Brian Sadler, WAPA (Alternate)

William "Billy" Shott, NPS-GLCA (Alternate)

Arianne Singer, New Mexico

Larry Stevens, GCWC

Arden Kucate, Pueblo of Zuni

**USGS/GCMRC Staff**

Caitlin Andrews  
Lucas Bair  
Kimberly Dibble  
Helen Fairley  
Thomas Gushue  
Meredith Hartwell  
Nicole Herman-Mercer  
Ted Kennedy  
Josh Korman  
Teo Melis  
Michael Moran

Emily Palmquist  
Diana Restrepo-Osorio  
Joel Sankey  
Russ Taylor-Grimes  
Joseph Thomas  
Darrin Thome  
David Topping  
Alicia Torregrosa  
Scott VanderKooi  
Mark Wimer

**Reclamation Staff**

Amee Andreason  
Tara Ashby  
Marcie Bainson  
Mike Bernardo  
Becki Bryant  
Ashley Bulosan  
Dan Bunk  
Kathy Callister  
Jenny Erickson  
Clarence Fullard  
Katrina Grantz  
Dave Isleman  
Carly Jerla  
Christina Kalavritinos

Kerri Pedersen  
Daniel Picard  
Alex Pivarnik  
Ernie Rheume  
Wayne Pullan  
Noel Santos  
Dave Speas  
Meghan Thiemann  
Shana Tighi  
Lee Traynham  
Nicholas Williams  
Jill Nagode  
Heather Patno

**Department of the Interior**

Jabob Borton, *Solicitor's Office*  
Noel Ottman, *Solicitor's Office*  
Kerry Rae, *ASWS Chief of Staff*

Rodney Smith, *Solicitor's Office*  
Susannah Thomas, *Solicitor's Office*

**Interested Persons**

Todd Adams, Utah  
Terra Alpaugh, Kearns & West  
Seth Arens, Western Water Assessment  
Rob Billerbeck, NPS  
David Braun, Sound Science  
Jackie Brown, Tri-State Generation & Transmission  
Rod Buchanan

Carlee McClellan, Navajo Nation  
Scott McGettigan, State of Utah  
Lisa Meyer, WAPA  
Emily Omana Smith, NPS-GRCA  
Betsy Morgan, Utah  
McKenna Murray, Utah  
RJ Neff

## August 2021 Adaptive Management Work Group Meeting

Daniel Bulletts, Southern Paiute Consortium  
Kevin Bulletts, Southern Paiute Consortium  
Kelly Burke, Grand Canyon Wildlands Council  
Shane Capron, WAPA  
Julie Carter, AZGFD  
Mike Chotkowski  
Lew Coggins, USFWS  
Kevin Dahl, NPCA  
Fred Daniel, Fireflies.ai  
Martina Dawley, Hualapai Tribe  
Kurt Dongoske, Pueblo of Zuni  
Craig Ellsworth, WAPA  
Ed Gerak, AZ Power Authority  
Alicyn Gitlin, Sierra Club  
Emily Halvorsen, State of Colorado  
John Hamill, FFI/TU  
Michael Harty, Kearns & West  
Brian Healy, NPS  
Ken Hyde, NPS  
Carlaine Johnson, SeaJay Environmental  
Kristen Johnson, ADWR  
Tildon Jones, USFWS  
Edward Keable, NPS

Jess Newton, USFWS  
Bill Persons, FFI/TU  
Erika Pirotte, Navajo Nation  
Sara Price, CRCN  
Ted Rampton  
Shana Rapoport, CRBC  
David Rogowski, AZGFD  
Amy Schott, NPS  
Gene Seagle, NPS  
Seth Shanahan, TWG Chair and SNWA  
Erik Skeie, State of Colorado  
Erik Stanfield, Navajo Nation  
Julie Stahli, USFWS  
Zach Stevens, DRLawFirm.com  
Jim Stroger, FFI/TU  
Gary Tallman, Northern Arizona University  
Melissa Trammell, NPS  
Tim Vigil, WAPA  
Sara Larsen, Upper Colorado River Commission  
Randy Lavasseur, NPS  
Mike Lyndon, NPS  
Ryan Mann, AZGFD  
Kevin McAbee, USFWS

### Abbreviations

AMWG – Adaptive Management Work Group  
AZGFD – Arizona Game and Fish Department  
BAHG – Budget Ad Hoc Group  
CFS – Cubic Feet Per Second  
CRBC – Colorado River Board of California  
CRCN – Colorado River Commission of Nevada  
CREDA – Colorado River Energy Distributors Association  
CRSP – Colorado River Storage Project  
CY – Calendar Year  
DOI – Department of the Interior  
DROA – Drought Response Operations Agreement  
ESA – Endangered Species Act  
FFI – Fly Fishers International  
FLAHG – Flow Ad Hoc Group  
FY – Fiscal Year (October 1 – September 30)  
GCDAMP – Glen Canyon Dam Adaptive Management Program

LTEMP – Long-Term Experimental and Management Plan  
MW – Megawatt  
NEPA – National Environmental Policy Act  
NGO – Non-Governmental Organization  
NTUA – Navajo Tribal Utility Authority  
NPS – National Park Service  
PI Team – Planning/Implementation Team  
P.L. – Public Law  
PST – Pacific Standard Time  
Reclamation – Bureau of Reclamation  
ROD – Record of Decision  
Secretary – Secretary of the Interior  
SNWA – Southern Nevada Water Authority  
SSA – Special Status Assessment  
TSC – Technical Services Center  
TU – Trout Unlimited

August 2021 Adaptive Management Work Group Meeting

GCMRC – Grand Canyon Monitoring & Research Center

GCRG – Grand Canyon River Guides

GCWC—Grand Canyon Wildlands Council

GLCA – Glen Canyon National Recreation Area

HFE – High Flow Experiment

TWG – GCDAMP Technical Work Group

TWP – Triennial Budget and Work Plan

USFWS – United States Fish & Wildlife Service

USGS – United States Geological Survey

WAPA – Western Area Power Administration

DRAFT



**GLEN CANYON DAM ADAPTIVE MANAGEMENT WORK GROUP  
Action Item Tracking Report**

Note: Items marked “Closed” will be removed from the next iteration of the report.

ITEM No. / DATE	ACTION ITEM	ASSIGNED TO / DUE DATE	STATUS
Item 2017.Sep.01	<p>At its next meeting, AMWG will consider a process for planning for the next 20 years of LTEMP.</p> <p><u>February 2018 update:</u> This will be addressed through the development of monitoring metrics and by the streamlining of GCDAMP guiding documents as described in the LTEMP ROD.</p> <p><u>August 2019 Update:</u> This action item will move forward as directed and informed by the Guidance Memo issued by the Secretary’s Designee in August 2019.</p> <p><u>May 2020 Update:</u> The draft FY21-23 budget and workplan includes funding support to develop and track monitoring metrics and and to streamline guidance documents. Beginning Oct 20, Reclamation and GCMRC will initiate review of the LTEMP FEIS metrics. This work will be a focus for FY21, but will likely be ongoing through the FY21-23 TWP.</p> <p>...</p> <p><u>May 2021 Update:</u> GCMRC and Reclamation are working to define the scope of the metrics development effort, propose a list of existing and new metrics for consideration, and develop criteria to evaluate the metrics. Will seek Secretary’s Designee input and TWG feedback on proposed plan later in 2021.</p> <p><u>August 2021 Update:</u> A <a href="#">draft project plan</a>, including objectives and timeline, was distributed in early June 2021 for review and input. GCMRC is addressing TWG comments. A status update will be presented during the August AMWG meeting and member feedback requested.</p> <p><u>February 2022 Update:</u> The GCMRC developed several draft metrics and pilot presentations concurrently with the 2021 Annual Report. The draft metrics are currently in review with DOI bureaus and leadership, prior to further review and discussion by the Technical Work Group.</p>	Lee Traynham / ongoing	Open

ITEM No. / DATE	ACTION ITEM	ASSIGNED To / DUE DATE	STATUS
Item 2020.Dec.22	<p>In accordance with the 2021-2023 Triennial Budget and Work Plan <a href="#">approved</a> by the Secretary of the Interior on December 22, 2020: “Due to uncertainties in future funding levels, prioritization of projects outlined in the FY2021-2023 TWP is necessary and will be undertaken by the GCDAMP during FY2021. Project priorities may change over time based on hydrology, resource conditions, evolving scientific understanding and uncertainties, administration objectives and other factors.”</p> <p><u>February 2022 update:</u> DOI Bureaus have identified high priority activities that support compliance with GCPA, NHPA, ESA, and NEPA. Following review by DOI leadership, Feb/Mar 2022 is targeted for sharing with the Budget Ad Hoc Group.</p>	All / ongoing	Open
Item 2021.Feb.11	<p>Reclamation will extend an invitation to Secretary Haaland to join the FY22 stakeholder river trip.</p> <p><u>February 2022 update:</u> Potential river trip dates as either June 22 – July 1 OR July 13 – July 22. Feedback regarding interest and availability to participate from DOI leadership and from AMWG members is pending.</p>	Reclamation / ongoing	Open

# Supplemental Materials

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## Potential GCDAMP & Other Meetings in 2022

Days	Dates	Meeting	Comments
<b>JANUARY</b>			
W-Th	Jan 5-6	CRAB meeting	
W	Jan 12	UCLT all day	
T-W	Jan 11-12	Annual Reporting Meeting – TBD	
Th	Jan 13	TWG Meeting – TBD	
M	Jan 17	Martin Luther King Holiday	
Tu-Th	Jan 25-27	CRTR meeting	
Tu-Th	Jan 25-27	Upper Basin Mtg (Moab)	
<b>FEBRUARY</b>			
Tu	Feb 8	DOI Federal Family Meeting – TBD	
W-Th	Feb 9-10	AMWG Meeting – TBD	
M	Feb 14	President's Day Holiday	
	Feb	Possible Salinity work group meeting	
Th	Feb 17	MSCP Financial WG mtg	
<b>MARCH</b>			
Sun	Mar 13	Daylight Savings	
M-F	Mar	School Spring Recess in Flagstaff	
Th	Mar	Flaming Gorge WG	
<b>APRIL</b>			
W-Th	Apr 12-13	TWG Meeting – TBD	Request for 5-6 or 19-20
W	Apr 13	UCLT all day	
	Apr	Possible Salinity work group meeting	
Th	Apr	Flaming Gorge WG	
Th	Apr	Fontenelle WG	
W	Apr 27	MSCP Steering Committee meeting	
<b>MAY</b>			
W-Th	May 11-12	MSCP work group	
W	May 18	AMWG Webinar - Virtual	
M	May 30	Memorial Day Holiday	
<b>JUNE</b>			
	June	Possible 100 <sup>th</sup> Salinity Forum	
W-Th	Jun 15-16	TWG Meeting – TBD	
W	June 22	MSCP Steering Committee meeting	
<b>JULY</b>			
M	Jul 4	Independence Day Holiday	
W	Jul 13	UCLT all day	
<b>AUGUST</b>			
Th	Aug	Flaming Gorge WG	
Tu	Aug 16	DOI Federal Family Meeting – TBD	

Days	Dates	Meeting	Comments
W-Th	Aug 17-18	AMWG Meeting	
Th	Aug	Fontenelle WG	
	Aug	Possible Salinity work group meeting	
M-F	Aug	Fall semester starts at NAU – Flagstaff, AZ	
		SEPTEMBER	
M	Sep 5	Labor Day Holiday	
		OCTOBER	
M	Oct 10	Columbus Day	
W-Th	Oct 12-13	TWG Meeting – TBD	
W	Oct 13	UCLT all day	
	Oct	Possible 101 <sup>st</sup> Salinity Forum	
W	Oct 26	MSCP Steering Committee meeting	
		NOVEMBER	
F	Nov 11	Veteran’s Day Holiday	
Th	Nov 24	Thanksgiving Holiday	
		DECEMBER	
Su	Dec 25	Christmas Day Holiday	



# United States Department of the Interior

OFFICE OF THE SECRETARY  
Washington, DC 20240

AUG 14 2019

## MEMORANDUM

To: Brent Esplin, Designated Federal Officer, Bureau of Reclamation  
Regional Director, Upper Colorado Region  
Kathleen Callister, Resources Management Division Manager, Bureau of Reclamation  
Upper Colorado Region  
Scott VanderKooi, Chief, Grand Canyon Monitoring and Research Center (GCMRC)  
U.S. Geological Survey (USGS)

From: Timothy R. Petty, Ph.D.  
Secretary's Designee  
Assistant Secretary for Water and Science

Subject: Glen Canyon Dam Adaptive Management Program Guidance

The Colorado River faces many challenges in the coming years, especially with an ongoing drought now in its 19th year. As such, it is important that the Glen Canyon Dam Adaptive Management Program (GCDAMP) is managed in such a way as to ensure consistency with the Grand Canyon Protection Act (GCPA) and the priorities of the Secretary of the Interior, and in accordance with the Law of the Colorado River and the Glen Canyon Dam Long Term Experimental and Management Plan (LTEMP) Record of Decision (ROD) and Final Environmental Impact Statement (FEIS).

The GCDAMP plays a central role in ensuring compliance with multiple laws associated with the operation of Glen Canyon Dam. It provides a process for cooperative integration of dam operations, downstream resource protection and management, and monitoring and research. Under the GCPA, Reclamation and GCMRC conduct research and monitoring and consult with specific stakeholders on that research and monitoring. The Adaptive Management Working Group (AMWG), a Federal Advisory Committee, is the vehicle through which Reclamation accomplishes this consultation. The AMWG also makes recommendations to the Secretary per the LTEMP ROD.

### **LTEMP Implementation**

The primary guiding documents for the GCDAMP will continue to be the LTEMP FEIS and ROD, which provide the framework for adaptively managing Glen Canyon Dam operations and management actions associated with downstream resources through 2037. This program guidance document will help ensure continuity and continued successes within the GCDAMP under the current administration and in the years to come. The priorities identified in the LTEMP ROD for the GCDAMP are as follows:

- Management and Experimental Actions
- Mitigation and Environmental Commitments
- Research and Monitoring

In addition, the Department of the Interior (Interior) has recently prioritized the responsible development and production of renewable energy on federal lands. To this end, I encourage the GCDAMP to work within the LTEMP framework to seek ways to improve the value of the hydropower resource. This work may include continued engagement with Project N of the GCDAMP Fiscal Years (FY) 2018-20 Triennial Workplan (TWP) and with interested AMWG stakeholders regarding the current science and policy regarding dam operations.

### **Updating Guidance Documents**

I direct Reclamation, USGS, and other Interior agencies to work with the AMWG to update the GCDAMP guiding documents to reflect and be fully consistent with the priorities outlined in the LTEMP FEIS Section 1.4 and emphasized in Section 6.1(c) of the LTEMP ROD. These guiding documents include the GCDAMP strategic plan, vision, mission, and charter.

With the challenges faced in FY 2018 regarding funding for the GCDAMP and the need to ensure appropriations are requested through the federal budget process, Interior supports continuing with the three-year workplan and budget process. The current FY 2018-20 GCDAMP TWP and budget process demonstrated that it can improve program efficiency by reducing the time and effort spent on annually developing a workplan and budget. The GCDAMP should continue to review the TWP annually to ensure it meets the priorities and goals of the GCPA and GCDAMP.

The development of the TWP and budget for FY 2021-23 will commence in late FY 2019 and continue through FY 2020. Its development should include consultation with members of AMWG, who will recommend to the Secretary whether they support the planned projects and funding. Reclamation and GCMRC will take the lead in drafting the FY 2021-23 TWP. The TWP and budget should focus on compliance priorities including:

- Maintaining dam releases consistent with applicable laws;
- Activities associated with the Endangered Species Act;
- Actions necessary for compliance with the National Historic Preservation Act; and
- Research and monitoring as required by the Grand Canyon Protection Act.

Activities that concern annual release volumes from Glen Canyon Dam—including discussion of Drought Contingency Planning and new negotiations of the Colorado River Interim Guidelines for Lower Basin Shortages and the Coordinated Operations for Lake Powell and Lake Mead—will be underway in FY 2019 or in the coming years. The GCDAMP and AMWG guidance documents discussed here should consider any implications of these ongoing discussions.

The LTEMP Scientific Monitoring Plan will continue to provide a framework for the scientific support needed to complete the monitoring and experimentation specified in the LTEMP FEIS



and ROD. This plan will help ensure that long-term monitoring and research activities are aligned with the LTEMP FEIS and ROD and the GCDAMP decision making process. In accordance with the LTEMP ROD, the Science Plan will be reviewed every three years and may be updated as needed. The next review will occur in conjunction with the start of the next TWP development process in early FY 2020. Also, in accordance with the LTEMP ROD, specific details concerning the means to collect, analyze, and report information required to support development of recommendations by the AMWG and decision making by Interior will be included in the TWP.

It is also important that the GCDAMP develops and implements monitoring metrics for the resource goals and objectives defined in the LTEMP ROD. Interior directs the AMWG to develop recommendations for these monitoring metrics to assist Interior in their development. The recommended metrics should build on existing LTEMP conservation measures, environmental and recreational goals, and other easily identifiable goals. As the process continues, additional goals can be developed.

Future research proposed and undertaken by the GCDAMP should be tied directly to LTEMP resource goals and objectives and continue to be focused on providing the best available science such that decision making is science-based and continues to work towards ensuring benefits to as many resources downstream of the dam as possible. This should be done in a collaborative process involving AMWG and TWG members, the Science Advisors Program, and ad hoc groups as needed. Several areas to consider as identified by the GCDAMP partners include:

- Evaluation of the threat posed by invasive non-native species.
- Exploring vegetation management to benefit high value recreational beaches and protect vulnerable archaeological sites.
- Considering impacts to hydropower as part of the development of a LTEMP experiments and study plans.

### **Operating Criteria and Operational Flexibility**

The LTEMP ROD provides guidance for hourly, daily, and monthly releases (see, for example, Table 3, p. B-4). In accordance with the LTEMP ROD Attachment B Section 1.2 (Page B-7), I encourage Reclamation to continue to utilize operational flexibility at Glen Canyon Dam in response to varying hydrological and other resource-related conditions. As warranted, Reclamation, in consultation with Western Area Power Administration (WAPA), should continue to make adjustments to hourly, daily, and monthly release volumes within the water year in response to operational, resource-related, and hydropower-related issues.

In response to stakeholder input at recent AMWG meetings, the feasibility of conducting Spring High Flow Experiments (HFE), along with modeling for improvements and efficiencies that benefit resources including natural, cultural, recreational, and hydropower should be explored. As a potential starting point, I encourage you to consider opportunities to conduct higher spring releases within power plant capacity, along with spring HFEs that may be triggered under the current LTEMP Protocol.

## **Conclusion**

This guidance is not meant to be all encompassing or to preclude additional scientific investigations that can improve the resources downstream of Glen Canyon Dam that are consistent with the LTEMP. The GCDAMP should seek ways to continuously improve the program, including searching for efficiencies and improvements and listening to the States, Tribes, and other program stakeholders.

The GCDAMP and AMWG are vital to ensuring Interior's responsibilities under the GCPA and the LTEMP ROD, and I greatly appreciate Reclamation, USGS, other Interior bureaus, and our external partners' dedication to ensuring Glen Canyon Dam is operated in a manner that protects, mitigates impacts to, and improves downstream resources.

**Approximate Timelines for the Development and Implementation of the TWP (Table 1) and  
Criteria for Review and Revisions (Section 2.7)**

**March 6, 2019**

**Passed by Consensus by the AMWG**

**Table 1.** Approximate timelines for the development and implementation of the TWP. Dates shown are estimated targets. Dates are shown which implement the 2021-23 TWP for reference.\*

<b>Month</b>	<b>Year-1 (2020) (development of TWP)</b>	<b>Year-2 (2021)</b>
December (year prior)	GCMRC and Reclamation produces annual project reports document for GCDAMP review.	
January	Annual reporting meeting and information synthesis (2 days) followed by 1-day TWG meeting to review budget and provide initial guidance to GCMRC and Reclamation. TWG reviews progress in addressing Information Needs and research accomplishments.	Annual reporting meeting (1-2 days) followed by 1-day TWG meeting with a primary emphasis on reporting results/findings/scientific advances on previous work plan.
February	GCMRC meets with tribes and DOI agencies. GCMRC follow-up with BAHG on priorities and areas of emphasis on TWP. GCMRC meets with cooperators to develop projects. AMWG meeting to discuss initial priorities. DOI and Federal family input.	
March	GCMRC and Reclamation will develop an initial TWP based on DOI priorities and input from scientists, the TWG, and DOI/DOE family. Initial TWP presented to DOI and Secretary's Designee.	
April	GCMRC meets with tribes and DOI agencies. April TWG meeting to consider draft TWP, including anticipated funding sources. Unresolved issues or conflicting priorities will be resolved by DOI in consultation with the DOI Family. GCMRC begins development of second draft TWP.	BAHG and TWG considers potential changes to the Fiscal Year 2 TWP based on criteria in section 2.7.
May	GCMRC and Reclamation provide a second draft TWP to the BAHG, Science Advisors, DOI agencies, and tribes for their review and comment. GCMRC meets with tribes, BAHG, to get input on TWP. GCMRC develops third draft of TWP.	
June	GCMRC and Reclamation finish third draft for review. TWG meets to provide input on the draft GCMRC and Reclamation TWP and provide a recommendation to the AMWG.	TWG recommends Fiscal Year 2 (2022) budget of TWP to AMWG.
July	GCMRC and Reclamation provide a final draft TWP to the AMWG for their review.	
August	AMWG meets to provide input on the GCMRC and Reclamation draft TWP and provide a recommendation to the SOI.	AMWG recommends Fiscal Year 2 (2022) budget of TWP to SOI.
September	SOI reviews the budget and work plan recommendation from AMWG.	
October 1	Fiscal Year 1 begins under the TWP guidance.	Fiscal Year 2 begins under the TWP guidance.
November 1	Consumer Price Index becomes available.	
Late November	Science and management meeting with DOI and cooperators.	Science and management meeting with DOI and cooperators.
December	Budget is finalized. USGS produces GCMRC annual project reports document for prior year work.	GCMRC produces annual project reports document.

**Table 1 (continued).** Approximate timelines for the development and implementation of the TWP. Dates shown are estimated targets. Dates in parentheses are shown which implement the 2021-23 TWP cycle for reference.

<b>Month</b>	<b>Year-3 (2022)</b>	<b>Year-4 (2023)</b>
January	Annual reporting meeting and information synthesis (2 days) followed by 1-day TWG meeting to review initial results and findings of TWP. Potential TWP changes may be identified.	Process starts again under year 1.
February	BAHG/agencies/tribes meetings to consider mid-work plan adjustments to TWP, February through March.	
March		
April	Consider mid-work plan adjustments at TWG meeting. BAHG and TWG considers potential changes to the Fiscal Year 3 TWP based on criteria in section 2.7.	
May		
June	TWG considers and recommends mid-work plan adjustments to TWP and a recommendation for Fiscal Year 3 (2023) budget.	
July		
August	AMWG meets and considers mid-work plan adjustments to TWP recommended by TWG and recommends Fiscal Year 3 (2023) budget to the SOI.	
September		
October 1	Fiscal Year 3 begins under the TWP guidance.	
November 1	Consumer Price Index becomes available.	
Late November	Science and management meeting with DOI and cooperators. New TWP development meeting within DOI.	
December	USGS produces GCMRC annual project reports document for prior year work.	

\* Table 1 calendar years have been updated to reflect development of the 2021-2023 Triennial Work Plan.

## 2.7 Criteria for Review and Revisions of the Budget and Work Plan

In order for the TWP process to be successful in reducing the administrative burden on the GCMRC, Reclamation, and the GCDAMP, it must have clear criteria for making changes to the budget and work plan. Revisions of the year two budget are intended to be limited to unexpected changes due to a scientific requirement or merit, or administrative needs. Year three changes may be more substantive according to the guidelines below. The individual steps of the process, including roughly when meetings should occur and their objectives, are provided in Table 1. The burden of an appropriate rationale for proposing a change falls upon the proposer to make a persuasive argument to the TWG and AMWG. The following criteria will be used by GCMRC, Reclamation, and TWG in making recommendations to AMWG on changes to the budget and work plan:

- **Scientific requirement or merit:** New information gained during the implementation of monitoring and research projects may result in a need to alter methods, scope, or timelines in the work plan or substantially alter or eliminate a project. This is a science need based on the experience of implementing an already approved project. This does not represent a shifting priority (e.g., policy change), but a scientific learning process which results in needed modifications to carry out the goals of the Program.
- **Administrative needs:** Administrative, policy, or programmatic changes may occur within the time-frame of an approved TWP. Examples might include the mitigation of an impact resulting from ESA, NHPA, or tribal consultation, a change in the “overhead” charges of a federal or state agency, a significant reduction of the balance of available funds, or a failure to secure permits.. As soon as an administrative event occurs that affects the TWP, GCMRC (or relevant agency – such as DOI) will notify the TWG.
- **New initiatives:** New initiatives may be brought up for discussion by members during BAHG or TWG budget discussions (see Table 1) for consideration by Reclamation and GCMRC. These new initiatives may need to be considered by the GCDAMP Program Manager prior to requesting either GCMRC or Reclamation to develop a proposal for mid-work plan consideration. If DOI determines it is beyond the scope of a mid-work plan change, then the initiative could be considered during the development of the next work plan. Given that the budget will likely be fully accounted for, direction on funding source within the current budget will be required for discussion with the GCDAMP Program Manager. Revisions must comply with the Budget Principles (see Section 2.1).

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**TABLE 4 Implementation Criteria for Experimental Treatments of Alternative D**

Experimental Treatment	Trigger <sup>a</sup> and Primary Objective	Replicates	Duration	Annual Implementation Considerations <sup>b</sup>	Long-Term Off-Ramp Conditions <sup>c</sup>	Action if Successful
<i>Sediment-Related Experiments<sup>d</sup></i>						
Spring HFE up to 45,000 cfs in Mar. or Apr.	Trigger: Sufficient Paria River sediment input in spring accounting period (Dec.–Jun.) to achieve a positive sand mass balance in Marble Canyon with implementation of an HFE Objective: Rebuild sandbars	Not conducted during first 2 years of LTEMP, otherwise implement in each year triggered, dependent on resource condition and response	≤96 hr	Potential short-term unacceptable impacts on resources listed in Section 1.3; unacceptable cumulative effects of sequential HFEs; sediment-triggered spring HFEs will not occur in the same water year as an extended-duration (>96 hr) fall HFE	Sediment-triggered spring HFEs are not effective in building sandbars; or long-term unacceptable adverse impacts on the resources listed in Section 1.3 are observed	Implement as adaptive treatment when triggered and existing resource conditions allow
Proactive spring HFE up to 45,000 cfs (Apr., May, or Jun.)	Trigger: High-volume year with planned equalization releases (≥10 maf) Objective: Protect sand supply from equalization releases	Not conducted during first 2 years of LTEMP, otherwise implement in each year triggered, dependent on resource condition and response	First test 24 hr; subsequent tests could be shorter, but not longer, depending on results of first tests	Potential short-term unacceptable impacts on resources listed in Section 1.3; unacceptable cumulative effects of sequential HFEs; will not be implemented in the same water year as a sediment-triggered spring HFE or extended-duration fall HFE	Proactive spring HFEs are not effective in building sandbars; or long-term unacceptable adverse impacts on the resources listed in Section 1.3 are observed	Implement as adaptive treatment when triggered and existing resource conditions allow

B-10

**TABLE 4 (Cont.)**

Experimental Treatment	Trigger <sup>a</sup> and Primary Objective	Replicates	Duration	Annual Implementation Considerations <sup>b</sup>	Long-Term Off-Ramp Conditions <sup>c</sup>	Action if Successful
<i>Sediment-Related Experiments (Cont.)</i>						
Fall HFE ≤96 hr up to 45,000 cfs in Oct. or Nov.	Trigger: Sufficient Paria River sediment input in fall accounting period (Jul.–Nov.) to achieve a positive sand mass balance in Marble Canyon with implementation of an HFE Objective: Rebuild sandbars	Implement in each year triggered, dependent on resource condition and response	≤96 hr	Potential short-term unacceptable impacts on resources listed in Section 1.3; unacceptable cumulative effects of sequential HFEs	This type of fall HFE is not effective in building sandbars; or long-term unacceptable adverse impacts on the resources listed in Section 1.3 are observed	Implement as adaptive treatment when triggered and existing resource conditions allow
Fall HFEs longer than 96-hr duration up to 45,000 cfs in Oct. or Nov.	Trigger: Sufficient Paria River sediment input in fall accounting period (Jul.–Nov.) to achieve a positive sand mass balance in Marble Canyon with implementation of an HFE longer than a 96-hr, up to 45,000-cfs flow Objective: Rebuild sandbars	Implement in each year triggered; limited to total of four tests in LTEMP period	Up to 250 hr depending on availability of sand duration of first test not to exceed 192 hr	Potential short-term unacceptable impacts on resources listed in Section 1.3; unacceptable cumulative effects of sequential HFEs	Extended-duration fall HFEs are not effective in building sandbars; resulting sandbars are no bigger than those created by shorter-duration HFEs; or long-term unacceptable adverse impacts on the resources listed in Section 1.3 are observed	Implement as adaptive treatment when triggered and existing resource conditions allow

B-11



**TABLE 4 (Cont.)**

Experimental Treatment	Trigger <sup>a</sup> and Primary Objective	Replicates	Duration	Annual Implementation Considerations <sup>b</sup>	Long-Term Off-Ramp Conditions <sup>c</sup>	Action if Successful
<i>Aquatic Resource-Related Experiments<sup>e</sup></i>						
Trout management flows	Trigger: Predicted high trout recruitment in the Glen Canyon reach Objective: Test efficacy of flow regime on trout numbers and survival of humpback chub	Implement as needed when triggered after consultation with Tribes; test may be conducted early in the 20-year period even if not triggered by high trout recruitment <sup>f</sup>	Implemented in as many as 4 months (May–Aug.)	Potential short-term unacceptable impacts on resources listed in Section 1.3	TMFs have little or no effect on trout recruitment after at least three tests; or long-term unacceptable adverse impacts on the resources listed in Section 1.3 are observed	Implement as adaptive treatment triggered by predicted high trout recruitment in Glen Canyon, taking into consideration Tribal concerns
Tier 1: Expanded translocation of humpback chub in the Little Colorado River	Trigger: Number of adult or subadult humpback chub in the Little Colorado River reach below Tier 1 triggers Objective: Increase number of adult and subadult humpback chub	Implement in each year triggered unless determined ineffective	As needed	Potential short-term unacceptable impacts on resources listed in Section 1.3	Expanded translocation has little or no effect on increasing the number of adult or subadult humpback chub; or long-term unacceptable adverse impacts on the resources listed in Section 1.3 are observed	Implement as adaptive treatment when triggered and existing resource conditions allow
Tier 1: Implement head-start program for larval humpback chub	Trigger: Number of adult or subadult humpback chub in the Little Colorado River reach below Tier 1 triggers Objective: Increase number of adult and subadult humpback chub	Implement in each year triggered unless determined ineffective	As needed	Potential short-term unacceptable impacts on resources listed in Section 1.3	Head-start program has little or no effect on increasing the number of adult or subadult humpback chub; or long-term unacceptable adverse impacts on the resources listed in Section 1.3 are observed	Implement as adaptive treatment when triggered and existing resource conditions allow

B-12

**TABLE 4 (Cont.)**

Experimental Treatment	Trigger <sup>a</sup> and Primary Objective	Replicates	Duration	Annual Implementation Considerations <sup>b</sup>	Long-Term Off-Ramp Conditions <sup>c</sup>	Action if Successful
<i>Aquatic Resource-Related Experiments (Cont.)</i>						
Tier 2: Mechanical removal of nonnative fish in Little Colorado River reach	Trigger: Tier 1 actions ineffective; humpback chub numbers in Little Colorado River below Tier 2 triggers Objective: Increase number of adult and subadult humpback chub	Implement in each year triggered unless determined ineffective after consultation with Tribes	Monthly removal trips (Feb.–Jul.) until “predator index” or adult humpback chub reach acceptable levels (see Appendix O)	Potential short-term unacceptable impacts on resources listed in Section 1.3	Mechanical removal has little or no effect on reducing predator index in the Little Colorado River reach; no population-level benefit on humpback chub; or long-term unacceptable adverse impacts on the resources listed in Section 1.3 are observed	Implement as adaptive treatment when triggered, taking into consideration Tribal concerns
Low summer flows (minimum daily mean 5,000 to 8,000 cfs) to target $\geq 14^{\circ}\text{C}$ at Little Colorado River confluence	Trigger: Initial experiment: in the second 10 years of the LTEMP period, when target temperature of $\geq 14^{\circ}\text{C}$ can be achieved only with low summer flow Objective: Increase humpback chub growth	Subsequent experimental use if: (1) initial test was successful, (2) humpback chub population concerns warrant their use, (3) water temperature appears to be limiting recruitment, and (4) target temperature of $\geq 14^{\circ}\text{C}$ could be achieved only with low summer flow	3 months (Jul.–Sep.)	Potential short-term unacceptable impacts on resources listed in Section 1.3	Low summer flows do not increase growth and recruitment of humpback chub; increase in warmwater nonnative species or trout at the Little Colorado River; long-term unacceptable adverse impacts on the resources listed in Section 1.3 are observed; or sufficient warming does not occur as predicted	Implement as adaptive treatment when conditions allow

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**TABLE 4 (Cont.)**

Experimental Treatment	Trigger <sup>a</sup> and Primary Objective	Replicates	Duration	Annual Implementation Considerations <sup>b</sup>	Long-Term Off-Ramp Conditions <sup>c</sup>	Action if Successful
<i><b>Aquatic Resource-Related Experiments (Cont.)</b></i>						
Macroinvertebrate production flows	Trigger: None Objective: Improve food base productivity and abundance or diversity of mayflies, stoneflies, and caddisflies	Target two to three replicates	Up to 4 months (May–Aug.) <sup>g</sup>	Potential short-term unacceptable impacts on resources listed in Section 1.3; coordinate planning with other experiments to avoid confounding conditions or results	Steady weekend flows have little or no benefit on food base, trout fishery, or native fish; increase in warmwater nonnative species or trout at the Little Colorado River; or long-term unacceptable adverse impacts on the resources listed in Section 1.3 are observed	Implement as adaptive treatment in target months when conditions allow
<i><b>Riparian Vegetation Experiments</b></i>						
Non-flow vegetation treatments	Trigger: None Objective: Improve vegetation conditions at key sites	Not applicable	20 years if successful pilot phase	Potential short-term unacceptable impacts on resources listed in Section 1.3	Control and replanting techniques are not effective or practical; or long-term unacceptable adverse impacts on the resources listed in Section 1.3 are observed	Implement as adaptive treatment if invasive species can be reduced and native species increased

B-14

- <sup>a</sup> Triggers will be modified as needed during the 20-year LTEMP period in an adaptive manner through processes including ESA consultation and based on the best available science utilizing the experimental framework for each alternative.
- <sup>b</sup> Annual determination by the DOI. Any implementation will consider resource condition assessments and resource concerns using the annual processes described in Sections 1.3 and 1.4.
- <sup>c</sup> Suspension of experiment if the DOI determines effects cannot be mitigated.
- <sup>d</sup> Details of implementation of sediment experiments are presented in Section 2.1.
- <sup>e</sup> Details of implementation of aquatic resource experiments are presented in Section 2.2.
- <sup>f</sup> The decision to conduct TMFs in a given year will consider the resource conditions, as specified in Section 1.3, and will also involve considerations regarding the efficacy of the test based on those resource conditions.
- <sup>g</sup> The duration and other characteristics of experimental macroinvertebrate production flows could be adjusted based on the results of initial experiments.