



# United States Department of the Interior

OFFICE OF THE SECRETARY  
WASHINGTON, D.C. 20240

APR 25 2012

96-42040  
ADM-1.10

## DECISION MEMORANDUM FOR THE SECRETARY

**FROM:** Anne J. Castle, Assistant Secretary – Water and Science

**CC:** Michael L. Connor, Commissioner, Bureau of Reclamation

**SUBJECT:** 2010-2011 Grand Canyon Protection Act Report to Congress

### I. INTRODUCTION

Section 1804 of the Grand Canyon Protection Act of 1992 requires the Secretary to transmit to the Congress and to the Governors of the Colorado River Basin States a report on the preceding year and the projected year operations undertaken pursuant to this Act. This Report provides an update from the last report submitted by the Department on May 16, 2011 and covers activities for the five Interior agencies having responsibilities under the Grand Canyon Protection Act-- the Bureau of Indian Affairs (BIA); the Bureau of Reclamation (WBR); the National Park Service (NPS); the United States Geological Survey (USGS); and the United States Fish and Wildlife Service (FWS)--for 2010 and 2011.

### II. BACKGROUND

This report addresses operations by the above five agencies for 2010 and 2011. Highlighted activities described in the Report are the preparation of environmental assessments (EAs) for High Flow Experiment Protocol and Non-Native Fish Control.

The High Flow Experimental Protocol EA will provide an opportunity for experimental high flows to be conducted when conditions are suitable to assess the ability of such releases to protect, mitigate adverse impacts to, and improve the values for which Grand Canyon National Park and Glen Canyon National Recreation Area were established. The channel of the Colorado River is depleted of sediment necessary for sandbars, beaches, and associated backwaters important to many resources. There is a need to determine what sediment and hydrology conditions are most effective for rebuilding and maintaining sandbars, beaches, and backwater habitats in Grand Canyon National Park, while maintaining physical, biological, and cultural resources.

The Non-native Fish Control EA evaluates alternatives for controlling non-native fish species that prey on and compete with native fishes including the humpback chub. Past efforts have focused on mechanical removal using boat-mounted electrofishing, but local Tribes have expressed strong concerns over the taking of life of non-native fish as a result of mechanical removal. In part to address these concerns, Reclamation is evaluating potential alternatives for controlling non-native fish species.

### **III. POSITION OF INTERESTED PARTIES**

In prior years the Grand Canyon Trust, an environmental organization, has urged completion of the Report to Congress. None of the other stakeholders have expressed a strong opinion.

### **IV. DECISION OPTIONS**

The Report to Congress is statutorily required. No separate decision is necessary.

### **V. RECOMMENDATION**

We recommend that the Secretary approve transmittal of the Report to Congress as required by the Grand Canyon Protection Act.

### **VI. SECRETARY'S DECISION**

APPROVE

DISAPPROVE

COMMENTS



THE SECRETARY OF THE INTERIOR  
WASHINGTON

APR 27 2012

The Honorable Matt Mead  
Governor of Wyoming  
Cheyenne, Wyoming 82002

Dear Governor Mead:

The enclosed report on the operation of Glen Canyon Dam by the Department of the Interior (Department) is submitted pursuant to Section 1804 of the Grand Canyon Protection Act of 1992, which provides:

Each year after the date of the adoption of criteria and operating plans pursuant to paragraph (1), the Secretary shall transmit to the Congress and to the Governors of the Colorado River Basin States a report, separate from and in addition to the report specified in Section 602(b) of the Colorado River Basin Project Act of 1968 on the preceding year and the projected year operations undertaken pursuant to this Act.

This report provides an update of the last report submitted by the Department on May 16, 2011. This report covers activities for years 2010 and 2011.

The Department continues to closely monitor conditions in the Colorado River Basin and looks forward to continuing to work with Congress and other interested stakeholders regarding the management of this vital component of the Colorado River system.

Sincerely,

  
Ken Salazar

Enclosures

**Identical Letters Sent To:**

Honorable Jeff Bingaman  
Chairman, Committee on Energy  
and Natural Resources  
United States Senate  
Washington, DC 20510

Honorable Brian Sandoval  
Governor of Nevada  
Carson City, Nevada 89701

Honorable Jerry Brown  
Governor of California  
Sacramento, California 95814

Honorable Gary Herbert  
Governor of Utah  
Salt Lake City, Utah 84114

Honorable Jan Brewer  
Governor of Arizona  
Phoenix, Arizona 85007

Honorable Susanna Martinez  
Governor of New Mexico  
Santa Fe, New Mexico 87501

Honorable John Hickenlooper  
Governor of Colorado  
Denver, Colorado 80203

**Chair and Ranking Members of:**

Senate Committee on Energy and Natural Resources

Senate Subcommittee on National Parks

Senate Subcommittee on Water and Power

Senate Committee on Environment and Public Works

Senate Subcommittee on Water and Wildlife

House Committee on Natural Resources

House Subcommittee on National Parks, Forests, and Public Lands

House Subcommittee on Water and Power

House Subcommittee on Fisheries, Wildlife, Oceans, and Insular Affairs

House Subcommittee on Indian and Alaska Native Affairs

REPORT TO CONGRESS  
OPERATIONS OF GLEN CANYON DAM  
PURSUANT TO THE GRAND CANYON PROTECTION ACT OF 1992  
FOR  
2010-2011

Secretary of the Interior

April 2012

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## EXECUTIVE SUMMARY

This report by the Department of the Interior (Interior) is submitted pursuant to section 1804 of the Grand Canyon Protection Act (GCPA) of 1992, which provides

Each year after the date of the adoption of criteria and operating plans pursuant to paragraph (1), the Secretary shall transmit to the Congress and to the Governors of the Colorado River Basin States a report, separate from and in addition to the report specified in section 602(b) of the Colorado River Basin Project Act of 1968 on the preceding year and the projected year operations undertaken pursuant to this Act.

This report provides an update from the last report, submitted by Interior for 2009-2010, and covers activities for 2010 and 2011.

## INTRODUCTION

Glen Canyon Dam was authorized for construction by the Colorado River Storage Project Act of 1956. 43 U.S.C. § 620. The Dam was completed in 1963 and is operated by the Bureau of Reclamation (Reclamation). In 1992, Congress enacted the GCPA, which requires the Secretary of the Interior (Secretary) to operate Glen Canyon Dam

[i]n accordance with the additional criteria and operating plans specified in section 1804 and exercise other authorities under existing law in such a manner as to protect, mitigate adverse impacts to, and improve the values for which Grand Canyon National Park and Glen Canyon National Recreation Area were established, including, but not limited to natural and cultural resources and visitor use.

Congress also directed that such operations be undertaken

in a manner fully consistent with and subject to the Colorado River Compact, the Upper Colorado River Basin Compact, the Water Treaty of 1944 with Mexico, the decree of the Supreme Court in Arizona vs. California, and the provisions of the Colorado River Storage Project Act of 1956 and the Colorado River Basin Project Act of 1968 that govern allocation, appropriation, development, and exportation of the waters of the Colorado River Basin.



In 1997, the Secretary established the Glen Canyon Dam Adaptive Management Program (GCDAMP) to carry out the requirements of the GCPA. As part of the GCDAMP, the Secretary also established the Adaptive Management Work Group (AMWG), a 25-member federal advisory committee that operates pursuant to the provisions of the Federal Advisory Committee Act, 5 U.S.C. § App. 2. The Secretary's Designee, currently Assistant Secretary for Water and Science Anne Castle, serves as the Chair of the AMWG.

## **STATUS REPORT**

Five agencies within Interior participate in the GCDAMP and undertake operations and other activities as part of Interior's actions pursuant to the GCPA; the: (1) Bureau of Indian Affairs (BIA); (2) Reclamation; (3) National Park Service (NPS); (4) United States Geological Survey (USGS); and (5) United States Fish and Wildlife Service (FWS). The Western Area Power Administration (Western) also has statutory responsibilities pursuant to the Department of Energy Organization Act, Flood Control Act, Reclamation Project Act, Colorado River Storage Project Act, and GCPA. The role of each responsible Interior agency under the GCPA is briefly addressed below.

### **Bureau of Indian Affairs**

The BIA's mission, among other objectives, includes enhancing quality of life, promoting economic opportunity, and protecting and improving trust assets of Indian Tribes and individual American Indians. This is accomplished within the framework of a government-to-government relationship in which the spirit of Indian self-determination is paramount. As part of the AMWG, BIA works hand-in-hand with interested tribes and other participating agencies to ensure that this fragile, unique, and traditionally important landscape is preserved and protected.

### **Bureau of Reclamation**

Reclamation operates Glen Canyon Dam in accordance with and subject to interstate compacts, an international treaty, federal laws, court decisions and decrees, contracts, and regulatory guidelines collectively known as the "Law of the River," additional criteria and operating plans specified in section 1804 of the GCPA, and approved experimental plans.

### **National Park Service**

The NPS manages units of the national park system and administers resource-related programs under the authority of various federal statutes, regulations, and executive orders, and in accordance with written policies set forth by the Secretary and the Director of the NPS, including the NPS Management Policies 2006 and the NPS Director's Orders. The NPS manages Grand

Canyon National Park and Glen Canyon National Recreation Area under the NPS Organic Act, 16 U.S.C. §§ 1 and 2-4, as amended; other acts of Congress applicable generally to units of the national park system; and the legislation specifically establishing those park units. 16 U.S.C. §§ 221-228j and 16 U.S.C. §§ 460dd through 460dd-9 (2006). The NPS Organic Act directs the NPS to “promote and regulate the use of . . . national parks . . . in such manner and by such means as will leave them unimpaired for the enjoyment of future generations.” The NPS helps the Secretary achieve the goals outlined in the GCPA through its resource-management and resource-monitoring activities.

## **U.S. Geological Survey**

The Grand Canyon Monitoring and Research Center (GCMRC) of the USGS was created to fulfill the mandate in the GCPA for the establishment and implementation of a long-term monitoring and research program for natural, cultural, and recreation resources of Grand Canyon National Park and Glen Canyon National Recreation Area. GCMRC provides independent, policy-neutral scientific information to the GCDAMP on (a) the effects of the operation of Glen Canyon Dam and other related factors on resources of the Colorado River ecosystem using an ecosystem approach, and (b) the flow and non-flow measures to mitigate adverse effects. The GCMRC’s activities are focused on (a) monitoring the status and trends in natural, cultural, and recreational resources that are affected by dam operations, and (b) working with land and resource management agencies in an adaptive management framework to carry out and evaluate the effectiveness of alternative dam operations and other resource conservation actions described in this report.

## **Fish and Wildlife Service**

The FWS provides Endangered Species Act (ESA) conservation and associated consultation and recovery leadership with various stakeholders primarily to benefit four listed species: the humpback chub (*Gila cypha*), razorback sucker (*Xyrauchen texanus*), southwestern willow flycatcher (*Empidonax trailii extimus*), and Kanab ambersnail (*Oxyloma haydeni kanabensi*). The FWS provides Fish and Wildlife Coordination Act (FWCA) planning assistance for important fish and wildlife resources whenever waters of the Colorado River or its tributaries are controlled or modified for conservation.

## **2010 OPERATIONS**

### **Bureau of Indian Affairs**

The BIA supported the Tribes in their funding requests for various projects, participated in consultation meetings with the Tribes regarding the Tribal Consultation Plan, conducted pre-

meetings with tribal representatives prior to AMWG meetings, and participated in ad hoc groups and other meetings regarding cultural and natural resources issues and concerns. The BIA provided funding to the Tribes for their participation in the GCDAMP. In 2010, several issues and concerns were raised by the Tribes regarding certain activities under this program. Non-native fish control as related to tribal sacred sites is a major concern. On-going consultation continues between Interior agencies and the Tribes to address this important issue. Based on a request by the Tribes, Interior established an AMWG Tribal Liaison position to improve continued coordination, communication, and cooperation between the agencies, the Tribes, and other GCDAMP stakeholders. The position was filled in the fall of 2010 and is based in Flagstaff, Arizona. The BIA, along with the other Interior agencies, is contributing funding for this position.

### **Bureau of Reclamation**

In 2010, Reclamation operated Glen Canyon Dam consistent with the 1996 Record of Decision (ROD), Operating Criteria for Glen Canyon Dam, the Interim Guidelines, the Experimental Releases Environmental Assessment (EA), and the 2010 Annual Operating Plan for Colorado River Reservoirs (2010 AOP). The operation of Glen Canyon Dam was also consistent with the August 13, 2009, recommendation by the AMWG “that the Secretary of the Interior adopt the GCDAMP biennial budget, work plan and hydrograph for FY 2010-2011 as sent to the AMWG on July 23, 2009.” The Secretary concurred with this AMWG recommendation on November 16, 2009.

Actual monthly releases from Glen Canyon Dam for water year (WY) 2010 are shown below in Table 1. These releases were consistent with the projections contained in the 2010 AOP and Reclamation’s October 2009 24-Month Study. The April 2010 24-Month Study projected the end of water year elevation at Lake Powell to be below the Equalization level of 3,642 feet and the projected end of WY 2010 elevation at Lake Mead to be above elevation 1,075 feet. Pursuant to sections 6.B.1. and 6.B.4. of the Interim Guidelines, the annual release volume was 8.23 million acre-feet from Glen Canyon Dam during WY 2010.

Table 1.  
Actual Monthly Releases from Glen Canyon Dam in Water Year 2010

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<b>Month</b>	<b>Release (maf)</b>
October 2009	0.620
November 2009	0.692
December 2009	0.901
January 2010	0.900
February 2010	0.631
March 2010	0.602
April 2010	0.602
May 2010	0.601
June 2010	0.601
July 2010	0.802
August 2010	0.802
September 2010	0.480
<b><i>Total Releases</i></b>	<b>8.235</b>

A steady flow regime (steady daily releases) of about 8,000 cfs, as described in the Experimental Releases EA, was implemented in September 2010 and October 2010 (the first month of the 2011 water year).

In 2010, Reclamation began development of a High Flow Experimental Protocol and alternative methods of non-native fish control, requiring National Environmental Policy Act (NEPA) compliance. The GCDAMP federal agencies, Hualapai Tribe, Zuni Pueblo, Hopi Tribe, Arizona Game and Fish Department (AZGFD), and Upper Colorado Compact Commission are cooperating agencies in the process.

The High Flow Experimental Protocol is designed to provide an opportunity for experimental high flows to be conducted when conditions are suitable to assess the ability of such releases to protect, mitigate adverse impacts to, and improve the values for which Grand Canyon National Park and Glen Canyon National Recreation Area were established, consistent with the Law of the River. The channel of the Colorado River below Glen Canyon Dam is depleted of sediment necessary for sandbars, beaches, and associated backwaters important to many resources. There is a need to determine what sediment and hydrology conditions are most effective for rebuilding and maintaining sandbars, beaches, and backwater habitats in Grand Canyon National Park, while maintaining physical, biological, and cultural resources. As part of the GCDAMP, Interior is developing this proposed protocol as a component of its efforts to comply with the requirements and obligations established by the GCPA and consistent with the Law of the River.

The EA for the Non-native Fish Control proposal evaluates alternatives for controlling non-native fish species that prey on and compete with native fishes including the humpback chub. Past efforts have focused on mechanical removal using boat-mounted electrofishing, but a number of Tribes have expressed strong concerns over the taking of life of non-native fish as a result of mechanical removal. In part to address these concerns, Reclamation is evaluating potential alternatives for controlling non-native fish species.

In fulfillment of its responsibilities, including those under section 106 of the National Historic Preservation Act, Executive Order 13175, Secretarial Order 3206, and the November 5, 2009, Presidential Memorandum on Tribal Consultation, Reclamation continues to conduct government-to-government consultation with Tribes that are part of the GCDAMP on operations of Glen Canyon Dam and activities of the GCDAMP. Tribal consultation meetings took place in 2010 between Reclamation and each of the GCDAMP Tribes, including staff at the Hopi and Navajo Tribes, and meetings with the councils of Hualapai, and Kaibab Paiute Tribes and the Zuni Pueblo. Although the Havasupai Tribe is not a GCDAMP member, Reclamation met with its Tribal Council in 2010. Reclamation also participated in an Interior-led GCDAMP tribal coordination meeting conducted on January 13, 2010; this is an annual meeting to attempt to identify issues of concern to GCDAMP Tribes with elements of the GCDAMP biannual budget and work plan. Actions taken to control non-native fish species is a major concern for the Tribes, especially in proximity to areas of the Grand Canyon that are sacred to them. Reclamation continues to conduct tribal consultation on this issue and has invited GCDAMP Tribes and other interested tribes to be cooperating agencies in development of an EA to evaluate alternatives for controlling non-native fish species.

## National Park Service

In 2010, Grand Canyon National Park provided significant support to the overall goals outlined in the GCPA as described herein.

### Archaeological/Cultural Resources

The NPS monitored 122 properties in 2010 and treated one site for erosion control as part of its on-going program for Colorado River Management Plan (CRMP) implementation and Archaeological Sites Management Information System requirements. In consultation with the affiliated Tribes, NPS continued to work on identifying impacts to traditional cultural areas and resources affected by both dam operations and visitors.

### Tribal Consultation

In 2010, NPS participated in numerous consultation meetings with the various Tribes who are directly involved in the GCDAMP and other Colorado River related programs. Grand Canyon

NPS staff specialists worked with other Interior staff to establish the Interior Native American Core Team. Staff worked with other Interior agencies in support of consultation efforts on the non-native fish removal project. Separate from specific GCDAMP related consultation, NPS staff, working with the Museum of Northern Arizona, conducted a series of meetings with tribal resource specialists relative to excavations conducted along the Colorado River between 2006 and 2009. In 2010, tribal advisors provided additional information for NPS and museum staff for use in interpreting archaeological evidence recovered from eroded archaeological sites along the Colorado River.

### Humpback Chub Translocation

In 2010, Grand Canyon National Park, in coordination with Reclamation, FWS, AZGFD, and the University of Missouri conducted a second translocation of endangered humpback chub to Shinumo Creek. Monitoring efforts, as well as non-native fish control efforts were also continued in Shinumo Creek in 2010. In addition, field survey and planning efforts were initiated to expand the experimental humpback chub translocation effort to Havasu Creek, which is thought to be the most suitable tributary in Grand Canyon to support a second reproducing humpback chub aggregation. Control of non-native trout that prey upon and compete with humpback chub was conducted at Bright Angel Creek, which is the main source of brown trout to the waters of Grand Canyon. A total of 454 rainbow trout and 594 brown trout were removed through these efforts. Finally, the NPS and Reclamation organized a panel of experts to evaluate habitat in lower Grand Canyon to determine the feasibility of re-introducing endangered razorback sucker below Lava Falls (river mile 179). All activities listed above are expected to continue in 2011.

### Wildlife Surveys and Monitoring

Activities in 2010 included surveying 20 potential Southwestern Willow Flycatcher (SWWFL) sites along 280 miles of the Colorado River on three separate occasions. Six detections were recorded. Habitat suitability assessments were made on 32 SWWFL habitat patches. A condor nest watch program was instituted and monitoring of condor nests continued until nest failure. Condor movement patterns and concentration areas were monitored and delineated in Geographic Information System layers. 5,462 acres of suitable Northern goshawk habitat were surveyed with one new nest site located. Five occupied inner canyon Mexican spotted owl Protected Activity Centers were monitored and production data was recorded. Two bighorn sheep were captured along the Colorado River, fitted with radio collars, and monitored. A three year cowbird nest parasitism study was concluded which indicated that approximately 2 to 4 percent of migratory song birds are parasitized on the South Rim of Grand Canyon. Twenty-one caves associated with the Colorado River corridor were monitored for bat activity.

## Vegetation Management/Exotic Species Removal

In 2010, Grand Canyon NPS staff continued small restoration projects along the river corridor under the goals and direction of the CRMP, focusing primarily on river camps. Crews planted several hundred native plants in a few highly disturbed areas and performed much needed camp maintenance throughout the corridor. In the backcountry areas associated with the Colorado River corridor, volunteers spent 2,803 hours treating invasive plants, with the main focus on removing and retreating tamarisk (*Tamarix ramosissima*) areas initially treated with support of an Arizona Water Protection Fund grant. Invasive plant species removed by volunteers included: camelthorn (*Alhagi maurorum*), Sahara mustard, Russian olive (*Elaeagnus angustifolia*), African mustard (*Malcomia africana*), Ravenna grass (*Saccharum ravennae*), sowthistle (*Sonchus asper*), puncture vine (*Tribulus terrestris*), and woolly mullein.

## Research Review and Permitting

The NPS continued to review proposals, coordinate efforts, and provide permitting as needed for all associated GCPA projects. Research and associated river permits for 2010 in disciplines such as fisheries biology, geomorphology, wildlife biology, air quality, vegetation management, near-shore ecology, and Light Detection and Ranging technology testing at key archaeological sites were processed. The GCMRC was issued 7 research and collecting permits and 13 stand-alone river permits, totaling 3,182 river user-days. For each of these GCMRC permits, assistance was provided to the Principal Investigator in completing the Minimum Requirement Analysis and related compliance documents. In addition, 5 tribal research permits with corresponding river trips were permitted for the Hopi, Hualapai, Navajo, and Paiute Tribes, and Zuni Pueblo totaling 941 user days. Overall, 4,123 user days were spent on the river conducting GCDAMP-related research.

## Resource Monitoring and Mitigation

The NPS continued the integrated monitoring program in 2010. In winter 2010 and 2011, two monitoring trips were completed, with 78 campsites being monitored. Two mitigation trips were completed to address campsite impacts. Projects were undertaken at 19 campsites and were accomplished in cooperation with stakeholder groups; one with Grand Canyon River Guides, and one with Grand Canyon Private Boater's Association.

## Watershed Restoration Program

In 2010, a new “Watershed Restoration Program” began which will focus on coordinating all restoration efforts within the greater Grand Canyon watershed. NPS resource staff worked to refine monitoring and mitigation protocols and methods that will be implemented beginning in 2011.



## U.S. Geological Survey

During 2010, the GCMRC budget and annual work plan supported ongoing monitoring and research activities aimed at meeting the GCDAMP's resource information needs. In addition to continuing to monitor status and trends of native and non-native fish in the Colorado River ecosystem, GCMRC continued to refine approaches for monitoring Glen Canyon Dam effects on other downstream resources of concern, such as fish, aquatic food base, camping areas, and archaeological sites. Some of the other major activities that occurred in 2010 include:

### Resource Monitoring

Monitoring the status and trends of key resources that are affected by the operation of Glen Canyon Dam is the foundation of the adaptive management process. In 2010, GCMRC continued efforts to design and implement a comprehensive monitoring program for downstream resources of the Colorado River including aquatic food base, rainbow trout in the Lees Ferry reach, native and non-native fishes, Kanab amber snail, riparian vegetation, water quality in the Colorado River below the dam, sediment storage, sandbars used as campsites, and archaeological sites in the river corridor. The General Core Monitoring Plan drafted and reviewed by the Technical Work Group (TWG) in 2009 was followed by a facilitated workshop in December 2010 to discuss and resolve TWG issues with the plan. Through collaboration with the TWG, the GCMRC intends to complete the General Core Monitoring Plan during 2011.

### Status of Resources

These findings are the product of the resource monitoring projects described above and the published results of the 2008 High Flow Experiment (HFE). A comprehensive assessment of the State of the Colorado River Ecosystem in Grand Canyon is planned for FY 2012.

### March 2008 High Flow Experiment Reporting

Studies related to the effects of the 2008 HFE on a variety of aquatic and terrestrial resources below Glen Canyon Dam were completed in 2009. In response to implementation of the 2008 High Flow Experimental Science Plan, more than 16 peer-reviewed reports were published by USGS scientists and cooperators in 2010. The main purpose of the 2008 HFE was to determine the effectiveness of rebuilding and reworking sandbar deposits and backwaters under highly sand enriched conditions in Marble and Grand Canyons. Rebuilding sandbars is intended to benefit native fish, archaeological sites, recreation, and other Grand Canyon National Park values. The 2008 HFE results are also available to inform Interior in development of a High Flow Experimental Protocol for future experimental research at Glen Canyon Dam (see USGS Fact Sheet 2010-3009 for a summary of effects of the 2008 HFE on key resources).



### Near-shore Ecology and Fall Steady Flow Study

GCMRC and its cooperators implemented the third year of the 5-year Near-shore Ecology Study to evaluate the importance of various near shore habitats to humpback chub. This study is also evaluating the effects of late summer–fall steady flows on humpback chub.

### Socio-Economics Expert Panel Review

In December 2009, GCMRC convened a socio-economic workshop with the TWG and a panel of independent economists to identify a two-phase strategy for achieving a more effective socio-economic program with the GCMRC in support of the GCDAMP's needs. The expert panel produced a report in February 2010, with recommendations for implementing future socio-economic studies to address GCDAMP needs for socioeconomic data to inform future trade off analyses and adaptive management decision-making processes. The panel's report is being reviewed and evaluated by an ad hoc committee of the TWG, who plan to develop alternative recommendations for future consideration by the AMWG.

### Non-native Fish Management Workshop

In March 2010, GCMRC convened a non-native fish workshop with agency, tribal, and recreational representatives to identify non-native fish management, research and monitoring priorities related to non-native fish. This workshop synthesized the GCMRC fish database information through 2009 to provide an overview of the distribution and relative abundance of non-native fishes in the Colorado River in Grand Canyon. A USGS Data Series report of these data will be finalized in 2011.

### Colorado River Ecosystem Modeling

In 2010, GCMRC organized and hosted two ecosystem modeling workshops to identify the factors that have contributed to recent trends in humpback chub and trout populations. Two new models were developed; one for the Lees Ferry reach and another for the mainstem of the Colorado River in the vicinity of the Little Colorado River confluence. Both focused on dynamic processes pertaining to native and non-native fish, food production, Glen Canyon Dam operations, and basin hydrology. The workshops occurred in March and April 2010, with the second one including members of the TWG. One result of the workshops was the further development of a rainbow trout model specifically for the Lees Ferry reach (Glen Canyon Dam tailwaters). The trout model uses 20 years of monitoring and research data provided by GCMRC and its science cooperators to predict trout production (i.e., juvenile survival and recruitment) using Age Structured Mark Recapture techniques previously applied to model humpback chub activity in Grand Canyon. The new model also attempts to predict downstream migration of

trout originating from the tailwaters reach. Model development is planned to be ongoing through 2011.

### Integrated Flow, Temperature, and Sediment Modeling

The GCMRC's Integrated Temperature, Flow, and Sediment Modeling research team completed and calibrated a model for use in evaluating the downstream fate of tributary sand inputs under a varied range of flow operations released from Glen Canyon Dam. A journal article describing the new sand transport model was published by USGS scientists in *Water Resources Research* in summer 2010. The GCMRC used the new model to evaluate the effects of various Glen Canyon Dam operating regimes on sand mass balance of the Colorado River through Grand Canyon to assist Interior and the AMWG in developing a recommended WY 2011 hydrograph for Glen Canyon Dam. Results of this evaluation were also published by USGS in Open File Report 2010-1133.

### Science Support to Department of the Interior Management Agencies

The GCMRC actively participated as a Cooperating Agency in development of the High Flow Experimental Protocol and Non-Native Fish Control EAs, providing effective and timely science and modeling support. The USGS also facilitated use of a Structured Decision Making (SDM) process to seek ways to resolve Tribal concerns related to non-native fish removal.

### Other Reporting Activities

During 2010, GCMRC completed approximately 30 science publications. A new GCMRC website was developed and implemented which provides an online library and access to online data sets. An annual report on the accomplishments associated with approximately 50 projects was completed in the first quarter of FY 2010. During the first quarter of FY 2009, the GCMRC, in coordination with a variety of Federal and State agencies, organized, sponsored, and convened in Scottsdale, Arizona in November 2008. Proceedings of the first "Colorado River Basin Science and Resource Management Symposium," held in 2009, were published as USGS Science Investigations Report 2010-5135 in July 2010. The symposium proceedings include over 40 peer reviewed chapters regarding research, monitoring, and restoration of the Colorado River. A complete list of USGS publications related to the GCDAMP can be accessed at [www.gcmrc.gov](http://www.gcmrc.gov).

### Tribal Consultation

In 2010, GCMRC participated in numerous consultation meetings with the various Tribes who are directly involved in the GCDAMP: Hopi and Hualapai Tribes, Navajo Nation, Kaibab Band

of Paiute Indians (who also represent the Southern Paiute Bands of Utah), and Zuni Pueblo. The GCMRC participated in these meetings as one of several Interior agencies involved in non-native fish control efforts. In addition, GCMRC convened a meeting with all the GCDAMP Tribes in June 2010 to review and discuss the draft GCMRC FY 2011-2012 work plan and identify any issues that may require additional government-to-government consultation to resolve.

### Data Integration and Delivery

The GCMRC expended a considerable effort in 2010 communicating the results of the scientific investigation to stakeholders and managers for use in decision-making related to the operation of Glen Canyon Dam. As described above, this data integration and delivery occurs in the form of frequent presentations to TWG and AMWG, science workshops, synthesis reports, and providing online access to reports and databases.

### Youth Education

In cooperation with NPS and Grand Canyon Youth, Inc., the GCMRC participated in two research and monitoring trips during summer 2010. These trips helped GCMRC and NPS meet the science needs of the GCDAMP while providing educational outreach to the youth organization.

### Fish and Wildlife Service

The FWS issued a revised biological opinion on October 29, 2009 in response to the May 26, 2009 court remand from the District Court (Court) of Arizona to provide an analysis and a reasoned basis for its conclusions in the 2008 Biological Opinion and to include an analysis of how the modified low fluctuating flow (MLFF) affects critical habitat and the functionality of critical habitat for recovery purposes. Subsequently the FWS reissued the Incidental Take Statement (ITS) on September 1, 2010 in response to remand by the Court (June 29, 2010) for the 2009 Supplement to the 2008 Final Biological Opinion (February 27, 2008) for the operation of Glen Canyon Dam; the FWS reconsidered and, with additional information, reissued the ITS. The FWS is working on a biological opinion in response to a request by Reclamation to consult on their decision to postpone two non-native fish removal trips during 2010 due to cultural and religious concerns regarding death associated with mechanical removal of non-native fishes.

The 2008 Biological Opinion, dated February 27, 2008, included the following Conservation Measures: Humpback Chub Consultation Trigger to be used if the population declines significantly; Comprehensive Plan for the Management and Conservation of Humpback Chub in Grand Canyon (Comprehensive Plan); Humpback Chub Translocation into tributaries; Non-native Fish Control to protect humpback chub from predation by trout, catfish, and other species

(Non-native Fish Control); Humpback Chub Nearshore Ecology Study; Monthly Flow Transition Study to assess potential to achieve improved conditions for young-of-year, juvenile, and adults; Humpback Chub Refuge to assist in case of a catastrophic loss by providing a permanent source of sufficient numbers of genetically representative humpback for restoration purposes; and Little Colorado River Watershed Planning with consideration for watershed effects to humpback chub. The 2008 Biological Opinion also provided a Conservation Recommendation that Reclamation continue working with FWS to implement activities that will achieve the recovery goals (in revision) for humpback chub, that Reclamation utilize the Comprehensive Plan and work with FWS to determine what actions remain to be accomplished, and help FWS find additional funding sources provided by other willing partners to help achieve recovery. A Conservation Measure was provided for the Kanab ambersnail for Habitat Protection to temporarily remove and safeguard all Kanab ambersnails within the zone that would be inundated, along with about 15% of the ambersnails' habitat, which would be flooded by the HFE. A Conservation Recommendation advised Reclamation to continue to work with FWS to implement the "Interim Conservation Plan for the *Oxyloma (haydeni) kanabensis* Complex and Related Ambersnails in Arizona and Utah" developed by the AZGFD".

The FWS is working as a Cooperating Agency in support of the preparation of the two Reclamation EAs on High Flow Experimental Protocol and Non-native Fish Control. The FWS is providing technical assistance in support of these efforts. High Flow Experimental Protocol EA work has included technical support to maximize both sediment and ecological benefits for this important opportunity to restore beach and associated habitats. Non-native Fish Control work has included stressing the need to have a collaborative effort to include all interested Tribes, recreational fishing interests, and other parties to develop options for consideration as alternatives. FWS prepared the following analysis in support of the September 2009 consultation meeting between Interior agencies and Zuni Pueblo leadership and cultural and religious representatives: Strategy to Evaluate the Potential of Relocating Mechanical Removal of Non-native Fish Species in Grand Canyon to Address the Needs and Concerns of Tribes.

In support of non-native fish management and response to concerns of the Tribes, FWS work included the following: participated in support of Reclamation-led consultation meetings with representatives of the Tribes during March–June, 2010; assisted Reclamation and GCMRC in their leadership of the GCDAMP Non-native Fish Workshop (March 30-31, 2010, Phoenix, AZ); assisted the NPS in their Non-native Control and Native Fish Restoration Implementation Plan for the Colorado River and Associated Tributaries Downstream of Glen Canyon Dam Workshops (May 26 and July 7-9, 2010, Flagstaff, AZ); and participated on a panel, entitled "Non-native Fish Removal in Grand Canyon: Cultural Considerations and Fish Management," before the Southwest Region Native American Fish and Wildlife Society 25th Annual Regional Conference (July 29, 2010, Scottsdale, AZ).

In 2010, the FWS assisted Reclamation in their commitments associated with the Conservation Measures in the 2008 Biological Opinion. This included supporting GCMRC-led monitoring of humpback chub, and efforts to develop alternative methods to mechanical control for managing trout and other non-native fish that potentially prey on humpback chub. The FWS provided technical assistance for the development of desired future conditions (DFCs) by the Glen Canyon Dam AMWG DFC Ad Hoc Group and review of the AMWG charter within the Glen Canyon Dam AMWG Charter Ad Hoc Group.

FWS conducted five monitoring trips in the lower portion of the Little Colorado River, the primary spawning and rearing area for humpback chub. Data from these trips generate population estimates in cooperation with the GCMRC for humpback chub, as well as providing monitoring data on other native and non-native fish. One humpback chub capture trip in the Little Colorado River was conducted in cooperation with the NPS in support of four projects, including the Chute Falls translocation on Navajo Nation lands, Dexter National Fish Hatchery and Technical Center (NFH&TC) genetic refuge, and the Shinumo Creek and Havasu Creek translocations in the Grand Canyon National Park. As a result of these capture efforts in 2010, 109 fish were translocated above Chute Falls and 185 fish transported to Dexter NFH&TC to augment the genetic refuge (established in 2008). Also, the Dexter NFH&TC captive broodstock refuge currently contains 660 humpback chub; 277 (2008 year class), 205 (2009 year class), and 178 (2010 year class).

In cooperation with the AZGFD and GCMRC, FWS conducted a mainstem Colorado River survey that sampled the nine humpback chub aggregations below Glen Canyon Dam.

In cooperation with NPS, the FWS conducted a baseline fishery survey of Havasu Creek below Beaver Falls on NPS-managed lands. The goal of this survey was to collect data to help determine whether the tributary is biologically suitable for humpback chub. Two papers on humpback chub were published this year and are cited below:

Stone, D.M. 2010. Overriding effects of species-specific turbidity thresholds on hoop-net catch rates of native fishes in the Little Colorado River, Arizona. *Transactions of the American Fisheries Society* 139: 1150-1170.

VanHaverbeke, D.R. 2010. The humpback chub in Grand Canyon. In *Proceedings of the Colorado River Basin Science and Resource Management Symposium*, November 18-20, 2008. Scottsdale, AZ: U.S. Geological Survey Scientific Investigations Report 2010-5135, 372p.

Dexter NFH&TC continues to maintain a genetic refuge of humpback chub that is intended to be used to augment the population should a catastrophic loss occur in the Little Colorado River or in the mainstem Colorado River. Under the Draft Genetics Management Plan (Keeler-Foster 2008,

in prep), recommendations, the refuge should be supplemented each year until it reaches 1,000 individuals. Dexter NFH&TC also received, treated for internal and external parasites, and held 300 subadult humpback chub for translocation into Shinumo Creek in June 2010. Prior to being stocked, Dexter NFH&TC used flow training technology to acclimate fish to flowing water conditions.

The FWS also provided planning assistance within the GCDAMP for recovery of endangered species including humpback chub. This included preparation work on a report for the AMWG with regard to development of a Recovery Implementation Program (RIP) for endangered native fish in the Lower Colorado River, including the humpback chub in Marble and Grand Canyons.

In cooperation with NPS, FWS completed a “Translocation Framework for humpback chub in Grand Canyon National Park” and distributed the document to external partners for comment and input.

In support of Reclamation mitigation commitments for the 2008 Experimental Releases from Glen Canyon Dam, Arizona, 2008 – 2012, the FWS worked with the AZGFD, other Federal agencies, and interested trout fishing interests to address recreational fishery concerns consistent with the intent of the FWCA. This included participating with Reclamation, NPS, GCMRC, Western, and recreational fishing business, guide, and user representatives regarding management of recreational fishing and native fish conservation.

## **2011 OPERATIONS**

### **Bureau of Indian Affairs**

The BIA continued to support the Tribes in their funding requests for various projects, participated in consultation meetings with the Tribes regarding the Tribal Consultation Plan, conducted pre-meetings with tribal representatives prior to AMWG meetings, and participated in ad hoc groups and other meetings regarding cultural and natural resources issues and concerns. The BIA provided funding to the Tribes for their participation in the GCDAMP. In Fiscal Year 2011, the BIA served as a Cooperating Agency for Reclamation’s two EA’s (High Flow Experimental Protocol and Non-Native Fish Control); participated on the Interior Native American Core Team and various GCDAMP Ad Hoc Groups; and reviewed the development of the hydrograph for the AOP and GCDAMP efforts. The BIA will also be a Cooperating Agency on the Long Term Experimental and Management Plan (LTEMP) Environmental Impact Statement (EIS) process. Other activities included the Programmatic Agreement for cultural resources and continued coordination efforts for tribal participation in the GCDAMP.

## Bureau of Reclamation

As in 2010, a 2011 hydrograph was jointly developed by the Interior AMWG agencies and Western. The recommended hydrograph was consistent with the Law of the River (including the GCPA) and was designed to enhance protection of downstream resources. This approach to operations does not modify the Interim Guidelines, operating criteria, or ROD, and falls within the parameters of the MLFF alternative adopted in the ROD. The recommended hydrograph received broad support from the members of AMWG, and was approved by the Secretary on September 21, 2010.

Releases from Lake Powell in WY 2011 continued to reflect consideration of the uses and purposes identified in the authorizing legislation for Glen Canyon Dam and were consistent with the GCDFEIS/ROD and the 2008 EA/Finding of No Significant Impact for Experimental Releases for Glen Canyon Dam, Arizona, 2008-2012. The actual monthly release volumes for WY 2011 are displayed in Table 2. A steady flow regime (steady daily releases), as described in the Experimental Releases EA, was implemented in September 2010 (as well as during the first month of the 2011 water year, October 2010). These steady releases were 8,000 cfs during these two months.

**Table 2. Actual Lake Powell Monthly Release Volumes  
Water Year 2011**

Month	Monthly Release Volumes (maf)
October 2010	0.495
November 2010	0.810
December 2010	0.847
January 2011	0.997
February 2011	0.964
March 2011	1.033
April 2011	0.940
May 2011	1.171
June 2011	1.377
July 2011	1.483
August 2011	1.479
September 2011	0.922
<b>Total Releases</b>	12.518

On December 10, 2009, Secretary Ken Salazar announced that Interior would initiate development of a High-Flow Experimental Protocol for releases from Glen Canyon Dam as part of the ongoing implementation of the GCDAMP. High-flow experimental releases have been undertaken in the past and will be further analyzed and implemented pursuant to the direction of

the Secretary to assess the ability of such releases to protect, mitigate adverse impacts to, and improve the values for which Grand Canyon National Park and Glen Canyon National Recreation Area were established. As part of the GCDAMP, Interior's effort to develop the High Flow Experimental Protocol is a component of its ongoing responsibility to comply with the requirements and obligations established by the GCPA of 1992 (Pub. L. 102-575). The High-Flow Experimental Protocol is currently the subject of an ongoing analysis, including analysis pursuant to NEPA. Interior anticipates that the High Flow Experimental Protocol will be completed early in 2012. The GCDAMP federal agencies, Hopi Tribe, Hualapai Tribe, Zuni Pueblo, AZGFD, and Upper Colorado River Commission are cooperating agencies in the process. Further information on the High Flow Experimental Protocol may be found at 74 Fed. Reg. 69361 (Dec. 31, 2009).

Along with the High Flow Experimental Protocol EA, Reclamation began an EA on Non-native Fish Control in 2010 that is also expected to be completed early in 2012. The Non-native Fish Control EA will evaluate alternatives for controlling non-native fish species that prey on and compete with native fishes including the endangered humpback chub. Non-native fish control is an important requirement and conservation measure of several FWS biological opinions on the operation of Glen Canyon Dam. Past efforts have focused on mechanical removal using boat-mounted electrofishing, but American Indian Tribes have expressed concerns over the taking of life that results from killing non-native fish during mechanical removal. In June 2009, the Zuni Pueblo and other GCDAMP Tribes expressed concerns that two removal trips were planned in the 2010 GCDAMP Budget and Work Plan, but tribal consultation on the action had not occurred. In response, the non-native fish control trips were canceled, Reclamation reinitiated ESA section 7 consultation on cancelling these trips, and began developing an EA to evaluate various alternatives for non-native fish control. The GCDAMP federal agencies, Zuni Pueblo, Hualapai Tribe, and AZGFD are cooperating agencies in this process. Reclamation also used an SDM process, conducting two workshops with the cooperating agencies in the fall of 2010, led by Dr. Mike Runge of USGS Patuxent Wildlife Research Center, to develop and evaluate alternatives for non-native fish control.

Reclamation continues to conduct government-to-government consultation with Native American Tribes as part of the GCDAMP on operations of Glen Canyon Dam and activities of the GCDAMP in services of its responsibilities, including those under section 106 of the NHPA, Executive Order 13175, Secretarial Order 3206, and the November 5, 2009, Presidential Memorandum on Tribal Consultation.

## **National Park Service**

In 2011, Grand Canyon National Park provided significant support to the overall goals outlined in the GCPA as described herein.



## Archaeological/Cultural Resources

The NPS opened its exhibit entitled “Grand Archaeology” at Kolb Studio on the South Rim of Grand Canyon April 30 2011. The exhibit details the results of archaeological excavations undertaken at nine sites along the Colorado River. The exhibit can be visited “on-line” through the NPS website and will travel to the Museum of Northern Arizona for exhibit from October 2011-October 2012.

The NPS completed a final draft of the CRMP monitoring protocols and distributed them for peer (including tribal) review. The NPS is now developing a draft of the CRMP mitigation protocols. That document was sent for review in fall 2011. NPS is currently working with a cooperator to develop a best practices manual for use of check dams for erosion control on archaeological sites. NPS monitored 15 sites within the CRMP project corridor in FY 2011.

The NPS at Glen Canyon National Recreation Area worked with GCMRC on refining field mapping and remote sensing techniques based upon channel cross-sections repeated over the past 50 years. At Grand Canyon National Park, GCMRC worked with NPS on evaluating the utility of aerial imaging for determining changes in ground cover at a select group of archaeological sites.

## Tribal Consultation

In 2011, NPS continued to participate in consultation meetings with the various Tribes who are directly involved in the GCDAMP and other Colorado River related program. Grand Canyon NPS staff worked to incorporate tribal perspectives into the NPS Native Fish plan, expected to be completed by the spring of 2012. Staff worked with other Interior agencies in support of consultation efforts on the non-native fish control project. Tribal advisors were consulted on specific monitoring and mitigation protocols relative to CRMP implementation. Final protocols are expected by the end of 2011.

## Humpback Chub Translocation

In 2011, NPS continued to coordinate with FWS, GCMRC, and the Wildlands Council to work in Havasu Canyon to expand the humpback chub translocation effort. Monitoring efforts continued in Shinumo Creek and initial baseline survey was completed in Havasu Canyon. Fish community and habitat data will continue to be collected during baseline surveys to determine the level of non-native fish removal needed, if any. NPS will be completing a Native Fish Management Plan by late 2011 to address management of native fish within Grand Canyon National Park (including the Lees Ferry area of Glen Canyon National Recreation Area). Work at Bright Angel Creek to remove trout continued in 2011.

## Wildlife Surveys and Monitoring

Activity in 2011 was similar to that undertaken in 2010 concerning SWWFL, California Condor, Northern goshawk and Mexican spotted owl. A three year Mexican spotted owl juvenile dispersal study commenced in 2011. A bighorn sheep genetic study conducted in conjunction

with the Biological Resources Management Division commenced in 2011. Mountain lion research expanded to include North Rim and inner radio-tracking.

#### Vegetation Management/Exotic Species Removal

In 2011, Grand Canyon NPS staff continued to work under the direction of the CRMP in implementing restoration projects and also expanded plant collection tasks in preparation for larger habitat restoration projects.

#### Research Review and Permitting

The NPS reviewed proposals, coordinated efforts, and provided permitting as needed for all associated GCPA projects. Research permits/river trip permits were provided in disciplines such as sediment, near-shore ecology, and fish monitoring.

#### Resource Monitoring and Mitigation

The NPS continued its integrated CRMP monitoring program in 2011. One mitigation trip was conducted in the Lower Gorge area to work on 5 campsites. A second trip is planned for the winter to work on at least ten additional campsites.

#### Watershed Restoration Program

In 2011, Grand Canyon National Park continued implementation of its Watershed Restoration Program with finalization of a monitoring and mitigation protocols specific to implementation of the CRMP. NPS conducted pilot restoration projects along the watershed to try to restore native vegetation in key areas and restore landscapes around damaged archaeological sites.

### **U.S. Geological Survey**

#### Resource Monitoring

During 2011, the Interior-approved work plan and budget for the GCMRC again supported ongoing monitoring and research activities aimed at meeting the GCDAMP's resource information needs. A major focus was on continuing to monitor status and trends of native and non-native fish in the Colorado River ecosystem and refining approaches for monitoring Glen Canyon Dam effects on other downstream resources of concern to the GCDAMP, such as fish, the aquatic food base, camping areas and archaeological sites. The GCMRC collaborated with the GCDAMP TWG to finalize the GCMRC's General Core Monitoring Plan and forwarded a recommendation to the AMWG for approval of the overall design and process for implementing all monitoring projects. This would then lead to implementing all monitoring components by the end of 2013.

## High Flow Experiment Synthesis

The GCMRC published a report that summarizes and synthesizes experimental results from the 1996, 2004, and 2008 HFEs. This report, USGS Circular 1366 “Effects of Three High Flow Experiments in the Colorado River Ecosystem Downstream from Glen Canyon Dam, Arizona” provides scientists the opportunity to clearly outline options for future HFEs intended to rebuild and maintain sandbars and related habitats below the dam. The GCMRC provided information derived from the above reports and other peer reviewed sources to assist Interior and its management agencies in the development of a science-based High Flow Experimental Protocol for Glen Canyon Dam.

## Near-shore Ecology and Fall Steady Flow Study

Year 4 of the 5 year nearshore ecology and fall steady flow study continued to evaluate the effects of fall steady flows on native fish recruitment and the importance of various near shore habitats to humpback chub.

## Socio-Economics Expert Panel Review

In 2011, GCMRC worked with Western to determine appropriate power economic models which will be used to evaluate economic impacts to power from alternative operating regimes. The Socio-Economic Ad Hoc Group established recommendations to the AMWG based in part on recommendations by the expert panel at the December 2009 workshop. This included (1) the development a hydropower “base case” for operating Glen Canyon Dam that will be used for evaluating the implications of implementing alternative dam operations on hydropower production and revenues and (2) an assessment of non-market recreational values associated with the Glen Canyon/Lees Ferry reach of the river corridor. The TWG is currently considering and may recommend additional studies be undertaken by GCMRC in 2012-2013.

## Non-native Fish Management Workshop

The GCMRC convened a non-native fish workshop with agency, Tribal, and recreational representatives in March 2011 to synthesize information related to the distribution and abundance of non-native fishes in the Colorado River in Grand Canyon. The GCMRC finalized a report that summarizes known methods for capturing and removing non-native fishes found in the Colorado River in Grand Canyon. This report included recommendations for additional research that would support improving the status of knowledge of these species, an important precursor to assessing the risk that they may pose to native fishes in the system.

## Knowledge Assessment

A key element of the collaborative science planning process outlined in the 2007-2011 Strategic Science Plan (SSP) (USGS 2006) and Monitoring and Research Plan (MRP) (USGS 2007) is a synthesis at 5-year intervals of new science information in an updated Knowledge Assessment. The Knowledge Assessment is a critical part of the adaptive management process that is needed

to inform the review and revision of the GCDAMP Strategic Plan and the 2012-2017 SSP and MRP. The 2011 Knowledge Assessment summarized and evaluated new information regarding status and trends of GCDAMP resources and responses of those resources to various experimental treatments for use by managers, stakeholders and scientist as they consider new direction in the GCDAMP science and management activities. As in 2005, knowledge assessment workshops were convened by GCMRC staff, cooperators and stakeholders to evaluate progress made over the last five years relative to flow and non-flow experimental treatments across all resources of interest to the GCDAMP and Interior. The outcome of the knowledge assessment will later be documented through development and publication of a USGS circular in 2012, similar to the 2005 report prepared on the State of the Colorado River Ecosystem.

### Science Support to Department of the Interior Management Agencies

GCMRC continued to provide science support to the development on the EAs for Non-Native Fish Removal and development of a High Flow Experimental Protocol. The EA's, led by Reclamation, are expected to be completed in the first quarter of 2012. In addition, GCMRC will actively provide science support to the LTEMP EIS which is to be initiated by Interior in 2012.

### Other Reporting

The GCMRC published approximately 25 to 30 new monitoring and research reports in 2011, as well as several new USGS fact sheets. Another report -- Open-File Report 2011-1220 "Summary report of responses of key resources to the 2000 Low Steady Summer Flow experiment, along the Colorado River downstream from Glen Canyon Dam, Arizona," was also published.

### Tribal Consultation

The GCMRC continued previous efforts to achieve more meaningful consultation with the Tribes on science issues related to GCMRC monitoring and other related 2011 work plan activities.

### Youth Education

In cooperation with NPS and Grand Canyon Youth (GCY), the GCMRC lead two research and monitoring trips during summer 2011. These trips helped GCMRC and NPS meet the science needs of the GCDAMP while also providing educational outreach to the GCY organization.

### Fish and Wildlife Service

In 2011, the FWS worked with GCMRC, BIA, Reclamation, NPS, and other GCDAMP stakeholders to further support conservation for a number of ESA-listed species (including the

humpback chub), including responses to Court orders and recent biological opinions. FWS will also work with Reclamation to complete necessary compliance for any new flow experiments such as a new HFE or non-native fish control actions. FWS worked with the AMWG to assess interest in developing a RIP for endangered native fish in the Lower Colorado River, including the humpback chub in Marble and Grand Canyons.

FWS conducted several monitoring trips in the Little Colorado River as well as lead a trip that samples the nine aggregations of humpback chub in the mainstem Colorado River. A translocation of humpback chub to Chute Falls took place in July 2011, along with collections to maintain the Dexter NFH&TC refuge population and fish for 2012 translocations into Havasu Creek and Bright Angel Creeks. FWS continued working as co-leads with the NPS and the Havasupai Tribe for planning and continuing baseline studies in Havasu Creek for a future humpback chub translocation in 2012. The FWS worked with the GCMRC and other partners to analyze and implement the recommendations of the recent GCDAMP Fisheries Monitoring Protocol Evaluation Panel. Removal of non-native fish will continue to be reviewed to assess the potential need to reduce rainbow trout brown trout, channel catfish (*Ictalurus punctatus*), black bullhead (*Ameiurus melas*), or other predatory non-native fish populations in the general area of the confluence of the Little Colorado River and mainstem of the Colorado River. The assessment will include recognition of the concerns expressed by the Zuni Pueblo and other Tribes that have concerns about the lethal removal of non-native fish from Grand Canyon, and will evaluate the feasibility of moving non-native fish control work to other areas that reduce detrimental impacts to tribal values.

FWS worked with GCMRC to develop new ways to mark small humpback chub using elastomer tags so that population estimates can be generated on young of year fish in the Little Colorado River. FWS worked with the NPS to develop new ways of collecting fish, including investigating methods for larval collections, for the different translocation projects that minimize the impacts on larger fish and decrease handling time.

The FWS continued to work with Reclamation as lead in conducting consultations with interested Tribes in regard to non-native fish control and other related matters. Specifically, the FWS, as a Cooperating Agency, assisted Reclamation in development of two EAs: High Flow Experimental Protocol Non-native Fish Control. The FWS continued to assist on work efforts of the AMWG and its TWG and Ad Hoc Groups.

FWS worked with the AZGFD to implement monitoring and conservation actions for the Kanab ambersnail within Grand Canyon National Park. The FWS worked to accomplish other management actions as determined appropriate within the GCDAMP with the stakeholders to conserve humpback chub and other endangered species in support of the ESA. Further, the FWS in coordination with the AZGFD worked within the GCDAMP and others to provide for

conservation of endangered species, Lees Ferry trout fishery, neotropical songbird riparian habitats, and other fish and wildlife resources in support of the FWCA within limits of funding availability.