

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, August 17, 2022
9:30 a.m. – 5:00 p.m. MST**

**Thursday, August 18, 2022
9:30 a.m. – 4:00 p.m. MST**

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Administrative Items

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Meeting Packet Order

Tabs	Documents
	Packet Cover/Meeting Information
Administrative Items	• Meeting Packet Order • Federal Register Notice • WebEx Participant Information • AMWG Ground Rules
AMWG Supporting Documents	• AMWG & TWG Committee Membership List • AMWG Charter 2021
Draft Agenda	• Agenda for August 17-18, 2022 Meeting
Draft Minutes & Action Items	• Draft Minutes from May 18 Meeting • Action Item Tracking Report
Supplemental Materials	• BOR/GCMRC Budgets • Potential GCDAMP & Other Meetings in 2023 • Dr. Petty Memo – Program Guidance • TWP Process Document • LTEMP ROD Table 4 – Experimental Treatments

Federal Register Notice:

<https://www.federalregister.gov/documents/2022/07/01/2022-14061/call-for-nominations-for-the-glen-canyon-dam-adaptive-management-work-group-federal-advisory>

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

Participant WebEx Information

Topic: AMWG – Day 1

Date/Time: **Wednesday, August 17, 2022 – 9:30 am, Mountain Standard Time**

Event Number: 2761 935 7298

Event Password: Aug17

Event Address:

<https://rec.webex.com/rec/j.php?MTID=m2ac6c2cecbel98a24e26693ffb283017>

Phone #: 415-527-5035

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Topic: AMWG – Day 2

Date/Time: **Thursday, August 18, 2022 – 9:30 am, Mountain Standard Time**

Event Number: 2761 373 0874

Event Password: Aug18

Event Address:

<https://rec.webex.com/rec/j.php?MTID=mde185a6cf327fad6b6ee62fa3b635bda>

Phone #: 415-527-5035



— BUREAU OF —
RECLAMATION

Glen Canyon Dam Adaptive Management Work Group Meeting

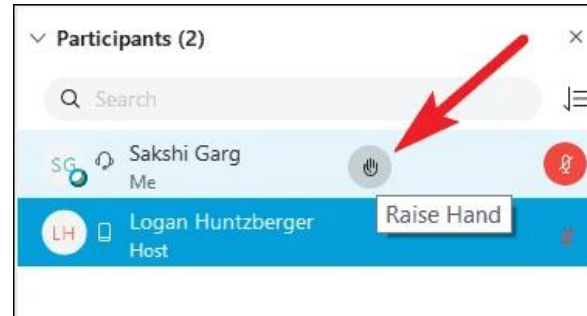
August 17-18, 2022

The meeting will begin at 9:30 am MST.

*Feel free to test your sound prior to the start of the meeting.
Then, please ensure your microphone is muted.*

Reminders for member questions & comments:

- Questions and comments are welcome after each presentation.
 - Use the WebEx “raise hand” function (or *3 on the phone) to get in the queue.
 - **State your name and affiliation prior to comment.**
 - We will also read aloud member questions entered into the chat.
- Comments in the chat window are considered informal discussion and will NOT be included as part of the formal meeting record unless you request the facilitator to read them aloud.



Reminder for members of the public: you are welcome to observe but are asked to defer any comments until the public comment period at the end of each meeting day.

Tips for audio and connectivity:

- If you are joined via phone for audio, dial *6 to unmute.
- If you are connected via phone and webinar, you may have to unmute on both devices to be heard.
- If you have mic/audio challenges, please chat @Reclamation Host via the WebEx.
- If you have an unstable internet connection, we recommend using your phone for audio and keeping your camera off.

Note This meeting is
being recorded to
support our note-taking.

AMWG Supporting Documents

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Glen Canyon Dam Adaptive Management Work Group

Committee Membership List

(Updated: 8/11/22)

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 EM: wpullan@usbr.gov	VACANT	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 EM: dpicard@usbr.gov

Federal Agencies:

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2-BUREAU OF INDIAN AFFAIRS	
Charles "Chip" Lewis (member) Western Regional Office 2600 N. Central Avenue, 4 th Floor Mailroom Phoenix, AZ 85004-3050 T: (602) 379-6782 EM: charles.lewis@bia.gov	Garry J. Cantley (alternate) Western Regional Office 2600 N. Central Avenue, 4 th Floor Mailroom Phoenix, AZ 85004-3050 T: (602) 379-6750 x1257 EM: garry.cantley@bia.gov

3-NATIONAL PARK SERVICE (Grand Canyon National Park)	
Ed Keable (member) Grand Canyon National Park PO Box 129 Grand Canyon, AZ 86023 T: (928) 638-7758 EM: edward_keable@nps.gov	Billy Shott (alternate) Glen Canyon National Recreation Area PO Box 1507 Page, AZ 86040 T: (928) 608-6200 EM: billy_shott@nps.gov

4-U.S. FISH AND WILDLIFE SERVICE	
Heather Whitlaw (member) IN PROCESS Arizona Ecological Services Field Office 9828 N 31 st Ave, Suite C3 Phoenix, AZ 85051 T: (806) 773-5932 EM: heather_whitlaw@fws.gov	Kirk Young (alternate) Arizona Fish & Wildlife Conservation Office 2500 S. Pine Knoll Drive Flagstaff, AZ 86001 T: (928) 556-2124 EM: kirk_young@fws.gov

Native American Tribes:

5-HUALAPAI TRIBE	
Martina Dawley (member) IN PROCESS Hualapai Dept of Cultural Resources PO Box 310 Peach Springs, AZ 86434 T: (928) 769-2234 C: (520) 440-7249 EM: mdawley@hualapai-nsn.gov	Carrie Cannon (alternate) IN PROCESS Hualapai Dept of Cultural Resources PO Box 310 Peach Springs, AZ 86434 T: (928) 727-2223 C: (928) 727-1338 EM: carrie.cannon@hualapai-nsn.gov
6-HOPI TRIBE	
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7-NAVAJO NATION	
Richard Begay (member) Navajo Nation Heritage and Historic Preservation PO Box 7440 Window Rock, AZ 86515 T: (928) 871-7000 EM: r.begay@navajo-nsn.gov	Erik Stanfield (alternate) Navajo Nation P.O. Box 3366 Page, AZ 86040 T: (480) 313-2482 EM: erikstanfield@navajo-nsn.gov
8-PUEBLO OF ZUNI	
Arden Kucate (member) PO Box 339 1203-B State Highway 53 Zuni, NM 87327 T: (505) 782-7000 EM: arden.kucate@ashiwi.org	VACANT (alternate)
9-SOUTHERN PAIUTE CONSORTIUM	
Daniel Bulletts (member) 1 North Pipe Spring Rd. Fredonia, AZ 86022 T: (928) 643-6278 EM: dbulletts@kaibabpaiute-nsn.gov	VACANT (alternate)
10-SAN JUAN SOUTHERN PAIUTE TRIBE	
VACANT (member)	

Seven Basin States:

11-ARIZONA

Clint Chandler (member)
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14-NEVADA

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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	
Larry Stevens (member) Grand Canyon Wildlands Council PO Box 1315 Flagstaff, AZ 86002 T: (928) 380-7724 EM: larry@springstewardship.org	Kelly Burke (alternate) Grand Canyon Wildlands Council PO Box 1315 Flagstaff, AZ 86002 T: (928) 606-7870 EM: gcwildlands@icloud.com

19-ENVIRONMENTAL GROUP	
Matt Rice (member) American Rivers 1536 Wynkoop, Ste 321 Denver, CO 80202 T: (303) 454-3395 EM: mrice@americanrivers.org	VACANT (alternate)

Recreational Industry:

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

21-RECREATIONAL INDUSTRY	
Jim Strogen (member) Trout Unlimited 401 West Christopher Point Payson, AZ 85541 T: (480) 242-2569 EM: jimstrog@gmail.com	Rod Buchanan (alternate) Trout Unlimited 1208 East Copper Hollow Queen Creek, AZ 85140 T: (209) 815-0062 EM: rodbuchanan23@gmail.com

Federal Power Purchase Contractors:

22-FEDERAL POWER PURCHASE CONTRACTORS	
Leslie James (member) Colorado River Energy Dist. Assoc. (CREDA) 10429 S. 51st Street, Suite 230 Phoenix, AZ 85044 T: (480) 477-8646 F: (480) 477-8647 EM: creda@creda.cc	Jaclyn Brown (alternate) Tri-State Generation and Transmission Association 1100 West 116th Avenue Westminster, CO 80234 T: (970) 819-2484 EM: jbrown@tristategt.org

23-FEDERAL POWER PURCHASE CONTRACTORS	
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Other Stakeholders:

24-ARIZONA GAME AND FISH DEPARTMENT	
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25-DEPARTMENT OF ENERGY (DOE) – WESTERN AREA POWER ADMINISTRATION (WAPA)	
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Glen Canyon Dam Technical Work Group
Membership List
(Updated: 8/11/22)

TWG Chairperson	TWG Vice Chairs
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4-NATIONAL PARK SERVICE (Glen Canyon National Recreation Area)	
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5-U.S. FISH AND WILDLIFE SERVICE	
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Native American Tribes:

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7-HOPI TRIBE	
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8-NAVAJO NATION	
Erik Stanfield (member, 7/19/21) P.O. Box 3366 Page, AZ 86040 T: (480) 313-2482 EM: erikstanfield@navajo-nsn.gov	VACANT

9-PUEBLO OF ZUNI	
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11-SAN JUAN SOUTHERN PAIUTE TRIBE	
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Seven Basin States:

12-ARIZONA	
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14-COLORADO	
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15-NEVADA	
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16-NEW MEXICO	
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18-WYOMING	
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Environmental Groups:

19-ENVIRONMENTAL GROUPS	
Larry Stevens (member, 11/3/10) Grand Canyon Wildlands Council PO Box 1315 Flagstaff, AZ 86002 Tel: (928) 380-7724 EM: larry@springstewardship.org	Kelly Burke (alternate, 8/25/17) Grand Canyon Wildlands Council PO Box 1315 Flagstaff, AZ 86002 Tel: (928) 606-7870 EM: gcwildlands@icloud.com

20-ENVIRONMENTAL GROUPS	
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Recreation Interests:

21-RECREATIONAL INTERESTS	
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22- RECREATIONAL INTERESTS	
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Federal Power Purchase Contractors:

23-COLORADO RIVER ENERGY DISTRIBUTORS ASSOCIATION (CREDA)	
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24-UTAH MUNICIPAL POWER AGENCY (UMPA)	
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Other Stakeholders:

25-ARIZONA GAME AND FISH DEPARTMENT	
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26-DEPARTMENT OF ENERGY (DOE) – WESTERN AREA POWER ADMINISTRATION (WAPA)	
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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

Date Signed

SEP 17 2021

Date Filed

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Draft Agenda

Glen Canyon Dam Adaptive Management Program Adaptive Management Work Group Meeting, August 17-18, 2022

Wednesday, August 17, 2022

Day 1 Webinar Information:

<https://rec.webex.com/rec/j.php?MTID=m2ac6c2cecebe198a24e26693ffb283017>

Telephone: 415-527-5035 Meeting Number: 2761 935 7298 Password: Aug17

DRAFT AGENDA

START TIME ¹ (Duration)	Wednesday, August 17, 2022 Topic and Presenter and Purpose ²
8:30 PDT/ 9:30 MDT (:45)	Welcome and Administrative Updates: Wayne Pullan, Secretary's Designee to the Adaptive Management Work Group (AMWG) and Mike Harty, Facilitator to the AMWG ▪ Webinar Protocols ▪ Introductions and Determination of Quorum (13 members) ▪ Approval of May 18, 2022 Meeting Minutes ▪ Administrative Updates ○ Summary of May Meeting Evaluation ○ Member Status, Nominations, and Reappointments ○ Action Item Tracking Report ○ ERN: AMWG nominations ○ ERN: Post-2026 Colorado River Reservoir Operational Strategies
9:15 PDT/ 10:15 MDT (:30)	AMWG 101 ▪ Rod Smith, (30 minutes) <u>Purpose:</u> To provide a background on the AMWG program and its proceedings.
9:45 PDT/ 10:45 MDT (1:00)	Basin Hydrology, Water Quality, and Operations: Heather Patno, Hydraulic Engineer, Bureau of Reclamation. ▪ Presentation (30 minutes) ▪ Q&A and discussion (30 minutes) <u>Additional Information:</u> 1) 24-Month Study 2) 5-Year Projections <u>Purpose:</u> To increase understanding of water supply, forecasted hydrologic conditions, and projected reservoir conditions (including DO and Temp) and operations for the current and upcoming water years.
10:45 PDT/ 11:45 MDT (:15)	BREAK

START TIME ¹ (Duration)	Wednesday, August 17, 2022 Topic and Presenter and Purpose ²
11:00 PDT/ 12:00 MDT (:20)	Aridification of the West and the Adaptive Management of The Colorado River Ecosystem Downstream from Glen Canyon Dam: Facilitated discussion ▪ Stakeholder Discussion (20 minutes) <u>Additional information:</u> 1) Long-Term Hydrologic Projections for the Colorado River Basin and Methods for Considering Uncertainty, Oct 2021 TWG Presentation. <u>Purpose:</u> To have meaningful discussion on how the AMP responds to ongoing aridification and how to improve engagement on this issue in the future.
11:20 PDT/ 12:20 MDT (:30)	Fish Exclusion Technologies Report and Dissolved Oxygen State-of-Practice Report: Connie Svoboda and Mike Horn, Bureau of Reclamation 1. Presentation (15 minutes) 2. Discussion (15 minutes) <u>Purpose:</u> To provide information and overviews of both the draft reports which will provide for enhanced discussion of non-native fish strategic planning.
11:50 PDT/ 12:50 MDT (:15)	Non-Native Fish Observations and Actions Above and Below Glen Canyon Dam: NPS, GCMRC, AZGFD, USU. ▪ Presentation (10 minutes) ▪ Discussion (5 minutes) <u>Purpose:</u> To provide information and recent observations of high-risk non-native fishes.
12:05 PDT/ 1:05 MDT (:55)	LUNCH
1:00 PDT/ 2:00 MDT (:30)	Technical Work Group Chair Report: Seth Shanahan, Technical Work Group Chair ▪ Presentation (20 minutes) ▪ Q&A, discussion (10 minutes) <u>Purpose:</u> To update AMWG members on current TWG and ad hoc group activities.
1:30 PDT/ 2:30 MDT (1:15)	Update on the Strategy and Operational Alternatives Directive from the Secretary's Designee: Seth Shanahan, TWG Chair; Mike Moran and Charles Yackulic, GCMRC ▪ Presentation (45 minutes) ▪ Q&A and discussion (30 minutes) <u>Purpose:</u> To review progress on the directive that came from the Secretary's Designee in the May 2022 AMWG meeting to develop a strategic plan and operational alternatives to prevent establishment of cool- and warmwater non-native fishes.

START TIME ¹ (Duration)	Wednesday, August 17, 2022 Topic and Presenter and Purpose ²
2:45 PDT/ 3:45 MDT (:15)	BREAK
3:00 PDT/ 4:00 MDT (:45)	GCMRC Science Updates: Michael Moran, Acting Chief; Grand Canyon Monitoring and Research Center ▪ Presentation (30 minutes) ▪ Q&A and discussion (15 minutes) <u>Purpose:</u> Bring AMWG members current with the latest research and selected monitoring results from GCMRC on bug flows, overflight data, water quality syntheses , and sandbar research.
3:45 PDT/ 4:45 MDT (:15)	Public Comment
4:00 PDT/ 5:00 MDT	ADJOURN FOR THE DAY

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² 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.

**Glen Canyon Dam Adaptive Management Program
Adaptive Management Work Group Meeting, August 17-18, 2022**

Thursday, August 18, 2022

Day 2 Webinar Information:

<https://rec.webex.com/rec/j.php?MTID=mde185a6cf327fad6b6ee62fa3b635bda>

Telephone: 415-527-5035 Meeting Number: 2761 373 0874 Password: Aug18

DRAFT AGENDA

START TIME ¹ (Duration)	Thursday, August 18, 2022 Topic, Presenter, and Purpose ²
8:30 PDT/ 9:30 MDT (:15)	Welcome and Administrative: Wayne Pullan, Secretary's Designee to the Adaptive Management Work Group (AMWG) and Mike Harty, Facilitator to the AMWG ▪ Introductions and Determination of Quorum (13 members) ▪ Revisit any outstanding items from the previous day
8:45 PDT/ 9:45 MDT (:30)	Federal Agency Updates (2-3 minutes each): ▪ WAPA: Glen Canyon Dam Emergency Exception Criteria ▪ FWS: Humpback chub, Razorback sucker ESA status ▪ NPS: Non-native Aquatic Species Management Plan ▪ DOI Solicitor's Office: LTEMP Litigation ▪ BIA, GCMRC, Reclamation ▪ Additional Items <u>Additional Information:</u> 1) 2021 Razorback Sucker Expert Science Panel Summary <u>Purpose:</u> To share updates regarding current stakeholder activities on the Colorado River that are pertinent to the GCDAMP.
9:15 PDT/ 10:15 MDT (:15)	Report Out from the 2022 Stakeholder River Trip ▪ Peggy Roefer, (15 minutes) <u>Purpose:</u> To provide feedback and share experiences from the GCMRC Stakeholder River Trip which took place July 13 – 22, 2022.
9:30 PDT/ 10:30 MDT (:30)	Update on the Meeting of the Parties to the LTEMP Programmatic Agreement: Zachary Nelson and Jamescita Peshlakai, Reclamation ▪ Presentation (15 minutes) ▪ Discussion (15 minutes) <u>Purpose:</u> To provide information and follow up to the August 2022 Meeting of the Parties to the LTEMP Programmatic Agreement.
10:00 PDT/ 11:00 MDT (:15)	BREAK

START TIME ¹ (Duration)	Thursday, August 18, 2022 Topic, Presenter, and Purpose ²
10:15 PDT/ 11:15 MDT (:30)	Tribal Partners Report and Perspectives ▪ Tribal report out and discussion (30 minutes) <u>Purpose:</u> Opportunity to hear of GCDAMP Partner Tribes' activities and meetings as well as Tribal concerns, challenges, and accomplishments. To have meaningful discussion on how Reclamation's performance, ways to improve, and how to engage better going forward.
10:45 PDT/ 11:45 MDT (:30)	The Role of AMWG in the DROA Process: Rod Smith, DOI. ▪ Presentation (15 minutes) ▪ Discussion (15 minutes) <u>Additional Information:</u> 1) https://www.usbr.gov/dcp/finaldocs.html , 2) https://www.usbr.gov/dcp/droa.html <u>Purpose:</u> To have meaningful discussion on the role and engagement in Drought Response Operations Agreement processes.
11:15 PDT/ 12:15 MDT (1:30)	LUNCH
12:45 PDT/ 1:45 MDT (:40)	LTEMP Experiments: Clarence Fullard, Deputy GCDAMP Program Manager, Bureau of Reclamation and Michael Moran, Acting Chief, Grand Canyon Monitoring and Research Center ▪ Presentation on Experiments Considered and Implemented for WY 2023 (10 minutes) ▪ LTEMP Experimental Process (20 minutes) ▪ Q&A and discussion (10 minutes) <u>Additional Information:</u>) Communication and Consultation Process, LTEMP ROD Attachment B, section 1.4. <u>Purpose:</u> To review the process and update AMWG members on LTEMP experiments that have been and may be conducted in 2023. To have meaningful discussion on how Reclamation's performance, ways to improve, and how to engage better going forward.
1:25 PDT/ 2:25 MDT (1:10)	FY 2023 Budget and Work Plan Recommendation: Seth Shanahan, TWG Chair; Clarence Fullard, Reclamation; Mike Moran, GCMRC; Discussion facilitated by Mike Harty, Kearns and West, Inc. ▪ Presentation: 10m ▪ Q&A, discussion, and action (60 minutes). <u>Additional Information:</u> 1) TWP Process and Timeline , 2) FY23 Draft Reclamation Budget 3) FY23 Draft GCMRC Budget , 4) Recommendation by the TWG (06/16/2022) . <u>Purpose:</u> To finalize a recommendation to the Secretary of the Interior regarding the FY 2022 Glen Canyon Dam Adaptive Management Program (GCDAMP) budget and work plan.

START TIME ¹ (Duration)	Thursday, August 18, 2022 Topic, Presenter, and Purpose ²
2:35 PDT/ 3:35 MDT (:05)	BREAK
2:40 PDT/ 3:40 MDT (:40)	Stakeholder Updates (2-3 minutes each): - States: AZDWR, AZGFD, CA, CO, NM, NV, UT, WY - Tribes: Hopi, Hualapai, Navajo Nation, Pueblo of Zuni, Southern Paiute - NGOs: Environmental (x2), Federal Power Purchasers (x2), Recreation (x2) <u>Purpose:</u> To share updates regarding current stakeholder activities on the Colorado River that are pertinent to the GCDAMP.
3:10 PDT/ 4:10 MDT (:10)	Public Comment
3:20 PDT/ 4:20 MDT (:15)	WRAP-UP: Wayne Pullan, Secretary's Designee to the Adaptive Management Work Group - FY2023 AMWG and AR meeting dates: - January 24-25, 2023 - February 15-16, 2023 - May 17, 2023 (webinar) - August 16-17, 2023
3:35 PDT/ 4:35 MDT	ADJOURN Please take the time to complete a brief meeting evaluation survey—thank you!

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² 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.

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Draft Minutes & Action Items

Glen Canyon Dam Adaptive Management Program Adaptive Management Work Group Meeting May 18, 2022

Wednesday, May 18, 2022

Start Time: 8:00 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 Updates

[Wayne Pullan, AMWG Chair] This meeting's primary purpose is for subject matter experts to share the latest information on current projected conditions below Glen Canyon Dam and to utilize AMWG members' knowledge and expertise to ensure that the Glen Canyon Dam Adaptive Management Program (GCDAMP) is prioritizing the most critical and relevant work given current conditions.

- Since February, Lake Powell elevations temporarily declined below 3,525 feet, which is an important elevation for the drought contingency planning and Drought Response Operations Agreement (DROA). Runoff has now increased to bring the reservoir elevation above 3,525, and under DROA, more water will flow into the lake from upstream reservoirs, and in agreement with the states, less water will be released downstream; this should result in an increase of 16 feet of elevation over the next 12 months. These measures are designed to protect key infrastructure, hydropower generation, and water supply for Page, Arizona and the LeChee Chapter of the Navajo Nation, in addition to other downstream resources.
- Bug flows have been initiated under the Long-term Experimental and Management Plan (LTEMP).

Introductions and Determination of Quorum

[Michael Harty, Kearns & West Facilitator] quorum reached with 16 members represented.

Approval of February 2022 Meeting Minutes

[Wayne Pullan, AMWG Chair] The draft minutes were distributed on May 11. No edits or objections were received. **[Larry Stevens, Grand Canyon Wildlands Council (GCWC)]** Motion to accept the minutes. **[Candice Hasenyager, Utah]** Seconded. The [February 9-10, 2022 meeting minutes](#) were approved by consensus.

Review February AMWG Meeting Evaluation

[Terra Alpaugh, Kearns & West] Ten respondents provided feedback on the February AMWG meeting. Based on that input, adjustments related to the motions process are being considered.. Reclamation has also incorporated two topics of interest related to non-native establishment risks and LTEMP process updates into today's agenda.

Nominations and Appointments

[Wayne Pullan, AMWG Chair] Welcome to Laura Dye, the Technical Work Group (TWG) alternate for Nevada. AMWG membership nominations ended April 25 with eight AMWG nominates and six TWG nominates. Contact Tara Ashby, Bureau of Reclamation (Reclamation) if there are questions.

Action Item Tracking

- Grand Canyon Monitoring and Research Center (GCMRC) has drafted monitoring metrics that are currently under review by Reclamation and then forward for further review by the TWG.
 - Hydrologic conditions and reservoir elevations have accelerated the need to move the metrics forward. **ACTION:** Mike Moran and Helen Fairley, GCMRC, will provide the draft writeups at least two weeks in advance of the June TWG meeting.
- The budget prioritization effort is complete.
- The Stakeholder River Trip will occur July 13-22, 2022.

Non-native Aquatic Species Establishment Risk

[Charles Yackulic, GCMRC] PRESENTATION This work is the result of a collaborative effort with multiple agencies. Smallmouth bass are considered the biggest threat to native fish. There are some places they have not invaded where temperatures are suitable. They are present in Lake Mead and Lake Powell, but they are not yet established in Grand Canyon. It is believed this is because there is turbidity at the inflow and the Pearce Ferry rapid is serving as a barrier. On the upstream end, it is believed the cold releases from Glen Canyon Dam cause few to pass through the dam because the fish occur higher in the water column than where the water is pulled. Limiting establishment is crucial. A conceptual model to explain the potential amount of entrainment that might be seen at a range of different reservoir elevations has been developed; the probability of establishment was determined using the temperature predictions from the March 25-month study and the assumption that a population could probably be maintained with around 250 fish. Hypothetical entrainment risk scenarios were developed for different elevations. If elevations are fluctuating, then the risk is higher, and the most significant risk is at the minimum probable elevation levels. Limiting establishment is most important and certain approaches can reduce that risk.

Q&A

[Larry Stevens, GCWC] Size must be an issue for passage through the dam. Is there any need to focus on the smaller size classes? What about the distribution in the forebay? **[Charles Yackulic, GCMRC]** Smaller fish tend not to do well with the pressure in the hydropower turbines. Based on reports from ten years ago and more recently, there is not much habitat near the reservoir for Age 0 fish.

[Christina Noftsker, New Mexico] What about spike flows as a way to limit smallmouth bass numbers in Lees Ferry? **[Charles Yackulic, GCMRC]** Spike flows are effective below Flaming Gorge for part of the cohort, but multiple spike flows over ten or more days would be needed to stop reproduction. Predicting that timing in our system would be tricky.

[Sinjin Eberle, American Rivers] What could be the impacts to humpback chub if smallmouth bass were to become established? **[Charles Yackulic, GCMRC]** Within a couple years of smallmouth bass showing up in Echo Park, humpback chub were reduced by more than 90% and are now functionally extirpated. In other areas, there is more overlap, and they are co-existing over the short term. It is expected there would be similar significant declines in the Little Colorado River and Western Grand Canyon.

[Matt Rice, American Rivers] Has there been any modeling based on the different scenarios in the presentation related to recovery of humpback chub? The risk is high, and the AMWG needs to act on a plan by this summer to get ahead of this issue. **[Charles Yackulic, GCMRC]** Have not done any formal modeling of humpback chub, but the risk is believed to be big.

[Ed Keable, National Park Service (NPS)] What is the comparative effectiveness of one-day-per-week versus multiple-days of bypass, as well as the appropriate timing of bypass focused on preventing spawning? **[Charles Yackulic, GCMRC]** There has been lab work to explore this, but there are multiple mechanisms by which temperature can affect smallmouth bass reproduction, including both survival of eggs and behavioral change with adult spawning (which was the biggest response seen in the Green River). If it's the latter, it might take a day to make an impact; if it relates to larvae and eggs it might take longer. Timing should be soon after temperature rises to 16 degrees Celsius.

[Brian Sadler Western Area Power Administration (WAPA)] Can you expand on the "mid-term" screens or other solutions for preventing entrainment? **[Charles Yackulic, GCMRC]** Reclamation is currently investigating this with the Technical Services Center (TSC).

[Jim Strogon, Fly Fishers International/Trout Unlimited (FFI/TU)] Where might the first sightings of smallmouth bass occur? Would it be downriver due to higher temperatures or in Lees Ferry? **[Charles Yackulic]** Smallmouth bass have been seen during monitoring in Lees Ferry for the past 10 years (between 0 and 3 per year). Would expect them there first if they come through in great numbers.

[Kelly Burke, GCMRC] The costs of dealing with this later would be significantly higher than the costs of taking preventative action. Given that the AMWG does not meet again until August, is there a way to have an emergency AMWG meeting to create a plan of action to prevent this? **[Wayne Pullan, Reclamation]** The information is concerning. The Smallmouth Bass Task Force has converged on dam operations as an important and necessary tool, but has not yet identified a specific hydrograph design or proposal. The TSC may have some information on this in a couple of months. Even if actions could be taken immediately the solutions would still be months or even years away. **ACTION:** GCMRC and Reclamation will work with the TWG to develop two to four operational alternatives to address smallmouth bass concerns while minimizing adverse effects to other resources. **ACTION:** GCMRC and Reclamation will work with the TWG to develop a larger strategy that may include monitoring; as well as a plan to prevent, detect, and respond to warmwater invasive fish establishment below Glen Canyon Dam. Recommend that unspent funds from LTEMP (C.5) be used to support staff time for this effort.

[Seth Shanahan, Southern Nevada Water Authority (SNWA) and TWG Chair] What is the breadth of the two to four operational alternatives? Is the purpose to address the immediate concern of non-native fish pass-through and establishment throughout the lower river? **[Wayne Pullan, Reclamation]** These would be alternatives within the realm of possibilities given the difficulties. We need to know the strategy and what the actions are going to be if there should be establishment of smallmouth bass.

[Kelly Burke, GCMRC] See Kurt Dongoske's comments in the chat about being mindful of Zuni concerns regarding lethal management actions. If the plan is to present this at the August meeting, have we met the window of opportunity for this summer? There is a timescale pressure.

[Bill Persons, FFI/TU] What is the AMWG asking the TWG to accomplish? **[Wayne Pullan, Reclamation]** **ACTION:** Reclamation will draft this request in writing.

Basin Hydrology and Operations, Water Quality, and Drought Response

[Heather Patno, Reclamation] [PRESENTATION](#) Significant hydrology in October and December increased snowpack, but this flatlined in the second week of January with almost no further snow accumulation until February, which saw normal amounts, and was followed by very warm temperatures in March. There is now a trend of spring forecasts decreasing incrementally. There is less than a 10% chance of reaching average hydrology this year. Runoff has increased storage as expected, with elevations now above 3,525 feet. The Lake Powell end of May elevation target was 3,533 feet but have not yet seen the inflows. Two separate Drought Response Actions have been implemented: the Drought Contingency Plan includes additional water released from Flaming Gorge Reservoir from May 2022 through April 2023, which is the “DROA Year.” The other action is to leave 480-thousand-acre feet in Lake Powell by reducing Glen Canyon Dam’s annual release volume, which assumes the water will be moved to Lake Mead. The presentation also provided detailed graphs on the modeled projections and the outage schedule for 2023, including patterns associated with implementing bug flows.

Q&A

[Jim Stroger, FFI/TU] What is the power pool for Lake Mead and the anticipated power generation? Is Lake Powell being prioritized to retain more water than Lake Mead? **[Heather Patno, Reclamation]** Lake Powell is expected to remain above the minimum power pool. The actions implemented are to make sure that Lake Powell stays above minimum for the near term. There is likelihood that additional adjustments between Lake Powell and Lake Mead will occur, which will depend on enhanced monitoring. Reclamation is expecting a continued downward trend, but no decision has been made. Both Lake Powell and Lake Mead are at critical elevations. Lake Powell minimum power pool is being protected right now, but continued changes and adjustments are likely to happen. This is a rapidly changing system.

[Kelly Burke, GCWC] Is there any way to assess the footprint of acceleration in these changes that can be seen in the modeling? **[Heather Patno, Reclamation]** Have seen dryer conditions over the past 30 years by looking at the probabilistic model and its 30 traces. Seeing similar conditions as the drought that occurred in 2001 to 2004, but the difference is the system now is at 50% of capacity rather than at 100%, which means half the storage is available to cushion the drought.

Water Year 2022 LTEMP Experiments and Proposed Process Updates

[Lee Traynham, Reclamation] [PRESENTATION](#) The Water Year 2022 LTEMP experiments are intended to be adaptive, starting with the annual reporting in January and TWG meetings to understand resource conditions.

- Sediment conditions did not trigger a spring High Flow Experiment (HFE).
- Reclamation is now in the fourth year of implementing the bug flows experiment. The approximately 8-week schedule for bug flows is compressed because of the May 1 implementation window. Feedback on this would be appreciated. Reclamation will also include any written comments in the technical package. Tribal partners can request consultations. An action item from the Planning & Implementation (PI) Team recommends GCDAMP refine the hypothesis, specify measures of success, and explore potential design improvements.

[Mike Moran, GCMRC] [PRESENTATION](#) Provided background on bug flows, which will occur from May to August 2022. The PI Team will be meeting periodically to determine if there are any adverse impacts

from bug flows to other resources. The presentation also provided monitoring updates and a summary of 2018-2020 bug flow findings. It is believed that bug flows have had an effect on midges, and maybe also on caddisflies but that relationship was not statistically significant.

Q&A

[Leslie James, Colorado River Energy Distributors Association (CREDA)] Do the findings imply that midges declined because of bug flows, or were there other reasons for that decline? **[Mike Moran, GCMRC]** There is no definitive answer. It will be interesting to see what happens this year especially if there is a big spike in midges. There are other factors (such as turbidity) that need to be untangled.

Federal Agency Updates

Staffing Updates

[Kathy Callister, Reclamation] Working with Human Resources to get the GCDAMP group chief hired as soon as possible. Will continue to provide updates. Until then, Reclamation staff will rotate through the position. Clarence Fullard will be the acting program manager through June. **[Mark Lamb, United States Fish and Wildlife Service (USFWS)]** New staff include Heather Whitlaw, who is the field supervisor for the Arizona USFWS office and has also been nominated to be on the AMWG. Dan Levitt is being nominated as the alternate for the TWG. Kirk Young and Jess Newton are also recognized for their continued work with USFWS. **[Scott VanderKooi, GCMRC]** The description for the GCMRC chief has been approved and should be announced soon. Will continue to inform the group and engage the GCDAMP stakeholders.

GCDAMP Program Funding

[Kathy Callister, Reclamation] Reclamation has received Fiscal Year (FY) 2022 funds. The President's FY 2023 budget has been released. Now the appropriations process will begin. **[Brian Sadler, WAPA]** Rodney Bailey has been announced as the new Colorado River Storage Project (CRSP) manager (replacing Tim Vigil). WAPA is hoping to use \$110 million in funding from the Bipartisan Infrastructure Law. Bug flow expenses and some other adjustments need to be added to the model.

Endangered Species Act (ESA) Updates

[Mark Lamb, USFWS] No updates to listings related to ESA species or their habitat. There will be some planning starting soon on the Interim Guidelines.

Expanded Non-native Aquatic Species Plan

[Rob Billerbeck, NPS] Have been meeting weekly with Reclamation, GCMRC, USFWS, and the Arizona Department of Game and Fish about options for each agency and compliance requirements. Next actions are being contemplated if more non-natives are seen through the dam. **[Taryn Preston, NPS]** The slough was pumped and green sunfish were removed. There were technical difficulties with the pumps so only 60 green sunfish were collected, which are under quarantine and will be released back into Lake Powell. The plan is to go back out as soon as possible to complete that project.

LTEMP Litigation

[Rod Smith, Department of the Interior Solicitor's Office] The LTEMP litigation was filed in the District Court in Arizona. It is a National Environmental Policy Act (NEPA)-based challenge that alleges Reclamation's climate change analysis done in 2016 did not comply with NEPA. The briefings are being

filed now. Next thing is for the plaintiffs to take up their brief, then the federal government and intervenors will take their last brief on June 10. Expect oral arguments followed by a ruling.

Technical Work Group Chair Report

[Michelle Garrison, TWG Vice Chair] [PRESENTATION](#) on upcoming meetings. The TWG will complete its discussions on the budget at the June meeting. TWG has been grappling with a number of issues of concern related to the drought's impacts on resources, including non-native fish, dissolved oxygen, and elevated river temperatures. Next steps include an expanded charge to the Steering Committee Ad Hoc Group to better track emerging issues and share them with TWG members on a more reliable and frequent basis. The TWG is also planning a tabletop exercise to help identify areas of potential importance to the AMWG. The Scope of Work for a water quality study is under development now and will be reviewed at the next TWG meeting.

Stakeholder Updates

- **[Candice Hasenyager, Utah]** The Utah Legislature provided \$500 million to support water projects.
- **[Jakob Maase, Hopi Tribe]** A river trip was just completed.
- **[Eric Stanfield, Navajo Nation]** The Navajo Nation's river trip is May 24 to June 2. Elections will also be held this year.
- **[Larry Stevens, GCWC]** Been working on riparian restoration at Paria Beach, one of the most visited sites along the Colorado River system.
- **[Leslie James, CREDA]** Prices of natural gas continue to go up. Everyone is watching the temperatures for this summer. Supply chain issues continue to create havoc for solar installations and other electric grid needs.
- **[Kevin Garlick, Utah Municipal Power Agency (UMPA)]** Many municipalities are struggling. UMPA added more than 80 megawatts of solar in last eight months, but it is hard to replace lost hydropower energy with natural gas and other sources.
- **[David Brown, Grand Canyon River Guides (GCRG)]** In early April, Guides Training Seminar participants and NPS staff conducted a work project at Clear Creek Camp to remove invasive plants where recreational camping had been lost due to vegetation encroachment. In addition, the Guides Training participants visited other campsites along the river corridor and collected data to inform future vegetation encroachment mitigation actions. This work supports experimental vegetation treatments as described in the LTEMP. There are many reports of extremely poor beach conditions due to vegetation encroachment, high wind events, and last year's monsoon season.

Tribal Liaison Report

[Jamescita Peshlakai, Reclamation] River trips are coming up. Will be holding the LTEMP programmatic meeting with the tribes on August 4. Also working with the tribes on their expenditures, budgets, and another five-year programmatic agreement at the end of September.

Q&A

[Larry Stevens, GCWC] Funding for the tribes has not increased in past 20 years. Will there be a discussion on whether that funding is adequate? **[Jamescita Peshlakai, Reclamation]** That is a concern.

It has not increased with the cost of living; however, there seems to be a large balance of unused funds, which is one of the problems that needs to be addressed.

Proposed FY 2023 Budget and Work Plan

[Michelle Garrison, TWG Vice Chair] The planning for 2021-2023 was done in 2020. In 2022, have been looking back at 2021 and assessing how 2022 is going in order to determine whether there should be any changes recommended for the budget. The TWG will take this up in June for the AMWG to take up in August. The Budget Ad Hoc Group had recommended that: 1) items that were cut or scaled back for budget reasons might be put back in if funds are available, and 2) the AMWG should provide direction to the TWG on a water quality study. In 2023, the TWG will have to start the process again for the next three-year planning process. **[Mike Moran, GCMRC]** [PRESENTATION](#) is an overview of the FY 2023 budget. Details are in the Triennial Budget and Work Plan. FY 2023 is expected to have a \$42,000 shortfall that may be made up with end-of-year funds. The Lake Powell Water Quality study is proposed for \$244,000, which would likely come outside of GCDAMP funds. **[Lee Traynham, Reclamation]** Not seeing any suggested revisions for Reclamation's FY 2023 budget. Projects A and B cover the AMWG and TWG, respectively. Project C will have slight adjustments as costs are increasing. Element C.5 is the Experimental Management Fund, which is available to monitor for unexpected management actions. This might be used to support non-native fish management. Project D (related to cultural resources) includes a cost increase for monitoring at Grand Canyon. One thing to flag is that some funding is coming in late. Most of the tribal partners are at end of their five-year agreement. Some of these projects might slip for a year because if funds are not spent they would need to be de-obligated.

Public Comment

[Lynn Hamilton, GCRG] GCRG is feeling the effects from not having an HFE since 2018. HFEs are the primary tool for building sandbars. GCRG is strongly advocating for a spring HFE. There is much talk about nimbleness, and these are unprecedented times. There needs to be an action plan in place and to also set up for experiments next year. There are real consequences if we are not nimble or proactive.

[John Dillon, Grand Canyon River Outfitters Association] Would echo Lynn's comments. There is also a visitor component with 22,000 to 23,000 people visiting Grand Canyon National Park each year. The lack of an HFE has a huge negative effect on camping beaches and the white-water rafting trips. COVID also resulted in a small influx of visitors that rolled over their trips to the subsequent year and resulted in slightly larger group sizes to make up for the previous year's losses. The efforts of AMWG and agency staffs are much appreciated.

AMWG Next Steps

- **Jim Stroger's question in chat as to whether the TWG might consider items outside the LTEMP Record of Decision.** **[Wayne Pullan, Reclamation]** The answer is "yes" with the caveat that it would require new NEPA compliance, which limits exercising that tool for the short term.
- **Next AMWG Meeting August 17-18.** Topics will include 2023 budget and workplan, hydrology and operations updates, tribal liaison report, and hearing back from the TWG on the requests made today. Any suggestions on additional agenda items should be sent to Kearns & West by June 30 with a copy sent to Reclamation. The meeting will be held virtually.

- **Lee Traynham's Departure. [Wayne Pullan, Reclamation]** Lee started with the group on May 12, 2019, and has done a tremendous job. She is highly capable, trustworthy, has integrity, and believes in the process. We wish her all the best.

Meeting adjourned at 12:03 PST.

Meeting Attendees

AMWG Members, Alternates, and Leadership

Arden Kucate (Pueblo of Zuni)	Kelly Burke Burke (GCWC)
Brian Sadler (WAPA)	Kevin Garlick (UMPA)
Candice Hasenyager (Utah Division of Water Resources)	Larry Stevens (GCWC)
Charles "Chip" Lewis (Bureau of Indian Affairs)	Leslie James (CREDA)
Charlie Ferrantelli (State of Wyoming)	Michelle Garrison (State of Colorado)
Cliff Barrett (UMPA)	Peggy Roefer (CRCN)
Clint Chandler (AZDWR)	Richard Begay (Navajo Nation)
Daniel Picard (Acting Designated Federal Officer, Reclamation)	Rod Buchanan (FFI/TU)
Jessica Neuwerth (CRBC)	Scott Mcgettigan (State of Utah)
Jim Strogon (FFI/TU)	Wayne Pullan (Acting Secretary's Designee)
John McClow (State of Colorado)	William "Billy" Shott (NPS-GLCA)

Department of the Interior

Christina Kalavritinos
Rod Smith

TWG Members and Alternates

Ben Reeder (GCRG)	Erik Stanfield (Navajo Nation)
Brian Healy (NPS-GRCA)	Jakob Maase (Hopi Tribe)
Christina Noftsker (State of New Mexico)	Kirk Young (USFWS)
Clarence Fullard (Vice Chair and Reclamation)	Kurt Dongoske (Pueblo of Zuni)
Craig Ellsworth (WAPA)	Ryan Mann (AZGFD)
Daniel Bullets (Southern Paiute Consortium)	Seth Shanahan (TWG Chair and SNWA)
David Brown (GCRG)	Sinjin Eberle (American Rivers)
David Rogowski (AGFD)	William "Bill" Persons (FFI/TU)

USGS/GCMRC Staff

Bridget Deemer	Kim Dibble
Drew Eppehimer	Michael Moran
Emily Palmquist	Paul Grams
Helen Fairley	Scott Vanderkooi
Joel Sankey	Ted Kennedy

Reclamation Staff

Alex Pivarnik	Jamescita Peshlakai
Becki Bryant	Jenny Erickson
Dave Speas	Kathy Callister

David Isleman
Ernie Rheaume
Heather Patno

Lee Traynham
Nicholas Williams

Acronyms

AMWG – Adaptive Management Work Group
CREDA – Colorado River Energy Distributors Association
CRSP – Colorado River Storage Program
DROA – Drought Response Operations Agreement
ESA – Endangered Species Act
FY – Fiscal Year
GCDAMP - Glen Canyon Dam Adaptive Management Program
GCMRC – Grand Canyon Monitoring & Research Center
GCRG - Grand Canyon River Guides
GCWC—Grand Canyon Wildlands Council
HFE – High Flow Experiment
LTEMP – Long-Term Experimental and Management Plan
NEPA – National Environmental Policy Act

NPS – National Park Service
PI Team – Project Implementation Team
PST – Pacific Standard Time
Reclamation – Bureau of Reclamation
Secretary – Secretary of the Interior
SNWA – Southern Nevada Water Authority
TSC - Technical Service Center
TU - Trout Unlimited
TWG – GCDAMP Technical Work Group
UMPA - Utah Municipal Power Agency
USFWS – US Fish & Wildlife Service
WAPA – Western Area Power Administration

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	At its next meeting, AMWG will consider a process for planning for the next 20 years of LTEMP. <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. <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. <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. ... <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. <u>August 2021 Update:</u> A draft project plan, 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. <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. <u>May 2022 Update:</u> The GCMRC developed several draft metrics and pilot presentations concurrently with the 2022 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.	Reclamation / ongoing	Open

ITEM No. / DATE	ACTION ITEM	ASSIGNED To / DUE DATE	STATUS
Item 2020.Dec.22	In accordance with the 2021-2023 Triennial Budget and Work Plan approved 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.” <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. <u>May 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.	All / ongoing	Open
Item 2022.May.18	The Secretary’s Designee directs Reclamation and GCMRC to work with the TWG regarding the following: - Develop a draft strategic plan to prevent, detect, and respond to cool- and warmwater invasive fish establishment below Glen Canyon Dam. The plan should include proposed monitoring, specific activities to be considered for prevention and response, along with their relative effectiveness, detection thresholds (“triggers”) for action, and conditions for discontinuing response activities (e.g. due to success, futility, resource limitations, etc.). - Develop 2-4 operational alternatives that could help prevent cool- and warmwater invasive fish establishment, while minimizing potential adverse effects to other resources. Operational alternatives that are not within the scope of the LTEMP ROD may be proposed, but would require additional NEPA, ESA, and NHPA compliance. Reclamation, GCMRC and the TWG will report out at the August AMWG meeting on the draft strategic plan and operational alternatives, and the AMWG may recommend further action or study. As a starting point, GCMRC will leverage information and products from existing research and monitoring efforts within	GCMRC, Reclamation, TWG / August 2022	Open

ITEM No. / DATE	ACTION ITEM	ASSIGNED To / DUE DATE	STATUS
	the GCDAMP, as well as from the Smallmouth Bass Task Force. Unspent FY 2022 funds from Reclamation Project C.5, <i>Experimental Management Fund</i>, may be utilized to support GCMRC staff time for this effort. <u>May 2022 update:</u> Reclamation, GCMRC and TWG leadership acknowledged and accepted the directive.		

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Supplemental Materials

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GCMRC FY2023 Budget Overview

AMWG Webinar Meeting
May 18, 2022

Michael Moran
Grand Canyon Monitoring and Research Center
Southwest Biological Science Center

FY2023 GCMRC Budget Request From Triennial Work Plan

Project	FY2023
Project A. Streamflow, Water Quality, and Sediment Transport and Budgeting	\$ 1,208,601
Project B. Sandbar and Sediment Storage Monitoring and Research	\$ 994,345
Project C. Riparian Vegetation Monitoring and Research	\$ 341,403
Project D. Effects of Dam Ops and Vegetation management for Archaeological Sites	\$ 303,781
Project E. Controls on Ecosystem Productivity: Nutrients, Flow, and Temperature	\$ 287,270
Project F. Aquatic Invertebrate Ecology	\$ 699,786
Project G. Humpback Chub Population Dynamics	\$ 1,597,633
Project H. Salmonid Research and Monitoring	\$ 514,277
Project I. Warm-Water Native and Non-Native Fish Monitoring and Research	\$ 658,125
Project J. Socioeconomic Research	\$ 192,953
Project K. Geospatial Science, Data Management, and Technology	\$ 510,993
Project L. Overflight Remote Sensing	\$ 315,509
Project M. Leadership, Management, and Support	\$ 1,479,305
Project N. Hydropower Monitoring and Research	\$ 26,245
Total Cost	\$ 9,130,227
Anticipated AMP Funding Available	\$ 9,088,000
Anticipated Over/Under Budget	(\$ 42,227)

FY2023 GCMRC Budget: Plans

- No expected major deviations from FY23 budget requests in Triennial Work Plan (TWP)
- \$42K shortfall to come from FY22 end-of-year (EOY) funds
- More on EOY funding below

GCMRC Budget: Lake Powell Water Quality

- Budgeted amount for CY22 is \$244K
 - Actual amount may be a little smaller
- \$57K additional funds for Lake Powell part of the water-quality synthesis
 - From AMWG motion in Feb. 2022
- Current agreement ends at the end of CY22
- **Funding for this project comes from outside the GCDAMP**

BAHG Budget Recommendation

The BAHG recommends the following revisions to the FY23 Workplan as prioritized below and as funds become available:

1. Continue JCM-West in FY23 (Project Element G.6) **[\$250,000]**
2. Continue TRGD with two sites in FY23 (Project Element H.2) **[\$67,000]**
3. Begin the Grand Canyon portion of the Water Quality Synthesis (from AMWG motion in Feb. 2022) **[\$125,000]**
4. Investigate Aquatic Vegetation Removal Pilot in Lees Ferry to reduce brown trout habitat (proposal in development) **[NA]**
5. Continue Sandbar Vegetation mapping with two surveys instead of one in FY23 (Project Element C.1) **[\$22,000]**
6. Enhance Streamflow and Sandbar Modeling to include silt and clay (Project Element B.5) **[\$64,000]**

GCMRC End-Of-Year Funds

- The amount of End-Of-Year (EOY) funds that will be available for FY22 is still unclear
- Will have a better idea near close-out in August
- No new GCMRC building means an overestimate in the overhead in the TWP for FY22
- Small amount (\$42K) of FY22 EOY funds will be needed to cover FY23 shortfall
- FY22 EOY funds will also be needed to cover over-budget in logistics due to inflation (~\$90K)

GCMRC End-Of-Year Funds Cont.

- **Aggregate EOY funds from FY20-22 should be sufficient to fund BAHG items 1-3**
 - **Items 1 and 2 are slated to occur in FY23**
 - **Item 3, Grand Canyon part of water-quality synthesis, is starting this fiscal year**
- **Could be sufficient aggregate EOY funds to cover items 5 and 6**
- **Item 4, vegetation removal in Lees Ferry, needs more design work**

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Potential GCDAMP & Other Meetings in 2023

Days	Dates	Meeting	Comments
JANUARY			
W-Th	Jan	CRAB meeting	
W	Jan 11	UCLT all day	
M	Jan 16	Martin Luther King Holiday	
T-W	Jan 24-25	Annual Reporting Meeting – TBD	
Th	Jan 26	TWG Meeting – TBD	
Tu-Th	Jan 24-26	CRTR Meeting	
FEBRUARY			
Tu	Feb 14	DOI Federal Family Meeting – TBD	
W-Th	Feb 15-16	AMWG Meeting – TBD	
Th	Feb 16	MSCP Financial WG mtg	
M	Feb 20	President's Day Holiday	
MARCH			
Sun	Mar 12	Daylight Savings (begins)	
M-F	Mar 13-17	School Spring Recess in Flagstaff	
Th	Mar	Flaming Gorge WG	
APRIL			
W-Th	Apr 12-13	TWG Meeting – TBD	
W	Apr 13	UCLT all day	
W	Apr 26	MSCP Steering Committee meeting	
MAY			
W-Th	May 10-11	MSCP work group	
W	May 17	AMWG Webinar - Virtual	
M	May 29	Memorial Day Holiday	
JUNE			
W-Th	Jun 14-15	TWG Meeting – TBD	
W	Jun 14	Flag Day	
W	June 28	MSCP Steering Committee meeting	
JULY			
Tu	Jul 4	Independence Day Holiday	
W	Jul 12	UCLT all day	
AUGUST			
Tu	Aug 15	DOI Federal Family Meeting – TBD	
W-Th	Aug 16-17	AMWG Meeting	
M-F	Aug	Fall semester starts at NAU – Flagstaff, AZ	
SEPTEMBER			
M	Sep 4	Labor Day Holiday	

Days	Dates	Meeting	Comments
M	Oct 9	Columbus Day	
W-Th	Oct 11-12	TWG Meeting – TBD	
W	Oct 11	UCLT all day	
W	Oct 25	MSCP Steering Committee meeting	
		NOVEMBER	
Su	Nov 5	Daylight Savings (ends)	
Sa	Nov 11	Veteran's Day Holiday	
Th	Nov 23	Thanksgiving Holiday	
		DECEMBER	
M	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.*

Month	Year-1 (2020) (development of TWP)	Year-2 (2021)
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.

Month	Year-3 (2022)	Year-4 (2023)
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 ^a and Primary Objective	Replicates	Duration	Annual Implementation Considerations ^b	Long-Term Off-Ramp Conditions ^c	Action if Successful
<i>Sediment-Related Experiments^d</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

TABLE 4 (Cont.)

Experimental Treatment	Trigger ^a and Primary Objective	Replicates	Duration	Annual Implementation Considerations ^b	Long-Term Off-Ramp Conditions ^c	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

TABLE 4 (Cont.)

Experimental Treatment	Trigger ^a and Primary Objective	Replicates	Duration	Annual Implementation Considerations ^b	Long-Term Off-Ramp Conditions ^c	Action if Successful
<i>Aquatic Resource-Related Experiments^c</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 ^f	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

TABLE 4 (Cont.)

Experimental Treatment	Trigger ^a and Primary Objective	Replicates	Duration	Annual Implementation Considerations ^b	Long-Term Off-Ramp Conditions ^c	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

TABLE 4 (Cont.)

Experimental Treatment	Trigger ^a and Primary Objective	Replicates	Duration	Annual Implementation Considerations ^b	Long-Term Off-Ramp Conditions ^c	Action if Successful
<i>Aquatic Resource-Related Experiments (Cont.)</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.) ^g	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>Riparian Vegetation Experiments</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

^a 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.

^b 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.

^c Suspension of experiment if the DOI determines effects cannot be mitigated.

^d Details of implementation of sediment experiments are presented in Section 2.1.

^e Details of implementation of aquatic resource experiments are presented in Section 2.2.

^f 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.

^g The duration and other characteristics of experimental macroinvertebrate production flows could be adjusted based on the results of initial experiments.