



Glen Canyon Dam Adaptive Management Program

CHAPTER 1. Bureau of Reclamation, Glen Canyon Dam Adaptive Management Program Triennial Budget and Work Plan—Fiscal Years 2021–2023

Introduction

The Glen Canyon Dam Adaptive Management Program (GCDAMP) is a science-based process for continually improving management practices related to the operation of Glen Canyon Dam (GCD) by emphasizing learning through monitoring, research, and experimentation, in fulfillment of the consultation and research commitments of the Grand Canyon Protection Act (GCPA). The Bureau of Reclamation's (Reclamation) Upper Colorado Basin – Interior Region 7 is responsible for administering funds for the GCDAMP and providing those funds for monitoring, research, and stakeholder involvement. The majority of program funding has historically been derived from hydropower revenues; however, supplemental funding is provided by various Department of the Interior (DOI) agencies that receive appropriations. These agencies include Reclamation, the U.S. Geological Survey (USGS), the National Park Service (NPS), the U.S. Fish and Wildlife Service (USFWS), and the Bureau of Indian Affairs (BIA).

The budget and work plan for fiscal years (FY) 2021–2023 was largely developed in consideration of the Record of Decision for the Glen Canyon Dam Long-Term Experimental and Management Plan Environmental Impact Statement (LTEMP EIS) and on the basis of outcomes from previous work plans. Additional consideration was given to meeting commitments outlined in: (1) the 2007 USFWS Biological Opinion for the Proposed Adoption of Colorado River Interim Guidelines for Lower Basin Shortages and Coordinated Operations for Lake Powell and Lake Mead (2007 Opinion); (2) the 2016 USFWS Biological Opinion for the Long-Term Experimental and Management Plan Environmental Impact Statement (LTEMP EIS) (2016 Opinion); and (3) Section 106 of the National Historic Preservation Act (NHPA), the 2017 Programmatic Agreement for the Glen Canyon Dam Long-Term Experimental and Management

Plan, and the 2018 Historic Preservation Plan for the Glen Canyon Dam Long-Term Experimental and Management Plan.

Future Funding Uncertainties

Environmental programs associated with the Colorado River Storage Project (CRSP) have historically been funded by revenues collected from the generation of hydropower at CRSP facilities. These programs include the GCDAMP, the Upper Colorado River Endangered Fish Recovery Program (UCRIP) and the San Juan River Basin Recovery Implementation Program (SJRIP) (collectively, the RIPs). The three programs together were awarded \$20.0 million in FY2020; \$11.36 million (57%) of this annual amount went to fund the GCDAMP while \$8.64 million (43%) supported the two RIPs.

In the past, the three programs have been funded using power revenues slated for repayment of CRSP construction costs to the U.S. Treasury. Over recent years, the amount of outstanding repayment obligations has diminished. Applying repayment dollars to fund environmental programs can continue on a sustainable basis, but at lower amounts than historically available. Due to declining repayment schedules for the system, it is anticipated that the hydropower revenues available to fund these programs will be reduced to \$12.5 million annually starting in FY2023.

Development of a sustainable funding solution for these environmental programs will require partners to work collaboratively in all three programs to ensure their continued success. Reclamation is working with program partners to develop and consider funding allocation alternatives, as well as to explore additional funding sources. 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.

A. Adaptive Management Work Group (AMWG) Costs

A.1. AMWG Direct Costs and Administration

This budget represents Reclamation staff costs to perform the daily administrative activities required to support the Adaptive Management Work Group (AMWG), the GCDAMP Federal Advisory Committee Act (FACA) committee. This includes issuing federal register notices for meetings and to solicit nominees, processing member nominations, submitting meeting reports within 30 days of each committee meeting, renewing the committee charter every other year, and preparing justification packages in response to federal advisory committee reviews. Reclamation responds to regular requests from the General Services Administration (GSA) to complete FACA

reports and incorporate meeting and member information into the FACA database. Reclamation also organizes stakeholder travel to AMWG meetings, activities that range from preparing travel authorizations to completing travel vouchers.

The primary goal is to perform all work associated with the AMWG in a timely and efficient manner, while using the funds available as prudently as possible. Secondary goals include increasing each stakeholder's awareness of significant budget and legislative issues related to the GCDAMP, improving working relationships with the AMWG members/alternates, finding constructive ways to resolve differences, and addressing individual concerns in an open and accepting forum of discussion.

Reclamation will work to ensure that personnel costs will not exceed what has been proposed in the budget. Reclamation staff will provide budget information to the AMWG on a regular basis. Completed AMWG work products will be of high quality and promptly distributed to AMWG members/alternates and interested parties.

Budget: FY21 = \$75,000 FY22 = \$75,000 FY23 = \$75,000

A.2. AMWG Member Travel Reimbursement

This budget covers the costs to reimburse AMWG members or alternates to attend regularly scheduled AMWG meetings.

Reimbursing AMWG members or alternates for travel expenses is done to encourage and support their attendance at all meetings. Many members live outside of Phoenix or Flagstaff Arizona, where meetings are often held. As a result, many members must incur travel costs. Having Reclamation provide reimbursement to AMWG members or alternates for air travel or mileage for the use of private vehicles, as well as other related travel costs such as hotel, per diem, and rental cars increases opportunities for members to participate in a variety of AMWG assignments. Because Reclamation can purchase airline tickets at the Federal Government rate, there are cost savings to the program.

The GCDAMP benefits from having all AMWG members participating in regularly scheduled meetings. The AMWG is made up of a group of diverse and committed stakeholders that span the resources and values of Glen Canyon Dam and Glen and Grand Canyon below. The AMWG provides a forum of discussion for bringing key issues to resolution. As a collective body, the AMWG provides scientifically informed and broadly supported recommendations to the Secretary of the Interior regarding the operation of GCD and other management actions.

Budget: FY21= \$20,000 FY22 = \$20,000 FY23 = \$20,000

A.3. AMWG Reclamation Travel

This budget supports travel expenses Reclamation staff incur to attend AMWG and ad hoc group meetings and AMWG related coordination. The primary goal is for Reclamation staff to be able to travel to meetings and participate in completing AMWG assignments. By doing so, the program benefits from greater interaction between Reclamation staff and GCDAMP stakeholders.

Reclamation staff will be involved with AMWG members in completing work assignments and resolving issues that affect the GCDAMP. They will develop good working relationships with all stakeholders involved and work toward consensus with AMWG members on a variety of issues.

Budget: FY21= \$20,000 FY22 = \$20,000 FY23 = \$20,000

A.4. AMWG Facilitation and Note Taking

This budget supports a facilitator who is under contract to Reclamation to provide facilitation services for AMWG meetings. The facilitator may also assist AMWG ad hoc groups or TWG in completing assignments.

The facilitator's primary responsibility is to keep the AMWG meetings organized and help the members reach consensus on important issues. The facilitator will create an atmosphere in which the members and other participants at AMWG meetings feel comfortable expressing their individual viewpoints. In addition, the facilitator assists Reclamation in meeting preparation and coordination, documents action items, administers meeting evaluations, and participates in post-meeting activities including planning team de-briefs, action item tracking, and review of meeting minutes.

In addition, the budget supports a note taker who is under contract to Reclamation to provide note taking services for AMWG and TWG meetings. The note taker may also assist AMWG ad hoc group on an as-needed basis. The work groups require note taking at meetings to accurately document the discussions, decisions, motions, action items, and recommendations to further their goals and objectives.

Budget: FY21= \$60,000 FY22 = \$60,000 FY23 = \$60,000

A.5. Public Outreach - Public Affairs and Public Outreach Ad Hoc Group

This budget covers the expenses for Reclamation staff and the Public Outreach Ad Hoc Group (POAHG) to develop materials for the GCDAMP public outreach efforts. This item also includes Reclamation public affairs staff attendance at AMWG meetings.

Reclamation public affairs staff and the POAHG, as appropriate, will work to develop materials to inform and educate the public on the goals and administration of the GCDAMP.

Products may include fact sheets, web site information, tribal outreach materials, video B-roll, special events, conference participation, and other pertinent means of advising the public and program members on the achievements of the GCDAMP.

Budget: FY21= \$25,000 FY22 = \$25,000 FY23 = \$25,000

A.6. AMWG Other

This budget represents some of the other “miscellaneous” expenses incurred in operation of the AMWG, including the following expenses:

- Meeting room rentals
- Overnight mailings of AMWG meeting packets
- Copying of reports
- Purchasing meeting materials (thumb drives, name tents, markers, paper, etc.)
- Purchasing audio visual equipment (microphones, cords, clickers, projector, etc).

In addition to the expenses noted above, training courses are often required for staff to keep current on environmental issues, FACA changes, computer technology improvements, etc. Other expenses will be kept to a minimum in an effort to reduce the administrative portion of the GCDAMP budget

Budget: FY21 = \$15,000 FY22 = \$15,000 FY23 = \$15,000

Table 1. Reclamation Adaptive Management Work Group Budget Summary

<i>Fiscal Year 2021</i>						
	Project Description	Reclamation Salaries	Travel	Operations / Supplies	Contracts / Cooperators	Total
A	Adaptive Management Work Group					\$ 215,000
A.1	Adaptive Management Work Group Costs (BOR)	\$ 75,000				\$ 75,000
A.2	AMWG Member Travel Reimbursement		\$ 20,000			\$ 20,000
A.3	AMWG Reclamation Travel		\$ 20,000			\$ 20,000
A.4	AMWG Facilitation and Notetaking				\$ 60,000	\$ 60,000
A.5	Public Outreach - Reclamation public affairs, POAG	\$ 25,000				\$ 25,000
A.6	AMWG Other			\$ 15,000		\$ 15,000
A	Total	\$ 100,000	\$ 40,000	\$ 15,000	\$ 60,000	\$ 215,000
<i>Fiscal Year 2022</i>						
	Project Description	Reclamation Salaries	Travel	Operations / Supplies	Contracts / Cooperators	Total
A	Adaptive Management Work Group					\$ 215,000
A.1	Adaptive Management Work Group Costs (BOR)	\$ 75,000				\$ 75,000
A.2	AMWG Member Travel Reimbursement		\$ 20,000			\$ 20,000
A.3	AMWG Reclamation Travel		\$ 20,000			\$ 20,000
A.4	AMWG Facilitation and Notetaking				\$ 60,000	\$ 60,000
A.5	Public Outreach - Reclamation public affairs, POAG	\$ 25,000				\$ 25,000
A.6	AMWG Other			\$ 15,000		\$ 15,000
A	Total	\$ 100,000	\$ 40,000	\$ 15,000	\$ 60,000	\$ 215,000
<i>Fiscal Year 2023</i>						
	Project Description	Reclamation Salaries	Travel	Operations / Supplies	Contracts / Cooperators	Total
A	Adaptive Management Work Group					\$ 215,000
A.1	Adaptive Management Work Group Costs (BOR)	\$ 75,000				\$ 75,000
A.2	AMWG Member Travel Reimbursement		\$ 20,000			\$ 20,000
A.3	AMWG Reclamation Travel		\$ 20,000			\$ 20,000
A.4	AMWG Facilitation and Notetaking				\$ 60,000	\$ 60,000
A.5	Public Outreach - Reclamation public affairs, POAG	\$ 25,000				\$ 25,000
A.6	AMWG Other			\$ 15,000		\$ 15,000
A	Total	\$ 100,000	\$ 40,000	\$ 15,000	\$ 60,000	\$ 215,000

B. Technical Work Group (TWG) Costs

B.1. TWG Direct Costs and Administration

This budget represents Reclamation staff costs to perform the daily activities required to support the TWG, a subgroup of the AMWG. The work includes completing assignments resulting from TWG meetings, consulting with stakeholders on a variety of GCDAMP issues relating to the operation of GCD, disseminating pertinent information to TWG members, preparing and tracking budget expenses, and updating the web pages Reclamation maintains for the program. Reclamation also completes all stakeholder travel activities, which range from preparing travel authorizations to completing travel vouchers.

Reclamation staff will provide budget information to the TWG on a regular basis. Completed TWG work products will be promptly distributed to TWG members/alternates and interested parties.

Budget: FY21 = \$120,000 FY22 = \$120,000 FY23 = \$120,000

B.2. TWG Member Travel Reimbursement

This budget provides funds to reimburse TWG members or alternates for expenses incurred to attend regularly scheduled TWG meetings.

Reimbursing TWG members or alternates for travel expenses is done to encourage and support their attendance at all meetings. By providing reimbursement to TWG members or alternates for air travel or mileage for the use of private vehicles, as well as other related travel costs such as hotel, per diem, and rental car increases opportunities for members to participate in a variety of TWG assignments. Because Reclamation can purchase airline tickets at the Federal Government rate, there are cost savings to the program.

The GCDAMP will benefit from having all the TWG members participate in regularly scheduled meetings. As a collective body, TWG members address and resolve concerns associated with the operation of GCD and make recommendations to the AMWG that incorporate the best scientific information available to the GCDAMP. It is important to support participation of all TWG members in regularly scheduled meetings so that they can stay abreast of TWG-related activities and the research and monitoring in the GCDAMP.

Budget: FY21 = \$25,000 FY22 = \$25,000 FY23 = \$25,000

B.3. TWG Reclamation Travel

This budget covers travel expenses that Reclamation staff will incur to prepare for and attend TWG meetings and ad hoc group meetings resulting from TWG assignments. The primary goal is for Reclamation staff to be able to travel to meetings and participate in completing TWG assignments. Reclamation staff will continue to be involved in meeting with TWG members to complete work assignments and resolve issues that affect the GCDAMP and operation of GCD. They will develop good working relationships with all TWG members and work toward consensus on a variety of GCDAMP issues.

Budget: FY21 = \$20,000 FY22 = \$20,000 FY23 = \$20,000

B.4. TWG Chair Reimbursement/Facilitation

This budget supports a person who is under contract to Reclamation to serve as the chairperson for the TWG. This person may also assist AMWG/TWG ad hoc groups in completing assignments.

The chairperson's primary responsibility is to conduct regularly scheduled TWG meetings. The chairperson also participates in ad hoc group assignments and works closely with Reclamation and GCMRC staff in setting meeting agendas. The chairperson follows up on TWG and ad hoc group assignments and ensures that information is shared with the members and alternates in a timely manner.

The chairperson creates an atmosphere in which the members and other participants at TWG meetings feel comfortable expressing their individual viewpoints. The chairperson will bring the TWG members to consensus on sensitive issues with the ultimate goal of making recommendations to the AMWG that incorporate the best scientific information available to the GCDAMP. The chairperson will follow up on action items and make assignments as necessary to accomplish TWG objectives.

In the event that the TWG chair salary is covered through funding outside the GCDAMP, these funds can be used by Reclamation for TWG-related administrative purposes or to cover facilitation, note taking and support for TWG-related issues. Part, or all, of this budget may be used for facilitation services for TWG meetings, support for TWG ad hoc groups, or support completing TWG assignments.

Budget: FY21 = \$0 FY22 = \$25,000 FY23 = \$25,000

B.5. TWG Other

This budget represents some of the other "miscellaneous" expenses incurred in support of the TWG, including the following expenses:

- Overnight mailings of AMWG meeting packets
- Copying of reports
- Purchasing meeting materials (thumb drives, name tents, markers, paper, etc.)
- Purchasing audio visual equipment (microphones, cords, clickers, projector, etc.)

It is expected that most, if not all, TWG meetings will be held at venues that do not incur additional costs to the GCDAMP. Other expenses will be kept to a minimum in an effort to keep within the GCDAMP budget.

Budget: FY21 = \$10,000 FY22 = \$10,000 FY23 = \$10,000

Table 2. Reclamation Technical Work Group Budget Summary

<i>Fiscal Year 2021</i>						
	Project Description	Reclamation Salaries	Travel	Operations / Supplies	Contracts / Cooperators	Total
B	Technical Work Group					\$ 175,000
B.1	TWG Direct Costs and Administration (BOR)	\$ 120,000				\$ 120,000
B.2	TWG Member Travel Reimbursement		\$ 25,000			\$ 25,000
B.3	TWG Reclamation Travel		\$ 20,000			\$ 20,000
B.4	TWG Chair Reimbursement/Facilitation				\$ -	\$ -
B.5	TWG Other			\$ 10,000		\$ 10,000
B	Total	\$ 120,000	\$ 45,000	\$ 10,000	\$ -	\$ 175,000
<i>Fiscal Year 2022</i>						
	Project Description	Reclamation Salaries	Travel	Operations / Supplies	Contracts / Cooperators	Total
B	Technical Work Group					\$ 200,000
B.1	TWG Direct Costs and Administration (BOR)	\$ 120,000				\$ 120,000
B.2	TWG Member Travel Reimbursement		\$ 25,000			\$ 25,000
B.3	TWG Reclamation Travel		\$ 20,000			\$ 20,000
B.4	TWG Chair Reimbursement/Facilitation				\$ 25,000	\$ 25,000
B.5	TWG Other			\$ 10,000		\$ 10,000
B	Total	\$ 120,000	\$ 45,000	\$ 10,000	\$ 25,000	\$ 200,000
<i>Fiscal Year 2023</i>						
	Project Description	Reclamation Salaries	Travel	Operations / Supplies	Contracts / Cooperators	Total
B	Technical Work Group					\$ 200,000
B.1	TWG Direct Costs and Administration (BOR)	\$ 120,000				\$ 120,000
B.2	TWG Member Travel Reimbursement		\$ 25,000			\$ 25,000
B.3	TWG Reclamation Travel		\$ 20,000			\$ 20,000
B.4	TWG Chair Reimbursement/Facilitation				\$ 25,000	\$ 25,000
B.5	TWG Other			\$ 10,000		\$ 10,000
B	Total	\$ 120,000	\$ 45,000	\$ 10,000	\$ 25,000	\$ 200,000

C. Program Management, ESA Compliance, and Management Actions

C.1. Administrative Support for NPS Permitting

This budget item provides funding to support the Grand Canyon National Park permitting of research and monitoring projects conducted under the GCDAMP. Grand Canyon National Park employs a permitting specialist and other staff who review all proposals for projects to be completed in the park and to determine NEPA, ESA and NHPA compliance requirements. The program provides these funds under the auspices of the GCDAMP to offset the park's administrative burden in providing permitting services. The primary goal is to ensure that projects conducted under the GCDAMP are reviewed and permitted by the NPS. Projects conducted under the GCDAMP will receive permits from the NPS in a timely manner.

Budget: FY21 = \$125,000 FY22 = \$125,000 FY23 = \$130,000

C.2. Contract Administration

This budget covers the expenses for Reclamation acquisitions and contracting staff to prepare and execute contracts associated with the GCDAMP. Specifically, these contracts include GCMRC science and monitoring, NPS monitoring and permitting, AMWG facilitation, AMWG and TWG note taking, TWG chairperson reimbursement (if needed), Science Advisors program, Tribal participation and resource monitoring, and programmatic agreement (PA) contract work. Most of these contracts and financial assistance agreements are up to five years in duration. In FY2022, substantial effort will be required to replace several current contracts that will expire that year.

Reclamation contract specialists will accurately apply funds spent on individual contracts to ensure costs do not exceed contract limits. They will keep the Reclamation Resources Management Division (RMD) contracting technical representative informed as to those charges so accurate reporting can be made to both AMWG and TWG members.

Reclamation contracting technical representatives will ensure that individual contractors are fulfilling the requirements of their contracts. They will maintain accurate records of payments made against the contracts and will keep Reclamation staff informed of discrepancies or concerns. Work will be completed on time and within the limits of the contract.

Budget: FY21 = \$70,000 FY22 = \$120,000 FY23 = \$70,000

C.3. Integrated GCDAMP Stakeholder River Trip

The objective of this project is to provide an opportunity for AMWG members and GCDAMP stakeholders to articulate their respective values, concerns and issues in a field setting. The river trip also provides the opportunity for AMWG members to visit the canyon and gain a greater understanding of GCDAMP resources and issues. The river trip will be agenda-driven and is intended to provide an opportunity for GCDAMP stakeholders to share perspectives about their values and positions respective to the Grand Canyon and the Colorado River. It is expected that one trip every 2 or 3 years is the appropriate frequency.

Budget: FY21 = \$0 FY22 = \$50,000 FY23 = \$0

C.4. Science Advisors Program

This budget provides funding to support the Science Advisors Program, including the office of the Executive Coordinator for the Science Advisors Program. Consistent with Section 6.1 (f) of the 2016 LTEMP ROD, the Science Advisors Program provides recommendations to the GCDAMP regarding research and monitoring priorities, knowledge integration, and the adaptive management of natural, cultural, and recreational resources affected by Glen Canyon Dam operations and associated adaptive management actions. As part of this effort, the Science Advisors Program periodically conducts independent, external reviews of GCDAMP resource-specific monitoring and research programs and carries out other advisory tasks as directed by the Department of the Interior and in consultation with GCDAMP. The SAP will be composed of qualified individuals not otherwise participating in the long-term monitoring and research studies. The Executive Coordinator manages the Science Advisor Program and may also carry out advisory tasks.

Priority tasks identified for the FY2021-2023 work plan are:

- Science Advisors Program administration
- AMWG and TWG meeting attendance and participation, as directed
- Establish and convene independent review panels, as directed
 - Review #1 – Monitoring Metrics
 - Review #2 – TBD
- Support and guide three-year Knowledge Assessment process

Budget: FY21 = \$150,000 FY22 = \$150,000 FY23 = \$150,000

C.5. Experimental Management Fund

This budget item reserves funds for conducting experiments or management actions within the GCDAMP, with priority given to LTEMP-related experiments and management actions that could not be anticipated in advance of the three-year budget and work plan and require timely implementation. The funds will be available to conduct experiments or management actions when conditions are appropriate. Reclamation will work with DOI agencies, the BAHG and TWG to identify projects that may be appropriate for the Experimental Management Fund. Each year, Reclamation will discuss with the TWG the possible projects or experiments for the upcoming year that may utilize the Experimental Management Fund. Projects that may utilize funds in the Experimental Management Fund include, but are not limited to, additional monitoring in the event of an extended duration fall HFE, additional experimentation related to native fish conservation and/or nonnative fish control, and other newly pressing scientific questions in the GCDAMP.

When implementing experiments under the LTEMP, Reclamation will collaborate with WAPA, GCMRC, and other GCDAMP partners to identify operational scenarios that improve hydropower resources and are consistent with the improvement and long-term sustainability of other downstream resources. These efforts will be coordinated with GCMRC's Project N.

If the funds allocated to the Experimental Management Fund are not needed in a given year, FY2021-2023 work plan projects proposed but unfunded due to budget limitations will be considered for end of year funding support, assuming all other funding criteria are met. Priority will be given to Reclamation Project C and Project D. Some year-end experimental management funds may also be allocated to the Native Fish Conservation Contingency Fund (Reclamation Project C.6) or to the Contingency Fund for NHPA Section 106 Compliance (Reclamation Project D.13).

Budget: FY21 = \$350,000 FY22 = \$350,000 FY23 = \$350,000

C.6. Native Fish Conservation Contingency Fund

This budget item tracks the native fish conservation contingency fund. The goal of this budget item is to ensure that funds are available for native fish conservation actions or nonnative fish control in the event this conservation action is needed for endangered humpback chub in accordance with Reclamation's ESA compliance obligations. This is a fund consisting of GCDAMP carryover funds from prior years and serves to ensure that funds are available for the conservation actions should the need arise. The first priority for use of these funds is to implement conservation actions as defined in the 2007 and 2016 biological opinions. Should excess funds become available beyond those needed for conservation actions, these funds could be expended on other research, monitoring, and management actions that help conserve native

fish. In past years, Reclamation has targeted a balance of approximately \$1M to \$1.5M in the Native Fish Conservation Contingency Fund given anticipated conservation actions and the status of native and nonnative fish. Should anticipated conservation actions and/or the status of native and nonnative fish significantly change, Reclamation may adjust the target balance of the fund.

Carryover balance:

- End of FY20 anticipated carryover = \$1,700,000

C.7.-C.8. GRCA and GLCA Experimental Vegetation Treatment

As described in the LTEMP Record of Decision, experimental riparian vegetation treatment is included as mitigation for dam operations within the Colorado River Ecosystem (CRE). This work is also listed as a priority in the most recent DOI policy guidance memo to the GCDAMP, which was issued by the Assistant Secretary for Water and Science on August 14, 2019.

Vegetation treatment actions on NPS managed lands will be implemented by NPS consistent with NPS *Management Policies* (NPS 2006) and consistent with the goals and objectives of LTEMP ROD. This will occur only within the CRE in areas that are influenced by dam operations. The NPS will work with tribal partners and GCMRC to plan, implement and evaluate a number of vegetation control and native replanting activities on the riparian vegetation within the CRE in Grand Canyon National Park and Glen Canyon National Recreation Area.

Principal elements of this experimental riparian vegetation proposal include:

- Control nonnative plant species affected by dam operations, including tamarisk and other highly invasive species through various control methods;
- Develop native plant materials for replanting through partnerships and the use of regional greenhouses;
- Replant native plant species to priority sites along the river corridor, including native species of interest to Tribes;
- Remove vegetation encroaching on campsites; and
- Manage vegetation to assist with cultural site protection.

The project area is from Glen Canyon dam to Pearce Ferry. Project partners are the National Park Service, associated tribes, GCMRC, Reclamation, youth corps and volunteers.

NPS will coordinate closely with GCMRC on this project. GCMRC projects C.4 and D.1 provide for the GCMRC's coordination with NPS and tribal partners in developing the scientific design, project site selection, implementation and monitoring protocols for the experimental vegetation treatments. During this triennial plan, NPS and GCMRC will develop and begin implementing

experiments that evaluate techniques for campsite clearing (GRCA), native species replanting (GLCA), and invasive removal (GLCA, GRCA). Additionally, experiments developed in collaboration with GCMRC examining whether and how vegetation removal affects cultural resources and sediment dynamics will continue (see GCMRC TWP D.1). The intent of these evaluations is to identify the most cost-effective and environmentally-sensitive methods to achieve the LTEMP ROD principle elements. This will allow for an adaptive management approach to adopt the more efficient approaches over time.

Coordinated activities would include removal of selected plant species of concern at targeted sites and subreaches (e.g., live and dead tamarisk, arrowweed), replant of native species at targeted sites, and ongoing monitoring of treatment areas. GCMRC project D.1 also provides a formal experimental design for evaluating if vegetation removal increases the probability of “preservation in place” of archaeological sites near HFE-sediment supplied sand bars, including site selection and pre- and post- treatment data collection. This experiment provides the connection for how other LTEMP experiments such as spring, fall or extended HFEs relate to the vegetation work (as HFEs would be predicted to increase sediment at the strategic locations identified and then be available to be blown by wind to cover archeological sites). This experiment includes appropriate monitoring and controls to determine how much benefit to the covering of cultural sites actually accrues from such removals. Additional funds are available to provide outreach and coordination with tribes by the NPS/GLCA for FY2020-21. In addition, GCMRC projects C.1, C.2, C.3 and L contribute to the NPS vegetation work in the following ways. Project C.1 provides riparian vegetation monitoring data between Glen Canyon Dam and river mile 240, which can be used to prioritize treatment areas and identify sources of native species for propagation. Project C.2 proposes to conduct manipulative experiments on hydrological tolerances of riparian species of interest, which can be used to inform species used for planting, locations of plantings in relation to surface flows, and anticipated responses of removed plants. Project C.3 proposes to develop predictive models of vegetation responses to flows using existing data from many sources, including data derived from the LTEMP non-flow vegetation experiments described here. These models can be utilized to develop planting and removal plans to increase treatment success. Project L will provide base maps for planning and navigating purposes, as well as spatial data sets that will contribute to project evaluation.

The project area is from Glen Canyon dam to Pearce Ferry. Project partners are the National Park Service (GLCA, GRCA), associated tribes, GCMRC, Bureau of Reclamation, youth corps and volunteers. Project costs include project coordination, planning and administration costs (including an annual coordination and planning meeting for NPS, GCMRC and tribes; GCMRC vegetation data processing and transfer to NPS), personnel costs (NPS seasonal and term biological technicians for field work, data entry and reporting; NPS term archeologist for on-site field work, GIS and data staff support; NPS tribal liaison to work with tribes; NPS compliance staff; funding tribal staff for tribal engagement as partners in planning and executing the experiment and for tribal on-site field work), supplies (tools and herbicides, plant propagation,

fuel for boat travel), and contracts, agreements and river support (cooperative agreement for greenhouse operation costs, river support for field work, youth crew agreement to support field work). NPS will explore additional sources of funding external to the program to assist in funding tribal partners.

Budget: GRCA FY21 = \$170,000 FY22 = \$170,000 FY23 = \$170,000
GLCA FY21 = \$43,000 FY22 = \$84,000 FY23 = \$67,000
Request Unfunded: FY23 = \$25,000

C.9. Evaluation of Means to Prevent Fish Passage through GCD

In the 2016 Biological Opinion for the LTEMP, Reclamation committed to evaluate means of preventing the passage of deleterious invasive nonnative fish through Glen Canyon Dam. Potential options to minimize or eliminate passage through the turbine or bypass intakes, or to minimize survival of nonnative fish that pass through the dam would be assessed. While feasible options may not currently exist, technology may be developed later in the LTEMP period that could help achieve this goal.

In 2019, Reclamation ran a prize competition called “Improving Fish Exclusion from Water Diversions and Intakes.” A brief summary of existing technologies was completed by subject matter experts during the prize competition effort. Six winners were awarded a total of \$75,000. Similarly, the Department of Energy’s Water Power Technologies Office, in partnership with Reclamation, recently (2020) launched a multi-stage prize competition called the “Fish Protection Prize” with \$700,000 in prizes. The focus of this competition is on further development of fish protection concepts. For additional details regarding the prize competitions see the section, “Projects Funded Outside the GCDAMP: Fish Exclusion at Dam Intakes”

Reclamation staff are actively participating in these prize competitions as reviewers and judges. Upon completion of the competition, Reclamation program staff will work with the Research and Development Office to identify concepts with applicability to dam intakes and to conduct high level feasibility screening. Promising concepts may be considered for appraisal study and pilot testing. Opportunities for cost sharing and continued collaboration within Reclamation and with other agencies will be pursued.

Budget: FY21 = \$40,000 FY22 = \$0 FY23 = \$0

Unfunded: FY22 = \$60,000

C.10. Evaluation of Temperature Control Methods at GCD

In the 2016 Biological Opinion for the LTEMP, Reclamation committed to explore the efficacy of a temperature control device, or methods, at Glen Canyon Dam to respond to potential

extremes in hydrologic conditions due to climate conditions that could result in nonnative fish establishment. This includes evaluations of current and evolving technological advances that could provide for warming and cooling the river in both high- and low-flow discharge scenarios, and high and low reservoir levels.

Reclamation's Prize Competition Program funded a review of temperature control options for reservoir release flows that was completed in January 2020 (Reclamation Hydraulics Laboratory Report PAP-1184) to investigate the viability and focus of a prize competition on this topic. Most of the existing options summarized in the review were evaluated during previous study of temperature control for Glen Canyon Dam.

In FY2020, Reclamation's Technical Services Center contracted with the company yet2 through an interagency agreement with NASA's Center of Excellence for Collaborative Innovation. The purpose of the contract is to complete a Technology Search to explore Water Temperature Control Devices that are innovative and/or can be applied from other industries. Final results will be available in summer 2020 and will be shared with the TWG. Additional GCDAMP work plan tasks will be considered following review of the Technology Search results, and promising concepts may be considered for appraisal study and pilot testing.

- Competition: <http://www.yet2.com/active-projects/exploring-water-temperature-control-devices/>

In FY2021, Reclamation will further develop a high-level assessment of the cooling capacity of the Glen Canyon Dam bypass tubes under various pool elevation and release scenarios. This analysis was first presented at the October 2018 TWG meeting. The bypass tubes release relatively cool water from an elevation of 3374 feet, which is roughly 100 feet lower than the intake to the penstock tubes. While there are several obstacles to utilizing the bypass tubes in practice, releasing water from a lower elevation may be one of few alternatives that can produce cooler temperatures in the Colorado River. This assessment will provide a general idea of how temperature would be impacted downstream of Glen Canyon Dam under various conditions.

Pool elevation in Lake Powell is a key driver of temperature conditions downstream of Glen Canyon Dam. Throughout the FY2021-2023 TWP, Reclamation will provide regular updates to the TWG of mid- to long-term projections of Lake Powell pool elevation, as these projections are closely tied to temperature risk and uncertainty. Reclamation utilizes a suite of reservoir operations models to update mid- and long-term projections regularly.

- Colorado River System Mid- to Long-term Projections:
<https://www.usbr.gov/lc/region/g4000/riverops/coriver-projections.html>

Budget: FY21 = \$15,000 FY22 = \$0 FY23 = \$0

C.11. Southwestern Willow Flycatcher and Yuma Ridgway's Rail Surveys

In the 2016 Biological Opinion for the LTEMP, Reclamation committed to monitoring two endangered birds: the Yuma Ridgway's rail and the southwestern willow flycatcher. Reclamation will partially assist in funding National Park Service staff in conducting Yuma Ridgway's rail surveys once every three years and conduct southwestern willow flycatcher surveys once every two years for the duration of the LTEMP. The purpose of these surveys is to determine if potential habitat is occupied by breeding birds. These monitoring trips will be coordinated and combined with existing trips. Reporting and documentation will be provided to Reclamation by NPS staff certified to survey for nesting birds during the breeding season. The Southwest willow flycatcher would be surveyed in 2021 and 2023, while the Yuma Ridgway's rail would be surveyed in 2022. This work will focus on the presence/absence surveys in accordance with the conservation measures outlined in the 2016 LTEMP Biological Opinion. Future GCDAMP budget cycles may also consider research questions associated with these species.

Budget: FY21 = \$10,000 FY22 = \$7,000 FY23 = \$10,000

C.12. Monitoring Metrics Development and Resource Condition Tracking

Section 6.1 (c) of the 2016 LTEMP ROD states that "The DOI, in consultation with the AMWG, will develop monitoring metrics for the goals and objectives using those in Appendix C of the FEIS as a starting point." The need to prioritize development of resource condition metrics was further emphasized by the August 14, 2019 memo from Dr. Timothy Petty, Assistant Secretary for Water and Science and Secretary's Designee, which provided strategic guidance for the GCDAMP. As an initial step, Reclamation and GCMRC will review the metrics utilized for the LTEMP FEIS analysis (See Table 1, Appendix C, LTEMP FEIS) for appropriateness and implementation feasibility. The agencies will work with the Science Advisors, Tribes, and other subject matter experts to address gaps, such as where existing metrics cannot be feasibly measured and reported, or where a resource goal does not lend itself to a science-based performance metric.

Newly proposed resource condition metrics will be presented to the AMWG and TWG for consideration, input, and adoption. As metrics are approved for adoption, Principle Investigators at GCMRC will be asked to track metric values for their respective resources and to report annually on current and relative values, highlighting trends over time. The list of metrics may need to be reviewed and revised over time to better reflect changing conditions, advances in technology, data availability, monitoring frequency, etc.

It is anticipated that the first few years of development and reporting (establishing current or baseline condition, identifying and processing relevant datasets, generating report graphics and visuals) may require substantial effort from GCMRC and this budget is intended to support that effort. Beyond the 2021-2023 TWP this budget item may be reduced or eliminated, with subsequent review assigned to the Science Advisor and with PIs incorporating condition tracking into standard reporting.

Budget: FY21 = \$50,000 FY22 = \$35,000 FY23 = \$35,000

C.13. Reclamation Program Management

This budget represents Reclamation staff costs to support broad programmatic goals of the GCDAMP and is separate from the administrative support tasks outlined in Project Element A.1. The work includes completing assignments resulting from AMWG meetings, consulting with stakeholders on a variety of GCDAMP issues relating to the operation of Glen Canyon Dam, disseminating pertinent information to the AMWG, and preparing and tracking budget expenses. Program management priorities identified for the current work plan include the following:

- Streamline GCDAMP Guidance Documents (2016 LTEMP ROD Section 6.1.c)
- Facilitate Development of Monitoring Metrics (2016 LTEMP ROD Section 6.1.c)
- Budget and Contracts
 - FY2021-2023 Triennial Budget and Work Plan Project Prioritization
 - Project Management and Oversight
- Improved Communication and Coordination with Other Programs
 - Upper Colorado River Endangered Fish Recovery Program
 - San Juan River Basin Recovery Implementation Program
 - Lower Colorado River Multi-Species Conservation Program
- Assessment of Models and Evaluation Tools
 - Archive, Document, Review, and Validate existing models
 - Assess Needs for Additional Evaluation Tools
- Continued Compliance Tracking & Reporting
 - NHPA – LTEMP Programmatic Agreement and HPP Requirements
 - ESA – LTEMP Biological Opinion Requirements
 - NEPA – LTEMP FEIS
 - GCPA – Annual Report to Congress

Budget: FY21 = \$145,000 FY22 = \$145,000 FY23 = \$145,000

Table 4. Reclamation Program Administration, ESA Compliance, and Management Actions

<i>Fiscal Year 2021</i>						
	Project Description	Reclamation Salaries	Travel	Operations / Supplies	Contracts / Cooperators	Total
C	Program Management, ESA Compliance, and Management Actions					\$ 1,168,000
C.1	Administrative Support for NPS Permitting				\$ 125,000	\$ 125,000
C.2	Contract Administration	\$ 70,000				\$ 70,000
C.3	Integrated Stakeholder River Trip					\$ -
C.4	Science Advisors Program				\$ 150,000	\$ 150,000
C.5	Experimental Management Fund				\$ 350,000	\$ 350,000
C.6	Native Fish Conservation Contingency Fund					\$ -
C.7	Experimental Vegetation Treatment - Grand Canyon				\$ 170,000	\$ 170,000
C.8	Experimental Vegetation Treatment - Glen Canyon				\$ 43,000	\$ 43,000
C.9	Evaluation of means to prevent fish passage through GCD	\$ 40,000				\$ 40,000
C.10	Evaluation of temperature control methods at GCD	\$ 15,000				\$ 15,000
C.11	Ridgway's Rail and Southwest Willow Flycatcher monitoring				\$ 10,000	\$ 10,000
C.12	Monitoring Metrics Development and Tracking				\$ 50,000	\$ 50,000
C.13	Program Management	\$ 145,000				\$ 145,000
C	Total	\$ 270,000	\$ -	\$ -	\$ 898,000	\$ 1,168,000

<i>Fiscal Year 2022</i>						
	Project Description	Reclamation Salaries	Travel	Operations / Supplies	Contracts / Cooperators	Total
C	Program Management, ESA Compliance, and Management Actions					\$ 1,236,000
C.1	Administrative Support for NPS Permitting				\$ 125,000	\$ 125,000
C.2	Contract Administration	\$ 120,000				\$ 120,000
C.3	Integrated Stakeholder River Trip			\$ 50,000		\$ 50,000
C.4	Science Advisors Program				\$ 150,000	\$ 150,000
C.5	Experimental Management Fund				\$ 350,000	\$ 350,000
C.6	Native Fish Conservation Contingency Fund					\$ -
C.7	Experimental Vegetation Treatment - Grand Canyon				\$ 170,000	\$ 170,000
C.8	Experimental Vegetation Treatment - Glen Canyon				\$ 84,000	\$ 84,000
C.9	Evaluation of means to prevent fish passage through GCD					\$ -
C.10	Evaluation of temperature control methods at GCD					\$ -
C.11	Ridgway's Rail and Southwest Willow Flycatcher monitoring				\$ 7,000	\$ 7,000
C.12	Monitoring Metrics Development and Tracking				\$ 35,000	\$ 35,000
C.13	Program Management	\$ 145,000				\$ 145,000
C	Total	\$ 265,000	\$ -	\$ 50,000	\$ 921,000	\$ 1,236,000

<i>Fiscal Year 2023</i>						
	Project Description	Reclamation Salaries	Travel	Operations / Supplies	Contracts / Cooperators	Total
C	Program Management, ESA Compliance, and Management Actions					\$ 1,127,000
C.1	Administrative Support for NPS Permitting				\$ 130,000	\$ 130,000
C.2	Contract Administration	\$ 70,000				\$ 70,000
C.3	Integrated Stakeholder River Trip					\$ -
C.4	Science Advisors Program				\$ 150,000	\$ 150,000
C.5	Experimental Management Fund				\$ 350,000	\$ 350,000
C.6	Native Fish Conservation Contingency Fund					\$ -
C.7	Experimental Vegetation Treatment - Grand Canyon				\$ 170,000	\$ 170,000
C.8	Experimental Vegetation Treatment - Glen Canyon				\$ 67,000	\$ 67,000
C.9	Evaluation of means to prevent fish passage through GCD					\$ -
C.10	Evaluation of temperature control methods at GCD					\$ -
C.11	Ridgway's Rail and Southwest Willow Flycatcher monitoring				\$ 10,000	\$ 10,000
C.12	Monitoring Metrics Development and Tracking				\$ 35,000	\$ 35,000
C.13	Program Management	\$ 145,000				\$ 145,000
C	Total	\$ 215,000	\$ -	\$ -	\$ 912,000	\$ 1,127,000

D. NHPA Compliance and Cultural Resources Program Management

D.1. Cultural Resources Program Administrative Costs

This budget funds the salary and travel expenses of Reclamation cultural resources staff to administer the National Historic Preservation Act (NHPA) compliance for the GCDAMP utilizing the 2017 Programmatic Agreement (PA), which includes the Section 106 compliance, documentation for the Determination of Eligibility, contracting and reviewing of proposals and reports, annual cultural resources reporting and meeting, costs associated with maintaining the grants for tribal participation in the GCDAMP and tribal contracts to implement tribal monitoring protocols, general consultations, and Historic Preservation Plan (HPP) implementation. This includes the implementation of the 2017 PA for Glen Canyon Dam Operations, as well as the 2012 Memoranda of Agreement (MOA) for Non-native Fish Control or its replacement. This budget item also supports Reclamation management involvement in tribal consultations and other cultural resources compliance activities.

The project goals and objectives are:

- Management of five tribal grants from both appropriated funds for participation in the GCDAMP and power revenues to provide implementation of tribal monitoring protocols.
- Management of the monitoring and mitigation of at-risk historic properties and other related projects associated with implementation of NHPA compliance agreements for the operation of Glen Canyon Dam.
- Reclamation cultural resource personnel attending, as needed, TWG and AMWG meetings, Cultural Ad Hoc Group meetings, and conducting meetings required by the 2017 PA and revised 2012 MOAs.

Completion of this project's components allow for compliance with the 2017 PA Stipulations I-IX, XI, and XII which also ensures accountability for the tribal grants and contracts and appropriate use of funds. The budget covers labor and travel for approximately 70% of one full time archeologist, as well as Reclamation management involvement in tribal consultations and other cultural resources compliance activities.

Budget: FY21 = \$120,000 FY22 = \$120,000 FY23 = \$120,000

D.2. External Support for Cultural Resources Compliance

Due to the workload involved in the implementation of the 2017 PA and limited Reclamation cultural resources staff, this budget item is for assistance with Reclamation's cultural resources compliance management. The awardee(s) will assist in the implementation of the 2018 Historic Preservation Plan, and will support Reclamation's ongoing section 106 compliance activities carried out under the 2017 PA Stipulations.

Tasks for the awardee(s) include support for planning, coordinating and attending the annual PA implementation meetings, and drafting annual reports. Coordination with Reclamation's Regional Archeologist, the contracting officer, Tribes, GCMRC, and GCDAMP stakeholders and Program Manager is also expected. The awardee(s) may solicit GCDAMP expertise and input on cultural resources issues to support the fulfillment of these tasks. The primary tasks are:

- Provide assistance to Reclamation for the administration and implementation of the GCDAMP cultural resources program, including assistance with Reclamation's compliance with Section 106 of the NHPA as defined in the 2017 PA.

Some of this funding may be used to support tribal participation (outside of formal consultation) in the development of planning and compliance documents (e.g. Memoranda of Agreement for Non-native Fish Control), where their unique expertise is necessary for adequately addressing issues, particularly associated with the management of their traditional cultural properties. The awardee will work cooperatively with GCMRC on Project D.

Completion of this Administrative support to Reclamation allows for compliance with the 2017 PA Stipulations I-IX, XI, and XII.

Budget: FY21 = \$40,000 FY22 = \$40,000 FY23 = \$40,000

D.3. Cultural Resources Monitoring – Grand Canyon (NPS)

The NPS, Grand Canyon will conduct data review, field work within the CRE, data entry, analysis and report preparation to support Reclamation's Section 106 compliance and implementation of the 2017 LTEMP PA, Stipulations IV and VI. Field staff will utilize the existing 2016 Cultural Resource Management protocol and associated SOPs for all activities. Protocols will be used to streamline field activities. Additional data collection related to geospatial references and condition of archaeological sites will be gathered using a hardened field computer or hand-held unit and imported directly into the Cultural Resource geodatabase. The project goals and objectives are:

- Support Reclamation's Section 106 compliance responsibilities under the 2017 PA, Stipulations IV and VI
- Conduct field assessments to update condition and impact data using existing monitoring

- protocols and subsequent updates as defined in the Historic Preservation Plan (HPP)
- Provide Reclamation site data to support the development and implementation of the HPP
 - Review and update site information and associated treatment recommendations contained within Reclamation's 2007 Geoarchaeological Investigations and Treatment Plan
 - Coordinate with resource managers to design and implement appropriate management actions
 - Streamline data collection and data management for cultural resources along the river corridor and report annually to Reclamation on activities and findings

Completion of this project component allows for compliance with the 2017 PA Stipulation VI, and NHPA, Section 106. The ultimate goal of the long-term monitoring program is to collect data to support the evaluation of impacts to historic properties (as identified in 2017 PA Stipulation VI & VII); and, as appropriate, to help identify mitigation measures to remediate sites damaged by the operations of Glen Canyon Dam.

Budget: FY21 = \$50,000 FY22 = \$50,000 FY23 = \$50,000

D.4. Cultural Resources Monitoring – Glen Canyon (NPS)

Long-term monitoring of cultural resources within the CRE of the Glen Canyon Reach is required for compliance with Section 106 of NHPA and the Grand Canyon Protection Act, and implementation of the 2017 LTEMP PA, Stipulations IV and VI. Implementation of long-term monitoring in the Glen Canyon reach will be conducted by National Park Service (NPS) through Glen Canyon National Recreation Area (NRA) and coordinated with other NPS entities, Reclamation, the Grand Canyon Monitoring and Research Center (GCMRC), Tribes, and other stakeholders.

This project will maintain a program of long-term monitoring in the Glen Canyon reach that meets the updated requirements of the 2017 PA for LTEMP and the associated HPP. It will support the evaluation and documentation of effects to historic properties and inform the development of any mitigation measures identified to protect historic properties from documented adverse effects of dam operations. NPS would work with Reclamation to identify mitigation measures for any documented adverse effects at specific sites in Glen Canyon NRA. NPS will continue consultation concerning tribal values associated with Glen Canyon Reach with Hopi Tribe, Hualapai Tribe, Navajo Tribe, Southern Paiute Consortium, and Pueblo of Zuni. This consultation helps formulate a plan for ethnographic data collection to assist with mitigation of sites.

This project meets objectives of cultural resources protection on lands administered by Glen Canyon NRA using adaptive management processes for the NPS and Reclamation to achieve specific goals for identification, monitoring, documentation and mitigation actions with regard to cultural resources in the Glen Canyon reach during fiscal years 2021-2023. The project goals and objectives are:

- Support Reclamation’s Section 106 compliance responsibilities under the 2017 PA, Stipulations IV and VI.
- Conduct field assessments to update condition and impact data using existing monitoring protocols and subsequent updates as defined in the Historic Preservation Plan (HPP).
- Provide Reclamation site data to support the development and implementation of the HPP.
- Conduct monitoring and data collection in support of evaluation of impacts to historic properties.
- Document effects to historic properties resulting from dam operations.
- Work with Reclamation to identify mitigation measures for any documented adverse effects at specific sites in Glen Canyon NRA.

Completion of this project component allows for compliance with the 2017 PA Stipulation VI. The ultimate goal of the long-term monitoring program is to monitor and document effects to historic properties in the Glen Canyon reach (as identified in 2017 PA Stipulation VI). The data will be useful for identifying mitigation measures to remediate any sites in the Glen Canyon reach damaged by the operations of Glen Canyon Dam.

Budget: FY21 = \$30,000 FY22 = \$30,000 FY23 = \$30,000

D.5. Traditional Cultural Property (TCP) Documentation for Hualapai, Navajo and Paiute Tribes

Reclamation has identified the need to document individual Tribal Traditional Cultural Properties (TCPs) in order to treat the TCPs as historic properties under 2017 PA, Stipulations I, IV, and VI. Under previous contracts, Reclamation initiated the documentation process with the five AMWG member tribes. The Hopi Tribe and the Pueblo of Zuni have completed TCP documentation. The Hualapai, Navajo and Paiute Tribes do not have documented TCPs. Future projects including Associative Values studies and possible projects related to Traditional Ecological Knowledge are based on TCP documentation. This project provides funding to assist in the documentation of TCPs for the Hualapai, Navajo and Paiute Tribes. The Pueblo of Zuni and the Hopi Tribe may require updates to their existing TCPs, as well. Funding from Tribal monitoring projects and the data and reports that result from this monitoring will also support the documentation of TCPs. This project will be closely coordinated with NPS efforts to document a single TCP for the entire canyon for all traditionally associated tribes. Funding for the NPS project will come from outside of the GCDAMP. It is anticipated that each tribe’s documented TCP will be incorporated into the broader, canyon-wide multi-property TCP. The project goals and objectives are:

- Documentation of TCPs for Hualapai, Navajo and Paiute Tribes.
- Update documentation for Zuni and Hopi TCPs, as appropriate.

Completion of this project allows for compliance with the 2017 PA Stipulation I.B(3) and IV.A(7). The project product is the documentation of TCPs for the Hualapai, Navajo and Paiute tribes and possible updates to the TCPs for the Hopi Tribe and the Pueblo of Zuni.

Budget: FY21 = \$0 FY22 = \$0 FY23 = \$0

D.6. Zuni and NPS Data Recovery and Community Outreach Pilot Project (*mitigation*)

Purpose & Site Selection

The LTEMP Historic Preservation Plan identifies that historic property treatment plans (HPTP) implemented to date have lacked the integration of tribal knowledge and cultural values in the study of historic properties. Incorporation of tribal perspectives and knowledge in plans for mitigation of adverse effects will assist in interpreting the physical remains constituting historic properties. To that end, the NPS has determined that a Pueblo II habitation site is experiencing erosion that is exacerbated by flow releases from Glen Canyon Dam, which cumulatively threatens this site's National Register Integrity. Site condition monitoring since 2003 has consistently documented erosion as the factor impacting the NHPA Integrity of Feature 4 and Feature 5 (GRCA archaeological site database, NPS monitoring reports, Dierker 2019). NPS has determined that stabilization of some features is not possible and has recommended data recovery at Features 4 and 5. This recommendation is supported in the Bureau of Reclamation Treatment Plan (Damp et. al. 2007).

The Zuni people refer to this site as *Heshoda uhta an De'lashinna* (House by the Cliff Shrine) and Zuni Cultural Resource Advisory Team (ZCRAT) monitors have recommended to the NPS the development of an integrated Zuni/NPS treatment plan to address the erosion and to further an understanding of the historical, cultural, and emotional relationship between Zuni medicine societies, the shrine located at this site, and the role the site plays in Zuni migration history (See Pueblo of Zuni monitoring reports 2015-2018).

Description of Tasks

The NPS (GRCA) and Pueblo of Zuni propose a three year multi-phased pilot project that will develop an integrated and culturally appropriate treatment plan that meaningfully incorporates an archaeological science perspective with a Zuni traditional perspective. The result will serve as an effective and bi-culturally commensurate means of mitigating the erosion and associated adverse effects of Glen Canyon Dam operations on Features 4 and 5 at the selected site.

The project will involve GRCA archaeologists, Zuni religious leaders and Zuni youth in the development and implementation of the data recovery effort. The dynamic bi-cultural interchange between Western trained archaeologists and traditionally educated Zuni religious leaders will result in a processual and traditional hybrid narrative of the past. The involvement of Zuni youth in this project is intended to expose them to a vigorous bicultural pedagogical experience where they learn from both Western scientists and Zuni traditional religious leaders about Zuni heritage in relationship to the Grand Canyon. The exchanges that takes place between the Western scientists, the Zuni religious leaders and Zuni youth during the implementation of the mitigation will be documented on video.

Deliverables

In FY2023, the project team will finalize the draft treatment report and develop Zuni community outreach in the form of open houses where NPS archaeologists, participating Zuni tribal scholars and Zuni youth, and members of the Zuni community would interact and discuss the treatment of the selected site, including the identification and resolving of adverse effects to Zuni traditional cultural properties and the environment. During this phase, a video product will be finalized and distributed to the local Zuni school system, the A:shiwi A:wan museum, NPS Desert View visitor center and Reclamation and other GCDAMP stakeholders.

When fully implemented this project is intended to serve as a potential model for Reclamation and the other signatories to the LTEMP Programmatic Agreement to consider in the development of a larger-scaled HPTP that effectively and commensurately incorporate tribal values and perspectives.

Budget: FY21 = \$20,000 FY22 = \$150,000 FY23 = \$100,000

D.7. Southern Paiute Consortium – Monitoring Paiute Places on the Colorado: An Educational Resource (*Associative Values*)

Overview and Purpose

This two-year project recognizes the need for improved understanding of the goals, processes, and products of tribal monitoring among two key audiences: (i) new generations of tribal monitors, and, (ii) new agency participants and other partners in the GCDAMP. In order to effectively perform their roles, each of these groups requires tools to promote rapid learning about tribal monitoring in the GCDAMP. Based on the experience of the Southern Paiute Consortium (SPC) Monitoring and Education program, incomplete understanding among these two groups is impeding the effectiveness of monitoring work that forms the basis of tribal participation, and of effective agency collaboration.

SPC proposes to address this by creating an interactive, immersive training tool, allowing each group to experience how monitoring work is done, guided by narration of elders and experienced tribal program participants. The experience will be built around virtual tours integrating interactive educational content, including immersive 360-degree imagery and audio narration, recorded at key places of cultural significance for Southern Paiutes along the Colorado River corridor. This project will aid future generations of Southern Paiute monitors, inform trainee tribal monitors in multiple contexts, orient new agency personnel and partners participating in the GCDAMP, and promote increased respect for places of cultural significance in the Colorado River corridor and the Grand Canyon.

Site Selection

The proposed project will focus on two sites within the Colorado River corridor, monitored by the SPC during its annual river trips. Apart from accessibility and logistical feasibility, the following three criteria have been used to determine the selection of the project sites:

- The site can be used to demonstrate, positively or negatively, the impacts of dam operations, as flows cause sediment to be deposited or eroded within and adjacent to the river channel;
- The site demonstrates, positively or negatively, the interactions between sediment scour and fill dynamics, and the condition of natural and cultural resources;
- The site incorporates cultural materials, including habitation sites, which are of value and significance to tribal participants but not of such sensitivity that they would require restrictions on documentation and educational use of media from the site.

Based on these three criteria, the following sites were selected for this project:

- **Nankoweap:** This site is a former living area and home to many culturally important plants. The lack of new sediment deposits has altered plant growth at the site and is a clear example of sediment scour and side channel cutting and their impact on cultural and natural resources present at the site.
- **Indian Canyon:** This site is a former living and gathering area. The relatively stable interface between the side Canyon and the main channel has resulted in fewer direct impacts of the dam operations on the cultural materials at the site, though indirect impacts of visitor activity are monitored and documented.
- **Alternate sites:** Time and resources permitting, additional sites may be incorporated into this project to provide background for education on monitoring. Several sites in the Glen Canyon Reach monitored by SPC in recent years illustrate dam effects with interlinked impacts on cultural resources. These sites include the Descending Sheep Panel and Bullet Hole Panel. While monitor training would not focus on such sites, they could still prove valuable and logistically viable for this project.

The immersive tour produced for selected sites will include guidance on how to identify specific resources (such as roasting pits, ancestral structures, and culturally significant plant communities) and examine dam impacts on these resources. It will give viewers a chance to explore the tribal monitoring process and understand impacts of Glen Canyon Dam operations, in virtual reality. Within the virtual tour, content will be made available to the platform user by their proximity to key points in the virtual environment, and their interaction with embedded objects. The platform will be updatable and expandable to encompass additional locations and training content.

Description of Tasks

The project will produce an immersive virtual tour of resources and monitoring work at the two selected monitoring sites, focused on dam impacted resources. This proposed project will facilitate the training of SPC Monitors in the use of audiovisual and mapping technologies to prepare for visits to two key monitoring sites within the Colorado River corridor, with BARA researchers and contractors, in order to collect media and spatial data required for the project. A key emphasis of the project will be working with tribal youth to engage them in monitoring work and to promote their knowledge of new technologies for resource monitoring and preservation. Monitors may then participate in the production of interactive digital mapping for the two areas selected for the documentation. This will form the basis for producing immersive tours of the monitoring sites and activities, complete with VR vision and audio narration by Southern Paiute monitors. Project researchers from the SPC will work to carry out the following activities:

- **Scoping and training:** workshops with SPC Monitors and participants from member tribes. This project will build on related projects, including the intergenerational knowledge project, Mapping Paiute Places: Connecting Generations Across Paiute Lands, funded by the Indian Land Tenure Foundation. This proposed project will train youth and interested adults in basic audio and video recording, field mapping, and landscape visualization techniques. Scoping and training will focus on the two areas of the Colorado corridor selected for the project;
- **Data collection:** during annual SPC river trips, stops at two key visitor-impacted sites along the Colorado River corridor with SPC Monitors, youth participants, BARA researchers, and multimedia media contractors. At each site selected, monitors will observe and record impacts of GCD operations and associated visitor impacts using site forms and 360-degrees 3D digital photography. They will record mapping data and audio narratives about monitoring and the selected sites. The 360-degree 3D digital photography will be captured with an 8K Ultra-high definition camera;
- **Resource development workshops:** workshops with SPC, developing materials from data collected on the annual river monitoring trip, and working with mixed-generation groups to enhance virtual tour data. Activities will include the pairing of elders with

youth and monitors to audio record narrations of the process of monitoring work, including oral narratives for virtual tours within and between places included the project;

- **Digital resource production:** production of a 3D virtual tour of monitoring at a selected monitoring site by SPC and BARA researchers and media consultants. Tour users will be able to navigate between views within the site via clickable ‘hotspots’ embedded within the tour. Hotspots can also be used to incorporate interactive buttons revealing descriptive text, illustrations, and ambient sound or descriptive narration. This product will be tested and reviewed with SPC participants and interested agency participants and other partners in the GCDAMP;
- **Resource piloting:** trial use of new training resource in tribal monitor training exercises, prior to annual river trip.

Objectives

Project objectives are as follows:

- Enhanced understanding of tribal monitoring goals, processes, and products for new generations of tribal monitors, new agency participants, and other partners in the GCDAMP;
- Improved ability to identify resources and impacts among trainee monitors;
- Development and adoption of culturally appropriate approaches integrating new digital technologies as part of cultural resource monitoring and education activities;
- Assessment of the need for further modifications to the SPC’s Monitoring and Education Program and protocols, in keeping with the 2017 LTEMP PA Stipulation VI (B)-(C);
- Assessment of the contribution of monitoring and education program to Goals 2 and 4 of the LTEMP HPP, and contribution to the projects outlined in Appendix N.1 and N.4.1.
- Contribution to the fulfillment of Stipulation I(B)(2) and Stipulation IV(A)(10) of the 2017 Long Term Experimental and Management Plan Programmatic Agreement (LTEMP PA).

This project will help fulfill the obligations of the Bureau of Reclamation under Section 106 of the National Historic Preservation Act (NHPA) to mitigate potential adverse effects of Glen Canyon Dam operations. It will do so by integrating tribal knowledge, perspectives, and concerns in the GCDAMP, and thereby fulfilling Stipulation I(B)(2) and Stipulation IV(A)(10) of the 2017 Long Term Experimental and Management Plan Programmatic Agreement (LTEMP PA). As this project will seek to integrate tribal knowledge systems into the GCDAMP program—including cultural sensitivity training, fostering awareness of historic properties within

the APE and their multiple histories and values, and improving the understanding of factors effecting cultural resources with new and innovative research methods—it will also contribute to Goals 2 and 4 of 2018 LTEMP Historic Preservation Plan (LTEMP HPP). Additionally, it has significant potential to contribute to the development of new training methods that might form part of cultural sensitivity training, as part of Appendix N.1: Cultural Sensitivity Training.

Budget: FY21 = \$50,000 FY22 = \$50,000 FY23 = \$0,000

D.8 Hualapai – A Proposal to Study Hualapai Agricultural and Gardening Practices along the Colorado River

Project Overview

The Hualapai Tribe has occupied much of the length of the Colorado River in the Grand Canyon since time immemorial. Widely regarded by anthropologists and archaeologists as primarily a mobile hunting and gathering culture, there is ample evidence that varying scales of domestic plant husbandry were also practiced in many areas of the ancestral territory. This proposed project seeks to investigate and document the geographic extent and degree of domestic plant use along the Colorado River using archival sources, ethnohistoric information, and archaeological evidence.

The proposed work will help map out specific locations of plant husbandry practiced by ancestral Hualapai, and potentially estimate the areal extent of where food could be grown in these areas. Identifying relationships among plant samples would provide a greater understanding of how plants were used and shared across the region, create a stronger tie between current culture and traditional plants, and potentially establish to what degree people utilizing the Colorado River in Grand Canyon cultivated plants.

In addition, the results of this study may well have bearing on National Register considerations of certain sites and perhaps groups of sites that are centered around optimal areas. This could pertain to archaeological aspects as well as contemporary cultural knowledge and values about the past Hualapai history of the river.

Description of Tasks and Timeline

This study will be pursued on several levels, including:

- Archival work to create a comprehensive overview of the current state of knowledge
- Review of archaeological survey and excavation records for evidence of plant husbandry
- Limited analysis of existing artifact collections held at repositories
- Ethnohistoric interviews focused on traditional ecological knowledge (TEK)

During Year 1 (FY2021), work will comprise project planning and research; collecting background information from archival sources and from archaeological site records; identification of repositories with relevant plant remains, following repository protocols for obtaining specimens for analysis (including applying for necessary permits, where applicable); interviewing tribal elders and other knowledgeable individuals regarding TEK information; and, hopefully, by the latter part of Year 1 conducting analysis. A progress report will be prepared by the end of the fiscal year.

During Year 2 (FY2022), work will continue with analysis and obtaining samples; continuing background research to supplement findings from Year 1; continuing interviews with tribal members.

During Year 3 (FY2023), most of the effort will be on reporting and data synthesis, with only limited additional new research to supplement previous findings.

Deliverables

The project will occur over the three-year period encompassing the FY2021 – 2023 Triennial Work Plan. A summary of each year's findings will be presented at Annual Reporting meetings, most likely as a poster session, with the final results presented to the overall audience during one of the day's sessions after Year 3.

Deliverables for the proposed project will include a descriptive technical report for Department of Cultural Resources and agency use, as appropriate, as well as one or more scientific publications. We also propose to create a popular summary of the project that will be targeted primarily toward Hualapai tribal members but could be of interest to the general public.

Objectives

The results of this study are expected to contribute to National Register evaluations and a better understanding of Hualapai history and culture along the river. The vast majority of archaeological sites recorded along the river corridor have been evaluated exclusively according to Criterion D for National Register of Historic Places (National Register) eligibility, which mainly pertains to a site's potential to contribute scientific research. Consideration of other National Register criteria has been heretofore largely absent. For the Hualapai people, significance of these sites and the landscapes within which they are found extend much more broadly, however. Specifically, Criterion A, which "recognizes properties associated with single events, such as the founding of a town, or with a pattern of events, repeated activities, or historic trends" applies as well (emphasis added). The Colorado River and the Grand Canyon country has long been well-established as integral to the identity of the Hualapai people since time immemorial, and ancestral sites along the river are direct evidence of this link. By learning more about the nature of these sites, their significance in terms of National Register eligibility would be enhanced.

The project further meets Goal #4 of the Historic Preservation Plan (HPP), in that it will “Foster Awareness of and Appreciation for Historic Properties within the APE,” which follows from discussion on Criterion A above. By contributing information about the nature of archaeological sites and landscapes along the Colorado River, project results will also bring to bear considerations for future treatment plans, should they become necessary, to resolve adverse effects within the APE (Goal #3). In terms of Goal #3, enhanced knowledge of sites and landscapes can drive more specific research questions that would be developed during future mitigation plans.

Budget: FY21 = \$45,000 FY22 = \$45,000 FY23 = \$0

D.9. Hopi Grand Canyon (Öngtupqa) Oral History Project Proposal *(Associative Values)*

Project Summary

The Hopi Cultural Preservation Office (HCPO) is proposing a three-year ethnographic oral history project related to the Grand Canyon (Öngtupqa). The project will involve interviewing 20 Hopi elders, ten men and ten women about their knowledge of the Grand Canyon. HCPO will use the funding to pay for new audio and video recording equipment, to compensate for the interviewees' time, and to hire one individual to record and transcribe these interviews. The project serves to learn more about Hopi traditional knowledge concerning the cultural affiliation to the Grand Canyon, recounting areas of cultural sensitivity, and embodying cultural resources throughout the Grand Canyon. This collected information will serve to mitigate adverse effects impacting both cultural and natural resources in the Grand Canyon and provide new knowledge on cultural resources monitoring.

HCPO strongly feels that this is a valuable time to record ethnography about the Grand Canyon because of the numerous development plans within the surrounding region. A critical component regarding this proposal is, in the past, HCPO has overlooked vital components in previous projects, including a Hopi Women's perspectives about the Grand Canyon.

Background

The Grand Canyon is an essential traditional cultural place for the Hopi people. It is central to their heritage and religious beliefs. This project is being proposed due to need to reconnect with our elders, for the Hopi people have lost a significant number of knowledgeable community members over time. In 1995, Dr. T.J Ferguson and the Hopi Cultural Preservation Office conducted ethnographic interviews of the Grand Canyon. A majority of these interviews were not used in the final report. Due to time, only 18 partial transcripts of these interviews survive, none of which were conducted with Hopi women. All interviews were recorded by hand notes and no audio or video were recorded. The Ferguson report concentrated more on Hopi clan

migrations and the Hopi people's general connections to the Grand Canyon. The Hopi Cultural Resources Advisory Task Team (CRATT) have been recorded for similar projects for their knowledge about the Grand Canyon over the years. CRATT members may or may not be interviewed if they have been interviewed before, but take note that CRATT have changed significantly over the years since the 1995 Ferguson study. The nearly 20 years of Hopi river monitoring trips will also serve as a basis for resource application for questions to pursue cultural affiliation, cultural sensitivity, and resources management. However, these interviews and Ferguson's report still serve as a foundation to start the oral history project.

A deeper affiliation and knowledge of the Grand Canyon has not been recorded from Hopi's own perspectives. The Hopi people do not regularly visit the Grand Canyon due to its immense, and sacred nature to them. The annual Grand Canyon river monitoring trip participants are not of this elder and knowledgeable population. Also of importance and a cultural note to reviewers of our proposal, Hopi women are also not allowed traditionally within the canyon. Thus, their beliefs and voice in relationship to the Grand Canyon have been overlooked in past studies. This project would serve to address these issues, along with capturing heritage-based knowledge of the Grand Canyon before Hopi knowledge regarding the Grand Canyon is ultimately lost and how to approach cultural resource management with the numerous proposals and development in the work for the Grand Canyon.

Description of Tasks

The project serves to record knowledge of the Grand Canyon from twenty individuals, considered elders in the Hopi community. Ten men and ten women shall be interviewed. Interviews will serve to obtain precious Hopi knowledge of the Grand Canyon as a Traditional Cultural Place. The oral history projects hope to unveil how the Grand Canyon has changed over time, identify possible traditional cultural places that have been neglected, recommend areas of cultural sensitivity, and recommend impacts on archeological sites and natural resources that may need additional management. Interviewees will be chosen for age, religious society membership, and those clans associated to the Grand Canyon. Interviewees will inform of previous research and work done in the canyon including the Ferguson's ethnographic report, CRATT interviews, and the Hopi monitoring trips reports, to serve as a foundation for interview questions and where HCPO may want to expand that knowledge. Interviewees will be paid for their time; each interview last approximately one hour.

The project will include funds to hire a Research Assistant for three years to conduct, transcribe, and write a report from the interviews and project findings. The Research Assistant will compile information from 20 years of Hopi work, digitize reports from before 2000, apply recommendations for river monitoring trips from the research being gained, and write the new report. They will also record and review material and transcribe video and audio recordings in both Hopi and English. Positions will be supervised by Stewart B. Koyiyumptewa, Hopi Cultural Resource Office Program Manager and THPO.

Objectives

Knowledge from Interviewees will aid the greater GCDAMP by:

1. Providing new information on old and possible new sites.
2. Obtain current clarity on the Grand Canyon as a traditional cultural place as a whole and recommend the best alternatives to protect its status as scared place.
3. Recite stories for public access.
4. Identify areas of cultural sensitivity and how to address them.
5. Provide new recommendations for site mitigation, maintenance, and erosion.
6. Work towards a starting place for the complex Hopi Tribal knowledge assessment in regard to the Grand Canyon.

This project fulfills LTEMP Goals of the PA agreement between the Hopi, Park Service, and the Bureau of Reclamation.

1. Look at sites from fresh eyes that may be impacted by future undertakings and provide recommendations for such undertakings.
2. Create new and redefine old associated values with resources for future project recommendations.
3. In general provide a new body of knowledge for new section 106 undertakings.

The report will be sent to the Bureau of Reclamation and serve as a base for additional Hopi recommendations on behalf of the Glen Canyon Dam Technical Work Group and the Adaptive Management Plan. The report will serve to also address areas of cultural sensitivity to aid in the cultural sensitivity project being conducted by the Bureau of Reclamation.

Budget: FY21 = \$45,000 FY22 = \$45,000 FY23 = \$45,000

D.10. Southern Paiute Participation in the Glen Canyon AMP: 25 Years of Monitoring and Education, 1996-2021 (*Associative Values*)

Overview and Purpose

This two-year project proposes to complete a comprehensive, tribally directed history and review of Southern Paiute Monitoring and Education programs under the GCDAMP. The aim of this project is to assess the impacts of changes in the GCDAMP since the Southern Paiute Consortium (SPC) completed its Ten Year Review of Southern Paiute monitoring, education, reporting, and participation in the GCDAMP in 2007. This project has the explicit goal of understanding how those changes have affected (1) the participation of Southern Paiutes; (2) the Southern Paiute tribal monitoring program, including modifications to the program and its methods; and (3) the integration of Southern Paiute knowledge and perspectives into the

GCDAMP; and to (4) draw upon that understanding to contribute to cultural sensitivity training for GCDAMP activities and personnel.

Recent discussions between tribal representatives and other GCDAMP participants have acknowledged the need for a contemporary synthesis of tribal participant activities, monitoring protocols, and long-term results of tribal monitoring activities. This review is intended to inform Southern Paiute tribal leaders and GCDAMP participants. In its Ten Year Review the Southern Paiute Consortium (SPC) noted the following:

Attempts to resolve differences between Western scientific and Southern Paiute traditional knowledge and ways of understanding the Colorado River ecosystem have been unsuccessful, in spite of several efforts to integrate them. Significant improvements in the integration of Southern Paiute and other Native American perspectives are unlikely to occur without major changes in the organization and function of the GCDAMP (Austin et. al. 2007: ix).

Since that time, there have been numerous changes in the GCDAMP, including turnover in members and staff of the participating organizations, the addition of tribal liaisons, and the development of mechanisms, such as the Knowledge Assessment tool and implementation of associative values studies, to mitigate or identify mitigation strategies for any potential adverse effects to the character of historic properties as a result of the Glen Canyon Dam operations under the LTEMP Record of Decision (LTEMP ROD). This project will address whether and how these changes have affected the participation of Southern Paiutes and the integration of their knowledge and perspectives into the GCDAMP. The project will examine the opportunities for tribal engagement in numerous settings, from meetings, committees, and working groups of the GCDAMP, to river trips, as well as less formal interactions with scientists and other stakeholders. It then will examine whether and how the Southern Paiutes have taken advantage of these opportunities and the channels of communication they have employed in doing so. This project is especially timely as individuals who have been active in the SPC are retiring and passing on, and these people hold vital information for understanding the trajectory of the program.

This project will be focused on several domains of GCDAMP activities that will serve as case studies within the review, including the following:

- GCDAMP program structures designed to engage tribal perspectives, including the tribal liaison role;
- Mechanisms and tools that have been developed within the GCDAMP to engage tribal perspectives, including associative values studies and the Knowledge Assessment tool;
- Processes of transmitting information about the GCDAMP and of transferring institutional and cultural knowledge within the SPC and among its member tribes, as age cohorts of monitors and participants move through the program.

Description of Project Tasks

This project is designed within a collaborative research framework and will use a mix of archival and documents review, qualitative, and quantitative research methods. Project researchers from the SPC will carry out the following activities:

- Archival and documents review and synthesis. Researchers will review a list of all Grand Canyon Monitoring and Research Center (GCMRC) publications (<https://www.usgs.gov/centers/sbsc/publications>) and identify those which indicate tribal participation or review. They will then review the identified publications to characterize the nature of tribal participation, and whether and how the Southern Paiutes participated, if indicated in the publication. They will review all annual reports submitted by the SPC to synthesize key findings of the SPC monitoring program, changes in monitoring protocols, and the site-by-site and overall program recommendations.
- Participant observation at SPC and GCDAMP events. Researchers will participate in SPC and GCDAMP meetings, river trips, and other activities to document the nature of tribal member and SPC representative involvement and interactions with other AMP participants (costs for river trips and regular SPC-GCDAMP activities are covered in SPC's annual budgets so are not reflected in the project budget). This will include working with the SPC and leaders of the member tribes to plan an event commemorating 25 years of participation in the GCDAMP and envisioning the next 25 years. At this event, researchers will present their preliminary findings and gather information from participants, including people who have and have not been involved in the SPC Monitoring and Education Program.
- Semi-structured interviews with Southern Paiute tribal members who have participated in any aspect of the SPC Monitoring and Education Program. Researchers will obtain lists of Southern Paiutes who participated in annual monitoring and education activities such as meetings and river trips. They will then identify key characteristics (e.g., level of participation, age at the time of participation) and select a sample of the participants to interview. The interview protocols and questions will be developed based on data gathered in steps I and II.
- Semi-structured interviews with other participants in the GCDAMP. Researchers will identify key individuals within the GCDAMP who have been involved in efforts to improve the integration of Southern Paiute and other Native American individuals and perspectives in the program. They will then identify key characteristics (e.g., level of participation, role at the time of participation) and select a sample of the participants to interview. The interview protocols and questions will be developed based on data gathered in steps I and II.
- Data synthesis and reporting. Following standard methods for qualitative data analysis, researchers will code field and interview notes to identify key themes, and explore these

themes during analysis. They will synthesize their findings in a written report and oral presentation for the SPC and participating tribes, and GCDAMP.

Objectives

The fundamental objective of the SPC, strengthening member tribe participation in the GCDAMP, will be promoted in the following specific project objectives:

- Provide a new synthesis of SPC participation in the GCDAMP since the Ten Year Review;
- Review the implementation of recommendations provided in the SPC Ten Year Review, especially those related to tribal participation and monitoring;
- Assess the integration of tribal perspectives and concerns in proposed and implemented mitigation projects, including associative values studies;
- Assess the need for further modifications to the SPC’s Monitoring and Education Program and protocols, in keeping with the 2017 LTEMP PA Stipulation VI (B)-(C);
- Assess the contribution of monitoring and education program to the Goals 2 and 4 of the LTEMP HPP, and contribute to the project outlined in Appendix N.1 and N.4.1.
- Contribute to the fulfillment of Stipulation I(B)(2) and Stipulation IV(A)(10) of the 2017 Long Term Experimental and Management Plan Programmatic Agreement (LTEMP PA).
- Evaluate how SPC programs have met the needs of its member tribes and other AMP participants, and provide strategic direction for future participation in the GCDAMP.

This project helps fulfill the obligations of the Bureau of Reclamation under Section 106 of the National Historic Preservation Act (NHPA) to mitigate potential adverse effects of Glen Canyon Dam operations and impacts and integrate tribal perspectives and concerns into any mitigation projects, especially as these are articulated through the 2017 Long Term Experimental and Management Plan Programmatic Agreement (LTEMP PA) and the 2018 LTEMP Historic Preservation Plan (LTEMP HPP). Specifically, with regard to integrating tribal knowledge, perspectives, and concerns in the GCDAMP, as well as to providing a valuable tribal history for use in cultural awareness training, this project will fulfill Stipulation I(B)(2) and Stipulation IV(A)(10) of the 2017 LTEMP PA. Additionally, as this project will seek to integrate tribal knowledge systems into the GCDAMP program—including cultural sensitivity training, fostering awareness of multiple histories and values, and reviewing the Adaptive Management Working Group’s (AMWG) goals for cultural resources—it will contribute to Goals 2 and 4 of 2018 LTEMP HPP.

Budget: FY21 = \$0 FY22 = \$0 FY23 = \$0

Unfunded: FY21 = \$48,000 FY22 = \$48,000 FY23 = \$0

D.11. Hualapai Shared Histories Along the Colorado River in Grand Canyon (*Associative Values*)

Introduction and Rationale

The proposed project will be to investigate the Hualapai people's shared relationships and histories with other tribes that inhabited the Colorado River in the Grand Canyon below Glen Canyon Dam. There has long been a tendency to connect cultural resource sites (primarily archaeological sites) along the Colorado River with one tribe or another, or if multiple tribes are acknowledged to be affiliated with a site, they are not seen as necessarily being affiliated in a mutually collective way (e.g., there is a tendency to view sites as "multi-component," or occupied by different cultures during different time periods, for instance).

There is ample ethnohistoric evidence, however, to demonstrate that throughout history tribes interacted frequently throughout the canyon and river corridor in various ways, such as trade, marriage, resettlement, political alliances, and, at times, even conflict. The phenomena that tribal histories often intermingled in these various ways has been largely neglected. As one example, the archaeological culture known as the Cohonina, of which there are many sites in the canyon and surrounding South Kaibab Plateau, are acknowledged to be ancestral to the Hualapai, Havasupai, and Hopi. The Hualapai Tribe seeks to investigate these shared histories with the other tribes participating in the Glen Canyon Dam Adaptive Management Program (GCDAMP).

The results of this study are expected to contribute to National Register evaluations on landscape and possibly site-specific scales, and lead to a better understanding of the complexities of the history of the Colorado River and Grand Canyon, in a way that current archaeological methods are ill-equipped to describe alone. The project could therefore be viewed as complementary to archaeological research.

Project Description

The proposed project will consolidate ethnohistoric and archival information, coupled with contemporary interviews with tribal elders and other knowledgeable individuals, as well as archaeological considerations, to convey a more nuanced interpretation of Hualapai history in Grand Canyon, and the Colorado River corridor in particular.

Ethnohistoric and archival sources will include past ethnographies, unpublished manuscripts, interview accounts (recordings and transcripts), and congressional testimony (mainly, but not exclusively, from the 1950s). Major sources for congressional testimony are the U.S. Senate hearings from the Indian Claims Commission. Extensive interview information can be found from the Doris Duke Oral History Project, undertaken mainly in the late 1960s, and in the Hualapai Department of Cultural Resources archives, where recordings and transcripts from the department's cultural monitoring river trips and related interviews from the early 1990s up to the present are stored.

Archaeological evidence may very likely also contribute to this understanding, by reconsidering those sites that may suggest multi-component use, as suggested predominantly by artifact assemblages. For example, sites that are situated near routes that facilitate travel cross-canyon or along the river for extended distances may be related to cross-cultural interactions. It is fair to say that pre-European contact history in the Grand Canyon is far more complicated than current archaeological methods are equipped to comprehend fully, but a consideration of ethnohistoric information could contribute substantively to understanding the nature of these sites and their place in the broader cultural landscape.

It will be very important that, at each step of this project, close coordination and agreement between the Hualapai Tribe and the other GCDAMP participant tribes be paramount. This will include planning, sharing of potentially unpublished manuscripts and other documents, interviews with tribal elders and other knowledgeable individuals, and vetting project results and reports in draft and final form. Participation in this project will be strictly voluntary, and will be framed as a collaboration that may be mutually beneficial.

Description of Project Tasks

The proposed project will consist of the following work activities:

- Synthesize archival and ethnohistoric materials concerning the Hualapai people's interactions and relationships with neighboring tribes
- Re-examine existing archaeological site records and other evidence for clues to inter-tribal histories
- Initiate joint meetings between Hualapai and other participant tribal members to discuss current knowledge about past shared histories

The Hualapai propose to undertake this project over a three-year period encompassing the FY2021 – 2023 Triennial Work Plan. A proposed timeline is as follows:

- During Year 1 (FY2021), work will include compiling archival resources, such as relevant ethnographic and archaeological publications and reports, unpublished manuscripts, previous oral history interviews (which may be written or in audio or video format), photographs, and other material; making contact with other GCDAMP participant tribes to plan for the nature and level of participation they wish to be involved; begin interviewing Hualapai elders and other knowledgeable individuals about their knowledge of interactions with other tribes along the river; initiate interviews and joint meetings with Hualapai and other tribal members to discuss inter-tribal histories in the Grand Canyon and along the Colorado River.
- During Year 2 (FY2022), work will include continuing with joint discussions between Hualapai and other participant tribal members; sharing by the Hualapai

Department of Cultural Resources regarding what we have learned up this point with other tribes; continuing with archival research; by the end of FY2022, preparation of a preliminary report to be vetted by other tribes. Information in this report will consist exclusively of information shared between Hualapai and singular participant tribes, such as Hualapai—Southern Paiute, etc.

- During Year 3 (FY2023), work will primarily comprise preparing a final report, based on continuing discussions with participant tribes as to what will be appropriate to divulge to a wider audience, although some supplemental information (archival or contemporary) may be identified and considered.

Objectives

The proposed project will address LTEMP Resource Goals “Archaeological and Cultural Resources” and “Tribal Resources.” Further, the project is in keeping with the objectives of the Grand Canyon Protection Act (GCPA), “to protect, mitigate damages to, and improve the condition of the environmental, cultural, and recreational resources of Grand Canyon National Park and Glen Canyon National Recreation Area downstream of Glen Canyon Dam.” By enhancing our knowledge of and incorporating a more holistic view of the indigenous cultural landscape along the river, we will have better tools for managing and potentially mitigating adverse effects in the future. The project itself should be viewed as inherently improving resource condition by broadening our understanding of them.

The project also meets Goal #4 of the Historic Preservation Plan (HPP), in that it will “Foster Awareness of and Appreciation for Historic Properties within the APE.” By contributing information about cultural landscapes and archaeological sites along the Colorado River, project results will also have implications for future treatment plans, should they become necessary, to resolve adverse effects within the APE (Goal #3). In terms of Goal #3, enhanced knowledge of sites and landscapes can contribute to more nuanced research questions that would be developed during future mitigation plans.

The study will have National Register of Historic Places implications by enhancing the cultural significance of the canyon at varying scales, potentially from the site level to the landscape level, in a way previously not well integrated into prior evaluations. Most sites in the canyon have currently been evaluated solely under Criterion ‘D’ of the National Register, under which historic properties “have yielded or may be likely to yield, information important in history or prehistory.” We anticipate that other criteria will also become applicable, particularly Criterion ‘A,’ under which historic properties “are associated with events that have made a significant contribution to the broad patterns of our history.” The broadening of National Register criteria may have implications for future mitigation measures.

Budget: FY21 = \$0 FY22 = \$0 FY23 = \$0

Unfunded: FY21 = \$40,000 FY22 = \$40,000 FY23 = \$0

D.12. Cultural Sensitivity Training Development

This project is to fund tribal expertise in the development of a GCDAMP cultural sensitivity training. American Indian tribes possess special expertise in religious and cultural significance. It is recognized that this expertise is the outcome of extensive traditional learning and training that certain Native individuals go through to receive tribal recognition as an initiated individual, a medicine person, or a spiritual leader. Reclamation acknowledges and respects traditional knowledge and traditional education systems and recognizes that the inclusion of individuals with this knowledge is a vital component for the identification, evaluation, analysis, recording, treatment, monitoring or disposition of historic properties. Because not every researcher within the GCDAMP is able to undergo the intense training that certain Native individuals complete, this project will fund those experts to 1) assist the researchers to identify key aspects of religious and cultural significance; 2) develop training methods to pass this information on, and 3) to participate in the cultural sensitivity training.

This training will be developed and then revised on a recurring basis, as needed. Information from each of the five GCDAMP associated tribes will be incorporated into this training; the training will be developed by tribal members and lead by a project coordinator. The project coordinator's role is to develop a written plan for the training, in coordination with representatives from each of the five GCDAMP associated tribes, and then to facilitate the implementation of the training. Funding in FY21 will be for the project coordinator to develop a written plan for the cultural sensitivity training, and to engage all five GCDAMP member Tribes to help refine the scope, content, and goals. Funding in FY22 and FY23 is intended for the development and implementation of the cultural sensitivity training, including coordination with the development of a video version of the training.

In conjunction with the development of the cultural sensitivity training, a video or on-line version of the training will be developed and circulated to allow the cultural sensitivity training to be more accessible for all GCDAMP researchers and stakeholders. This project includes the development of audio and visual elements of the training as well as other training materials. This project will be implemented by a contractor. Coordination with the project coordinator and tribal experts is critical to the success of this project.

The project goals and objectives are:

- Develop and implement a cultural sensitivity training program that will be used by all researchers working within the GCDAMP.

- Produce a Cultural Sensitivity Training video for use by all GCDAMP researchers and stakeholders

Additional sources of external funding will be explored and utilized, if appropriate. Funds may be reallocated to this budget item during the GCDAMP annual reassessment of the budget and work plan.

Completion of this project allows for compliance with the 2017 PA Stipulation IV.A(9). The ultimate goal is to develop a training course for GCDAMP funded researchers and other interested GCDAMP participants.

Budget: FY21 = \$50,000 FY22 = \$50,000 FY23 = \$50,000

Unfunded FY21 = \$125,000 FY22 = \$200,000 FY23 = \$150,000

D.13. Contingency Fund for NHPA Section 106 Compliance

Compliance with the 2017 PA Stipulation I B for mitigation of potential adverse effects requires the mitigation of identified adverse effects to historic properties. Although no specific adverse effects or actions have been identified, this project is to set aside funding for possible future mitigation needs.

Reclamation’s compliance with the 2017 PA Stipulation I B is the primary outcome of this project. The goal of this budget item is to ensure that funds are available to Reclamation in the event that 2017 PA Stipulation I B mitigation actions are required. Mitigation of documented adverse effects to historic properties due to operations of Glen Canyon dam under LTEMP during this budget cycle are eligible for use of these funds. Prior to utilization of these funds, Reclamation’s Regional Archeologist will participate in an already planned river trip to assess and determine the level of mitigation necessary. Funds in this budget item may accumulate over time, rolling from one year to the next, serving to ensure that funds are available for the mitigation actions should the need arise.

If funds allocated to the Experimental Management Fund (Reclamation project C.5) are not needed in a given year; at the end of the year, some of the funds may be allocated to the Contingency Fund for NHPA Section 106 Compliance.

Budget: FY21 = \$25,000 FY22 = \$25,000 FY23 = \$25,000

Carryover balance:

- End of FY20 carryover = \$300,000

D.14. Tribal Resources Monitoring

This budget item provides funds to identify and monitor traditional cultural properties (TCPs) and to implement Native American monitoring protocols that were developed in FY 2007 and recommended by the TWG as part of efforts to develop a core-monitoring program.

In addition, the five GCDAMP Tribes (Hopi Tribe, Hualapai Tribe, Southern Paiute Consortium, Pueblo of Zuni, and Navajo Nation) will work with Reclamation and the NPS to implement monitoring of historic properties in Glen and Grand Canyons.

The primary goal of this activity is to monitor and evaluate the effects of dam operations and other actions under the authority of the Secretary of the Interior on resources of value to Native American Tribes. A secondary goal is to conduct condition monitoring of historic properties to assist Reclamation in compliance with the 2017 PA Stipulation VI.

Annual reports will be prepared detailing activities, findings, and monitoring data that result from implementing core-monitoring protocols for historic properties. Condition monitoring data will be provided to Reclamation to assist in prioritization of historic properties for treatment in subsequent years. In addition, monitoring data will be used to update NPS databases.

This project includes funding for five tribes for up to \$35,000 each year.

Budget: FY21 = \$175,000 FY22 = \$175,000 FY23 = \$175,000

D.15. Tribal Participation in the GCDAMP

This budget item provides funding through DOI agency appropriations (i.e., not power revenues) for the participation in GCDAMP meetings of the five GCDAMP Tribes (Hopi Tribe, Hualapai Tribe, Southern Paiute Consortium, Pueblo of Zuni, Navajo Nation). This funding covers preparation for meetings, participation in meetings, and travel costs associated with participation in the meetings. The purpose of the funding is to ensure tribal viewpoints are integrated into continuing GCDAMP dialogs, votes, and in the final recommendations made to the Secretary of the Interior. The five DOI agencies (U.S. Geological Survey, National Park Service, Reclamation, U.S. Fish and Wildlife Service, and Bureau of Indian Affairs) provide appropriated funding to support this budget item, with Reclamation serving as lead agency for administration of these funds. This project is also a component of the tribal monitoring and referenced in the 2017 PA Stipulation VI.

Budget: FY21 = \$475,000 FY22 = \$475,000 FY23= \$475,000

Table 5. Reclamation Cultural Resources Budget Summary

<i>Fiscal Year 2021</i>						
	Project Description	Reclamation Salaries	Travel	Operations / Supplies	Contracts / Cooperators	Total
D	Cultural Resources					\$ 650,000
D.1	Cultural Resources Program Management (BOR)	\$ 120,000				\$ 120,000
D.2	External Support for cultural resources compliance				\$ 40,000	\$ 40,000
D.3	Cultural Resources Monitoring - Grand Canyon				\$ 50,000	\$ 50,000
D.4	Cultural Resources Monitoring - Glen Canyon				\$ 30,000	\$ 30,000
D.5	Traditional Cultural Property Documentation					\$ -
D.6	Zuni and NPS Data Recovery and Community Outreach Pilot				\$ 20,000	\$ 20,000
D.7	Monitoring Paiute Places on the Colorado: An Educational				\$ 50,000	\$ 50,000
D.8	Hualapai Agricultural and Gardening Practices along the				\$ 45,000	\$ 45,000
D.9	Hopi Grand Canyon (Öngtupqa) Oral History Project				\$ 45,000	\$ 45,000
D.10	Southern Paiute Participation in the Glen Canyon AMP: 25 Years of Monitoring and Education, 1996-2021					\$ -
D.11	Hualapai Shared Histories Along the Colorado River in Grand					\$ -
D.12	Cultural sensitivity training development				\$ 50,000	\$ 50,000
D.13	Contingency fund for NHPA section 106 compliance				\$ 25,000	\$ 25,000
D.14	Tribal resources monitoring				\$ 175,000	\$ 175,000
D.15	Tribal participation in AMP (not funded by power revenues)				\$ 475,000	\$ 475,000
D	Total	\$ 120,000	\$ -	\$ -	\$ 530,000	\$ 650,000

<i>Fiscal Year 2022</i>						
	Project Description	Reclamation Salaries	Travel	Operations / Supplies	Contracts / Cooperators	Total
D	Cultural Resources					\$ 780,000
D.1	Cultural Resources Program Management (BOR)	\$ 120,000				\$ 120,000
D.2	External Support for cultural resources compliance				\$ 40,000	\$ 40,000
D.3	Cultural Resources Monitoring - Grand Canyon				\$ 50,000	\$ 50,000
D.4	Cultural Resources Monitoring - Glen Canyon				\$ 30,000	\$ 30,000
D.5	Traditional Cultural Property Documentation					\$ -
D.6	Zuni and NPS Data Recovery and Community Outreach Pilot				\$ 150,000	\$ 150,000
D.7	Monitoring Paiute Places on the Colorado: An Educational				\$ 50,000	\$ 50,000
D.8	Hualapai Agricultural and Gardening Practices along the				\$ 45,000	\$ 45,000
D.9	Hopi Grand Canyon (Öngtupqa) Oral History Project				\$ 45,000	\$ 45,000
D.10	Southern Paiute Participation in the Glen Canyon AMP: 25 Years of Monitoring and Education, 1996-2021					\$ -
D.11	Hualapai Shared Histories Along the Colorado River in Grand					\$ -
D.12	Cultural sensitivity training development				\$ 50,000	\$ 50,000
D.13	Contingency fund for NHPA section 106 compliance				\$ 25,000	\$ 25,000
D.14	Tribal resources monitoring				\$ 175,000	\$ 175,000
D.15	Tribal participation in AMP (not funded by power revenues)				\$ 475,000	\$ 475,000
D	Total	\$ 120,000	\$ -	\$ -	\$ 660,000	\$ 780,000

Table 5. Reclamation Cultural Resources Budget Summary (continued)

<i>Fiscal Year 2023</i>						
	Project Description	Reclamation Salaries	Travel	Operations / Supplies	Contracts / Cooperators	Total
D	Cultural Resources					\$ 635,000
D.1	Cultural Resources Program Management (BOR)	\$ 120,000				\$ 120,000
D.2	External Support for cultural resources compliance				\$ 40,000	\$ 40,000
D.3	Cultural Resources Monitoring - Grand Canyon				\$ 50,000	\$ 50,000
D.4	Cultural Resources Monitoring - Glen Canyon				\$ 30,000	\$ 30,000
D.5	Traditional Cultural Property Documentation					\$ -
D.6	Zuni and NPS Data Recovery and Community Outreach Pilot				\$ 100,000	\$ 100,000
D.7	Monitoring Paiute Places on the Colorado: An Educational					\$ -
D.8	Hualapai Agricultural and Gardening Practices along the					\$ -
D.9	Hopi Grand Canyon (Öngtupqa) Oral History Project				\$ 45,000	\$ 45,000
D.10	Southern Paiute Participation in the Glen Canyon AMP: 25 Years of Monitoring and Education, 1996-2021					\$ -
D.11	Hualapai Shared Histories Along the Colorado River in Grand					\$ -
D.12	Cultural sensitivity training development				\$ 50,000	\$ 50,000
D.13	Contingency fund for NHPA section 106 compliance				\$ 25,000	\$ 25,000
D.14	Tribal resources monitoring				\$ 175,000	\$ 175,000
D.15	Tribal participation in AMP (not funded by power revenues)				\$ 475,000	\$ 475,000
D	Total	\$ 120,000	\$ -	\$ -	\$ 515,000	\$ 635,000

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Table 6. Reclamation Total Budget Summary

	2021	2022	2023
GCDAMP Total	\$ 11,360,000	\$ 11,360,000	\$ 11,360,000
Reclamation Total (20%)	\$ 2,272,000	\$ 2,272,000	\$ 2,272,000
GCMRC Total (80%)	\$ 9,088,000	\$ 9,088,000	\$ 9,088,000
A Adaptive Management Work Group	\$ 215,000	\$ 215,000	\$ 215,000
A.1 Adaptive Management Work Group Costs (BOR)	\$ 75,000	\$ 75,000	\$ 75,000
A.2 AMWG Member Travel Reimbursement	\$ 20,000	\$ 20,000	\$ 20,000
A.3 AMWG Reclamation Travel	\$ 20,000	\$ 20,000	\$ 20,000
A.4 AMWG Facilitation and Notetaking	\$ 60,000	\$ 60,000	\$ 60,000
A.5 Public Outreach - Reclamation public affairs, POAG	\$ 25,000	\$ 25,000	\$ 25,000
A.6 AMWG Other	\$ 15,000	\$ 15,000	\$ 15,000
B Technical Work Group	\$ 175,000	\$ 200,000	\$ 200,000
B.1 Technical Work Group Costs (BOR)	\$ 120,000	\$ 120,000	\$ 120,000
B.2 TWG Member Travel Reimbursement	\$ 25,000	\$ 25,000	\$ 25,000
B.3 TWG Reclamation Travel	\$ 20,000	\$ 20,000	\$ 20,000
B.4 TWG Chair Reimbursement/Facilitation	\$ -	\$ 25,000	\$ 25,000
B.5 TWG Other	\$ 10,000	\$ 10,000	\$ 10,000
C Program Management, ESA Compliance, and Management Actions	\$ 1,168,000	\$ 1,236,000	\$ 1,127,000
C.1 Administrative Support for NPS Permitting	\$ 125,000	\$ 125,000	\$ 130,000
C.2 Contract Administration	\$ 70,000	\$ 120,000	\$ 70,000
C.3 Integrated Stakeholder River Trip	\$ -	\$ 50,000	\$ -
C.4 Science Advisors Program	\$ 150,000	\$ 150,000	\$ 150,000
C.5 Experimental Management Fund	\$ 350,000	\$ 350,000	\$ 350,000
C.6 Native Fish Conservation Contingency Fund	carryover from previous years		
C.7 Experimental Vegetation Treatment - Grand Canyon	\$ 170,000	\$ 170,000	\$ 170,000
C.8 Experimental Vegetation Treatment - Glen Canyon	\$ 43,000	\$ 84,000	\$ 67,000
C.9 Evaluation of means to prevent fish passage through GCD	\$ 40,000	\$ -	\$ -
C.10 Evaluation of temperature control methods at GCD	\$ 15,000	\$ -	\$ -
C.11 Ridgway Rail and Southwest Willow Flycatcher monitoring	\$ 10,000	\$ 7,000	\$ 10,000
C.12 Monitoring Metrics Development and Tracking	\$ 50,000	\$ 35,000	\$ 35,000
C.13 Program Management	\$ 145,000	\$ 145,000	\$ 145,000
D Cultural Resources	\$ 650,000	\$ 780,000	\$ 635,000
D.1 Cultural Resources Program Management (BOR)	\$ 120,000	\$ 120,000	\$ 120,000
D.2 External Support to Reclamation for cultural resources compliance	\$ 40,000	\$ 40,000	\$ 40,000
D.3 Cultural Resources Monitoring - Grand Canyon	\$ 50,000	\$ 50,000	\$ 50,000
D.4 Cultural Resources Monitoring - Glen Canyon	\$ 30,000	\$ 30,000	\$ 30,000
D.5 Traditional Cultural Property Documentation	\$ -	\$ -	\$ -
D.6 Zuni and NPS Data Recovery and Community Outreach Pilot	\$ 20,000	\$ 150,000	\$ 100,000
D.7 Monitoring Paiute Places on the Colorado: An Educational Resource	\$ 50,000	\$ 50,000	\$ -
D.8 Hualapai Agricultural and Gardening Practices along the Colorado River	\$ 45,000	\$ 45,000	\$ -
D.9 Hopi Grand Canyon (Öngtupqa) Oral History Project	\$ 45,000	\$ 45,000	\$ 45,000
D.10 Southern Paiute Participation in the Glen Canyon AMP: 25 Years of Monitoring and Education, 1996-2021	\$ -	\$ -	\$ -
D.11 Hualapai Shared Histories Along the Colorado River in Grand Canyon	\$ -	\$ -	\$ -
D.12 Cultural Sensitivity Training Development	\$ 50,000	\$ 50,000	\$ 50,000
D.13 Contingency fund for NHPA section 106 compliance	\$ 25,000	\$ 25,000	\$ 25,000
D.14 Tribal resources monitoring	\$ 175,000	\$ 175,000	\$ 175,000
D.15 Tribal participation in AMP (not funded by power revenues)	\$ 475,000	\$ 475,000	\$ 475,000
TOTAL Anticipated Budget Available to Reclamation	\$ 2,272,000	\$ 2,272,000	\$ 2,272,000
TOTAL Estimated Reclamation Expenditures	\$ 2,208,000	\$ 2,431,000	\$ 2,177,000
(Over) / Under budget	\$ 64,000	\$ (159,000)	\$ 95,000

Table 7. Reclamation Unfunded or Partially Funded Proposals

		2021	2022	2023
C.7	Experimental Vegetation Treatment - Grand Canyon	\$ -	\$ -	\$ 25,000
C.9	Evaluation of Means to Prevent Fish Passage through GCD	\$ -	\$ 60,000	\$ -
	Dissolved Oxygen Monitoring and Risk Assessment	\$ 50,000	\$ -	\$ -
D.10	Southern Paiute Participation in the Glen Canyon AMP: 25 Years of Monitoring and Education, 1996-2021	\$ 48,000	\$ 48,000	\$ -
D.11	Hualapai Shared Histories Along the Colorado River in Grand Canyon	\$ 40,000	\$ 40,000	\$ -
D.12	Cultural Sensitivity Training Development	\$ 125,000	\$ 200,000	\$ 150,000
Total Unfunded		\$ 263,000	\$ 348,000	\$ 175,000

Projects Funded Outside the GCDAMP

Reclamation supports projects and management actions outside of the GCDAMP in order to meet compliance obligations under the biological opinions for the 2007 Interim Guidelines and 2016 LTEMP EIS and to inform other Grand Canyon ecosystem goals. Findings and data from these projects are leveraged into GCDAMP research and monitoring. Reclamation supported projects outside the GCDAMP currently being implemented include:

Razorback sucker monitoring and research

Partners: BioWest / National Park Service / Reclamation / Northern Arizona University / GCMRC

In 2010, Reclamation’s Upper Colorado Region and the Lower Colorado River Multi-Species Conservation Program (LCR MSCP) initiated a joint project to evaluate Razorback Sucker use of the Colorado River Inflow Area of Lake Mead (CRI). As a result of this study it was determined that razorback sucker were utilizing lower Grand Canyon and moving upstream into Grand Canyon. Additional sampling showed that humpback chub were also utilizing lower Grand Canyon. Reclamation will continue to fund BioWest and NPS to assist in continuing this small-bodied and larval fish monitoring of both species to determine their presence and distribution at different life stages, habitat use, and spawning of both species. Reclamation will coordinate with the GCRMC and GCDAMP on the results of the monitoring and research.

Brown trout control

Partner: National Park Service

The Brown Trout Control project is a continuation of funding provided to the NPS to implement comprehensive brown trout control activities in Bright Angel Creek and the Bright Angel Creek Inflow reach of the Colorado River. Additional actions may include brown trout control where new or expanded spawning populations develop, if study indicates those areas are sources of brown trout in GRCA. This project may also support future planning efforts, including sonic-

telemetry studies of habitat use and vulnerability to electrofishing for brown trout in Glen and Marble canyons.

Consistent with its 2018 Expanded Non-Native Aquatic Species Management Plan and Environmental Assessment (NNAS EA), NPS expects to test the efficacy of incentivized harvest as a potential tool to manage the Brown Trout population at Lees Ferry beginning in FY2021. Reclamation supports this effort and expects to contribute partial funding for up to two years. The GCDAMP will support the proposal through increased monitoring and research of Brown Trout population dynamics and angler behavior, as described in GCMRC Project H.

Humpback chub translocations

Partner: National Park Service

Reclamation is funding NPS to implement humpback chub translocations into Colorado River tributaries. This requires removal of nonnatives and periodic monitoring. Currently translocations are successful in Havasu Creek and may be implemented in Shinumo and Bright Angel Creeks if they are determined viable. Actions include working in partnership with FWS, GCMRC, and most importantly, the Havasupai Tribe, to conduct preliminary surveys and a feasibility study for translocation of humpback chub into Upper Havasu Creek (above Beaver Falls). Other tributaries will also be assessed to determine their potential for additional translocations.

Lake Powell water quality monitoring

Partner: Reclamation Upper Colorado Basin Region, Water Quality Group

Physical and biogeochemical processes in Lake Powell affect the nutrient concentration of dam releases. In the Colorado River Ecosystem temperature and nutrients affect trends in all aquatic resources as well as vegetation colonization on sandbars, and beach resources. Through its water quality group, Reclamation's Upper Colorado Basin Region conducts water quality sampling in Lake Powell assisting the GCDAMP to better understand the effects of reservoir elevation, seasonal reservoir stratification and other factors that may be affecting the water quality of releases from the dam.

Releases from Glen Canyon Dam that are relatively low in dissolved oxygen concentration (< 5 mg/L) have the potential to negatively impact the Colorado River Ecosystem between Glen Canyon Dam and Lees Ferry. Low reservoir levels may increase the likelihood of low DO plumes occurring near Lake Powell's penstock level during late summer, prior to reservoir mixing and destratification. Reclamation will evaluate its current sampling methods and frequency and determine if additional data collection is warranted. Historic hydrologic conditions, including lake levels and inflow volumes, that existed during years with low DO

releases will be evaluated and an approach to forecast the potential for such conditions to develop will be considered. A literature and case study review will be conducted, and a synthesis of potential mitigation approaches will be shared with the GCDAMP for consideration.

Reservoir release temperature control methods

Partner: Reclamation, Science and Technology Program

Temperature control of reservoir releases is a high priority throughout Reclamation as it helps Reclamation to comply with biological opinions, water quality requirements, and supports the recovery of endangered fish species under the Endangered Species Act. There are currently several approaches in place at Reclamation dams to address temperature control; these include temperature control devices, temperature curtains, and reoperation strategies.

Reclamation's Prize Competition Program funded a review of temperature control options for reservoir release flows that was completed in January 2020 (Reclamation Hydraulics Laboratory Report PAP-1184) to investigate the viability and focus of a prize competition on this topic.

Reclamation contracted with the company yet2 through an interagency agreement with NASA's Center of Excellence for Collaborative Innovation in 2020. The purpose of the contract is to complete a Technology Search to explore Water Temperature Control Devices that are innovative and/or can be applied from other industries.

- Website: yet2.com/active-projects/exploring-water-temperature-control-devices/

Final results will be available in summer 2020 and can be shared with Reclamation's partners and stakeholders.

Fish Exclusion at Dam Intakes

Partner: Reclamation, Science and Technology Program; Department of Energy's Water Power Technologies Office

In 2019, Reclamation ran a prize competition called "Improving Fish Exclusion from Water Diversions and Intakes." A brief summary of existing technologies was completed by subject matter experts during the prize competition effort. Six winners were awarded a total of \$75,000. (Note: Reclamation did not take a license to the solutions and intellectual property is protected.)

- Prize Competition: <https://www.usbr.gov/research/challenges/fishexclusion.html>
- Winners: <https://www.usbr.gov/newsroom/stories/detail.cfm?RecordID=68883>

Similarly, the Department of Energy's Water Power Technologies Office, in partnership with Reclamation, recently (2020) launched a multi-stage prize competition called the "Fish Protection Prize" with \$700,000 in prizes. The focus of this competition is on further

development of fish protection concepts. Competitors can propose solutions that can be applied to river and irrigation canal diversions, unscreened diversion pipes for irrigation or municipal water supplies, cooling water intakes of power plants, or dam intakes.

- Prize Competition: <https://americanmadechallenges.org/fishprotection/index.html>

While the prize is soliciting solutions of all shapes and sizes, organizers identified the following six topic areas as having the greatest potential for successful and cost-effective fish exclusion:

- Sensory deterrents (e.g., acoustic and visual)
- Turbulence and velocity-based deterrents
- Combination stimulus barriers
- Diversion or intake layouts/geometry
- Fish screen materials or coatings
- Fish screen cleaning methods.

A submission summary slide and a 90-second video for each submitted concept are available on the American Made Challenges website. On June 30, 2020, nine finalists were awarded at the completion of the “Concept Stage” and offered 50 hours of technical assistance from Pacific Northwest National Laboratory.

- Concept Finalists: <https://americanmadechallenges.org/fishprotection/concept.html>

Following a 90-day “Incubation Stage”, the competition will culminate in the “Pitch Contest Stage,” after which up to three winners will be announced. The federal government did not take a license to the solutions and intellectual property is protected.

Table 8. Summary of Conservation Measures Activities

Consevation Measure		Activity that addresses it	Who is doing the work
Humpback Chub			
Translocations	Tributaries (Shinumo, Havasu, Bright Angel)	NPS-Humpback Chub Tributary Translocations and Associated Monitoring and Nonnative Fish Control	NPS/FWS/GCMRC
	Chute falls	GCMRC - Project G	GCMRC/FWS
	Explore other tribs	GCMRC- Project G; NPS - Humpback Chub Tributary Translocations and Associated Monitoring and Nonnative Fish Control; FWS - coordination with Havasupai Tribe on translocations on Havasupai lands	GCMRC/NPS/FWS
	Nonnative removal in tribs	NPS-Humpback Chub Tributary Translocations and Associated Monitoring and Nonnative Fish Control; NPS - brown trout control	NPS/FWS/GCMRC
Mainstem	Expand aggregations outside LCR	GCMRC Project G; NPS-Humpback chub tributary translocations	GCMRC/FWS/NPS
	Mainstem augmentation	GCMRC Project G; NPS translocations	GCMRC/FWS/NPS
LCR Monitoring	Spring and Fall Population estimates	GCMRC Project G	GCMRC/FWS
	LCR mainstem aggregation monitoring	GCMRC Project G	GCMRC/FWS
	Multistate model	GCMRC Project G	GCMRC
Mainstem monitoring	Aggregations	GCMRC Project G	GCMRC/NPS/FWS
	New populations & outside agregations	GCMRC Project G; NPS/BioWest/FWS	GCMRC/NPS/BioWest/FWS
	Parasite monitoring	GCMRC Project I	GCMRC
Refuge	Fund FWS Humpback Chub refuge (SNARRC)	Reclamation	FWS / Reclamation
Razorback Sucker			
	Habitat use	BioWest/BOR/NPS-Razorback Sucker Monitoring and Adaptive Management, Larval and Small-bodied Fish Sampling	BioWest/BOR/NPS
	Determine effects of dam operations-TMFs	BioWest/BOR/NPS-Razorback Sucker Monitoring and Adaptive Management, Larval and Small-bodied Fish Sampling	GCMRC/BioWest/BOR/NPS
	Determine extent of hybridization	Reclamation funded masters degree project	Reclamation
Benefit Native Aquatic Species			
	Remove brown trout from Bright Angel, inflow & and other areas	NPS-Humpback Chub Tributary Translocations and Associated Monitoring and Nonnative Fish Control; GCMRC- Project H	NPS/GCMRC
	Evaluate use of piscicide or other tools to renovate Bright Angel and Shinumo		NPS
	Evaluate TMFs for brown trout	GCMRC-Project H	GCMRC
	Rapid Response	GCMRC- Project I; NPS-Invasive Species Monitoring & Management	NPS/GCMRC
	Evaluate temperature control methods	Reclamation Project C.10	Reclamation
	Evaluate means to prevent fish passage through the dam	Reclamation Project C.9	Reclamation
	Backwater slough	NPS- Invasive Species Monitoring and Management	NPS/Reclamation
Southwest Willow Flycatcher			
	monitor every 2 years	Reclamation Project C.11	NPS
Yuma Ridgway's Rail			
	monitor every 3 years	Reclamation Project C.11	NPS