Glen Canyon Dam Adaptive Management Work Group
Agenda Item Information
December 5-6, 2006

Agenda Item

Public Outreach Ad Hoc Group

Action Requested

√ Motions requested (see more information below under Background Information):
Motion # 1: AMWG recommends that the Secretary approve as final the content of the public outreach website at www.gcdamp.gov.

Motion # 2: AMWG recommends that the Secretary approve the proposed Website Modification Process for determining what future content or materials for posting to the site need AMWG review and approval.

Motion #3: AMWG recommends that the Secretary approve the following six fact sheets as final for public distribution:

- Lees Ferry Trout Fishery
- Historical Native Fishes of Glen and Grand Canyons
- Glen Canyon Dam Temperature Control Device
- Colorado River Storage Project
- Endangered Species
- Sand Bars in the Grand Canyon

√ Information item only; we will answer questions but no action is requested.
The budget information detailed below is for your information.

Presenters

Mike Yeatts, Co-Chair, Public Outreach Ad Hoc Group, and Staff Archeologist, Hopi Cultural Preservation Office

Jeff Humphrey, Co-Chair, Public Outreach Ad Hoc Group, Public Outreach Specialist, Arizona Ecological Services Field Office, U.S. Fish and Wildlife Service

Doug Hendrix, Member, Public Outreach Ad Hoc Group, and Public Information Officer, Upper Colorado Region, Bureau of Reclamation

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Previous Action Taken

√ By AMWG:
At the March 2005 AMWG meeting, the following motions were passed:
MOTION: AMWG approves the logo, catch phrase, outline of stationary display at Glen Canyon Dam, and the AMP website anonymously hosted by Reclamation, www.gcdamp.gov, all as presented to AMWG.

MOTION: AMWG delegates to POAHG these specific authorities:
1) Posting to and updating of AMP website (AMWG retains review opportunities on new materials via email prior to posting),
2) Identify new topics for Fact Sheets and start creating them,
3) Finalize strategy for Glen Canyon Dam Display with Reclamation review and involvement,
4) Speak to media on rapid response items via Secretary's Designee and/or Interior public relations, including the five-day AMWG review for the rapid response process, and
5) Develop, finalize, and distribute guide resources.

MOTION: AMWG authorizes:
1) A continuing budget line item of $50,000/year with carryover from year to year, not to exceed $25,000 (for a total of $75,000),
2) POAHG to recommend service contracts to the Bureau of Reclamation to complete necessary duties and products, and
3) POAHG to report public outreach budget details annually to the TWG Budget Ad Hoc Group for review in a timely manner.

At the March 2006 AMWG meeting, the following motions were passed by consensus:
MOTION: AMWG recommends to the Secretary of the Interior the design, content, and installation of the AMP Stationary Display, with the following changes: consideration of a small flyer to take away and identification of the location of the mechanical removal.

MOTION: AMWG approves the layout and functionality of the AMP website as presented at the AMWG meeting.

Relevant Science

√ The fact sheets and other outreach information are based on the most current research and monitoring data available.

Background Information

ITEM #1: PUBLIC OUTREACH WEBSITE (ACTION ITEM)

Background: In March 2005, AMWG approved the idea of a public outreach website, and delegated to the POAHG the specific authority to post to and update the website. In addition, AMWG reserved the opportunity to review new materials via email before they were posted. In March 2006, AMWG approved the layout and functionality of the website.

On October 16, 2006, AMWG and TWG members received an email asking them to review the website at http://www.gcdamp.gov/, and send feedback for necessary modifications by November 27, 2006 to Mike Yeatts (michael.yeatts@nau.edu) and Jeff Humphrey (jeff_humphrey@fws.gov). Members were asked to review the site from the perspective of a broad public audience.

Much of the website content has already been approved by the AMWG during its review and approval of fact sheets and the stationary display. Stylistic input is not being sought as the layout and functionality was previously approved by AMWG. The full content of the website is to be approved at this meeting. Please note that the website is designed to accommodate future expansion.

Proposed Motion #1: "AMWG recommends that the Secretary approve as final the content of the public outreach website at www.gcdamp.gov"

ITEM #2: WEBSITE MODIFICATION PROCESS (ACTION ITEM)

Background: In March 2005, AMWG approved the idea of a public outreach website, and delegated to the POAHG the specific authority to post to and update the website. In addition, AMWG reserved the opportunity to review new materials via email before they were posted.

Attachment: A proposed Website Modification Process is attached on page 4 for AMWG's consideration.

Proposed Motion #2: "AMWG recommends that the Secretary approves the proposed Website Modification Process for determining what future content or materials for posting to the site need AMWG review and approval."

ITEM #3: FACT SHEETS (ACTION ITEM)

Background: The POAHG has presented several fact sheets for approval by AMWG. At today's meeting, AMWG will be asked to approve six additional fact sheets. The "Colorado River Storage Project" and "Glen Canyon Dam Temperature Control Device" fact sheets were given to AMWG for review in March 2005. AMWG was asked to review the fact sheets on "Lees Ferry Trout Fishery," "Historical Native Fishes of Glen and Grand Canyons," and "Endangered Species" in March 2006. The information in the "Sand Bars in the Grand Canyon" fact sheet was approved by AMWG in March 2006 when it approved the content of the stationery display for Glen Canyon Dam.

Attachments: The six fact sheets proposed for approval are attached behind page 4.

Proposed Motion #3: AMWG recommends that the Secretary approve the following six fact sheets as final for public distribution:

- Lees Ferry Trout Fishery
- Historical Native Fishes of Glen and Grand Canyons
- Glen Canyon Dam Temperature Control Device
- Colorado River Storage Project
- Endangered Species
- Sand Bars in the Grand Canyon

ITEM #4: BUDGET REPORT (INFORMATION ITEM)

Background: In March 2005, AMWG authorized a continuing budget line item of $50,000 per year for the POAHG, with a potential carryover from year to year not to exceed $25,000. The $50,000 per year has now increased to $51,500 with CPI increases. The activity for FY2006 was as follows:

FY 06 Expenditures (Includes $6,000 for AAB proposal)	87,595
Obligations (Oct. 31, 2006)	84,290
Ending balance for FY 06	6,405
Beginning budget balance for FY 07	51,500
Total available budget for FY 07	57,905

Attachment: The POAHG PowerPoint presentation is attached as the end of this packet.

Proposed Website Modification Processes:

Long-Term Management and Maintenance of the gcdamp.gov Web Site

The intent and purpose behind the development of the gcdamp.gov web site is to provide a comprehensive source of information on the Glen Canyon Dam Adaptive Management Program. The site is a collaborative effort and product of the multi-entity Public Outreach Ad Hoc Group on behalf of the AMWG and the Secretary's Designee. An essential part of the development and ownership of this web site is long-term management and maintenance. In order to fulfill its intended purpose, it is important that the site be kept up-to-date with the most current information about AMP activities as well as maintained technically.

Long-term management and maintenance should be considered in three distinct areas:

1 - Basic Maintenance Modifications

Basic maintenance deals with day-to-day functionality of the web site:

- Modifications to external link addresses
- Updates to contact page information as necessary
- Correction of text errors/typos
- Modifications in compliance with section 508 (people with disabilities) accessibility
- Modifications to resolve technical issues or code requirements

Proposed Site Modification Process: Continue modifications when deemed necessary by Reclamation Upper Colorado Region Web Manager, POAHG, or DOI.

2 - Current Events Modifications

The addition of new content or external links, associated with activities and events that arise over time and which are important to the site's credibility. This includes posting or linking to news releases or speeches, announcements or bulletins, photos, special event timelines, Federal Register notices, links to newly released documents, FAQ's, etc.

Proposed Site Modification Process: The Secretary's Designee or Alternate or POAHG will provide authorization to incorporate reviewed and approved current event information and links.

3 - Core Content Modifications

The development of new web site material intended to address a specific new or existing topic area that will become part of the site's long-term core content. This includes content taken from new fact sheets or special narratives written specifically for the web.

Proposed Site Modification Process: Continue the existing process of development and review by and through the POAHG and subsequent formal approval by the AMWG, unless specifically directed by the Secretary's Designee or Alternate.

Lees Ferry Trout Fishery

The 15.5-mile stretch of clear flowing Colorado River winding through the Marble Canyon Gorge between the Glen Canyon Dam and the beginning of the Grand Canyon is commonly referred to as Lees Ferry. Since 1964 this area has hosted a recreational trout fishery that has grown in importance and reputation. For anglers, this picturesque stretch of river is a unique tail-water trout fishery of international renown. Anglers from around the world have come to Lees Ferry to fish for rainbow trout in this large, swift flowing river winding its way through the lower most segment of Glen Canyon.

Because of the reliable flows of cold water ranging from 46 to 60 degrees and the supply of food (such as aquatic insects and scuds), the Lees Ferry reach of the Colorado River has the capacity to maintain a remarkable trout fishery in the desert. The fishery itself has gone through an evolution since it was first created following the completion of the Glen Canyon Dam. During its infancy, this productive fishery produced huge rainbow trout ranging from 10 to 20 pounds. The fishery has gone through peaks and valleys, but throughout its history, it has provided some of the most sought after trout fishing opportunities in the Southwest.

Rainbow Trout from Lees Ferry.

The trout population at Lees Ferry is principally composed of rainbow trout. While small tributaries of the Colorado River in Grand Canyon National Park were stocked with brown trout and rainbow trout beginning in the 1920s and continuing until the 1960s, the main stem of the Colorado River was not amenable to supporting trout populations. The main stem of the river became more conducive for trout with the completion of Glen Canyon Dam and the establishment of reliable cold, clear water flows. By agreement with the land and water managers, the Arizona Game and Fish Department began establishment of the Lees Ferry trout fishery in 1964, initiating stocking of trout in the accessible portion of Glen Canyon between the Paria River and Glen Canyon Dam.

The Lees Ferry trout fishery has evolved into a self sustaining, naturally reproducing rainbow trout population. The fishery was maintained through stocking catchable, and later fingerling trout, from 1964 through the mid-1990s. Natural reproduction of trout became more reliable with the establishment of more reliable flows resulting from the re-operation of Glen Canyon dam, and stocking support was ceased. Reproduction of trout in the Lees Ferry reach peaks in winter and spring months.

The fishery is managed for a "blue ribbon" fishing experience by the Arizona Game and Fish Department, the wildlife management agency for the State of Arizona. The intention of "blue ribbon management" is to provide a quality fishing opportunity where anglers can catch larger than average trout, at a relatively high catch rate, in a unique recreational setting. To accomplish this, special fishing regulations are imposed between Glen Canyon Dam and the Paria River that require the use of artificial flys or lures (bait items are not allowed) and that limits the harvest of fish. Current regulations require that fish over 12 inches in length must be immediately released alive. Anglers may retain 4 smaller trout per day, and may possess 8 Lees Ferry trout at any one time. Regulations differ below the Paria Riffle, allowing the use of bait items and a larger daily bag limit. Below 21-mile rapid (in Grand Canyon National Park), there anglers may harvest and retain as many caught trout as they wish.

Anglers use a diversity of fishing methods at Lees Ferry. Fly fishing is practiced by many anglers visiting Lees Ferry. Fly fishers will travel by boat to gravel bars and beaches upriver from the principal access point at the boat ramp within the Glen Canyon National Recreation Area, and fish while wading along those gravel bar area. Spin fishing is not uncommon, with spin anglers fishing frequently from shoreline areas or while drifting their boats through riffles or runs in the river.

A fisherman casts his line in the Lees Ferry strech of the river below Glen Canyon Dam.

River flows can have direct and indirect effects on the trout population at Lees Ferry, and on recreation associated with the trout fishery. Several factors can influence the abundance of trout and the food supplies available to fuel their growth. River flows can directly influence the amount of food available for trout, and how it is delivered. The abundance of the organisms that make up the base of the aquatic food chain [aquatic algae and plants; chironomid midge larvae; and Gammarus] is related to the reliable minimum volume of water in the river. Fluctuations in flows can increase the numbers of food organisms that are available to trout in the "drift" by lifting them from the river bottom and delivering them in the flow. Because trout lay their eggs in "redds" or nests in the river gravels, changing flows can regulate the success of spawning and in-turn determine the numbers of trout in the river. Anglers too can be influenced by changing flows. Fly anglers often wade along gravel bars to cast to fish in deeper water. Wading anglers have to be alert to changing water levels, both for their angling tactics and to ensure their safety.

The trout fishery at Lees Ferry is one of the values associated the Glen Canyon National Recreation Area, and its maintenance is among the goals of the Adaptive Management Program. The explicit goal is to "maintain a naturally reproducing population of rainbow trout above the Paria River, to the extent practicable and consistent with the maintenance of viable populations of native fish."

Historical Native Fishes of Glen and Grand Canyons

The native fishes of the Colorado River make up one of the most unique and unusual faunas found anywhere in the world. This assemblage of fish is specifically adapted to the historic environment of the Colorado River, and the species that make up this assemblage are often found nowhere other than the Colorado River Basin.

Even prior to the construction of Glen Canyon Dam, the Colorado River in Grand Canyon was dominated by introduced fish species, mostly warm water types. The construction of Glen Canyon Dam changed the river from a turbid, flood-prone, warmwater river to a perennially cold, clear river. This allowed trout, which were introduced, to flourish and expand their use of the river.

These fundamental changes to the ecosystem in which the native fish evolved is may present numerous challenges to their survival. They encounter a physiological of being a warmwater adapted fish now living in a cold environment. Introduced fishes residing in the Grand Canyon may interact with, compete with, or prey upon these native fishes. Finally, changes in the foodbase have occurred do to the presence of much clearer water than existed prior to construction of Glen Canyon Dam.

Common Native Fish in Grand Canyon - Conservation Through Adaptive Management

- **Speckled Dace** (*Rhinichthys osculus*) - This small minnow is widely distributed across the western United States. They inhabit tributaries of the Colorado River through Glen and Grand Canyons, and are not uncommon in backwaters in western Grand Canyon.

- **Bluehead Sucker** (*Catostomus discobolus*) - Blueheads occur throughout the upper Colorado River Basin and extend into the Lower Basin through the Little Colorado River Drainage and through Grand Canyon to Lake Mead. They are common in tributaries in Grand Canyon. An adult bluehead may approach 20 inches in length, and can live up to 20 years.

- **Flannelmouth Sucker** (*Catostomous latipinis*) - Flannelmouth Sucker are widely distributed in the Upper Colorado River Basin, and extend into the Little Colorado River Watershed of Arizona and through Grand Canyon. An adult flannelmouth sucker may approach about 20 inches in length,and like other large suckers of the Colorado River may live up to 20 years.

Endangered Fishes of Grand Canyon - A Major Focus of Adaptive Management

- **Humpback Chub** (*Gila cypha*) - This endangered fish is only known from the Colorado River System, and is restricted to a few remaining populations. One of those populations resides in the Grand Canyon. It was historically widely distributed in the Upper Colorado River Basin and extended down the main stem of the Colorado River into the Lower Basin to at least current Lake Havasu. In Grand Canyon, most humpback chub are found in the vicinity of the Little Colorado River and its confluence with the Colorado River. This is a warm water species, and its' spawning and recruitment appears limited in the now cold waters of the Colorado River in Grand Canyon. Spawning

and recruitment of young chub appears to be principally restricted to the lower portions of the Little Colorado River in Grand Canyon. An adult chub might reach 20 inches in length, and may live 20 years or more. Population levels have declined over the last decade, though recent information suggests some recent increases in recruitment. Modification of the river's temperature, expansion of tributary populations, and nonnative fish control are all strategies being evaluated through Adaptive Management.

Endangered Fish Absent from Grand Canyon - Possible Restoration Species

- **Razorback Sucker** (*Xyrauchen texanus*) - The endangered razorback sucker may be extirpated from Grand Canyon. This fish was historically widely distributed throughout both the Upper and Lower Colorado River Basins. No razorbacks have been captured from the River in recent years. Adult razorback suckers are found in the Colorado River and the lower San Juan River above Lake Powell; in Lake Mead; and Lake Mohave. A large razorback sucker can reach a length of 3 feet, and may live upward of 40 years.

- **Bonytail Chub** (*Gila elegans*) -A cousin of the humpback chub, they share many features in common.. Its size and lifespan are similar to a humpback chub. This species is very rare and is listed as endangered. Bonytail chub have not been reported from Glen or Grand Canyon in recent history (more than 30 years?).

- **Colorado Pikeminnow** (*Ptycocheilus lucius*) - This fish is the giant of the minnow family, reported achieving a maximum length of 6 feet. This fish was historically widely distributed throughout the Colorado River Basin. It is now extirpated from the Lower Basin, including Grand Canyon, and is listed as an endangered species throughout its range.

FINAL REVIEW

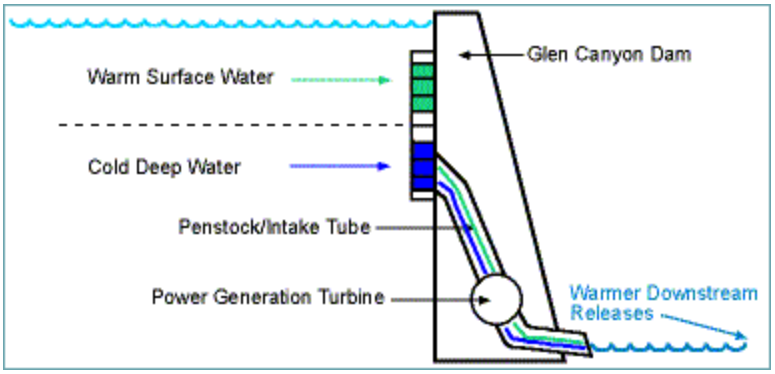
Glen Canyon Dam Temperature Control Device

Overview

Prior to completion of Glen Canyon Dam in 1963, the temperature of water flowing through the Grand Canyon each year was highly variable, ranging from the icy, spring run-off to the warm, 85-degree summer-heated flows. However, once the dam was constructed, the temperature of the water released from the dam - drawn from the depths of Lake Powell and released through the dam's large penstock intakes - ranged between 45 to 50 degrees. Immediately downstream, these cold water releases are good for the trout fishery. But as the water moves downstream through the Grand Canyon, it only warms to about 60 degrees - not warm enough to allow the endangered native fish species, the humpback chub, to adequately reproduce or to successfully compete with or evade predation by some nonnative fishes in the Colorado River.

Why a Temperature Control Device?

In 1994, the U.S. Fish and Wildlife Service (FWS) issued a biological opinion under the Endangered Species Act recommending that the Bureau of Reclamation study the feasibility of modifying the operation of the dam by adding a temperature control device to the existing dam intake structures. The temperature control device would provide operators of the dam with flexibility to draw water from different depths of the reservoir, including warmer water from near the surface of the reservoir during the summer and autumn months, which are critical for the humpback chub. The goal of the temperature control device would be to provide the right combination of cold and warm water withdrawals to benefit the humpback chub, while protecting the trout fishery at Lees Ferry and avoid enhancing or increasing the population of non-native, warm-water fish.



Helping Native Fish

Research indicates that increasing the temperature of water flowing from Glen Canyon Dam is a key element in improvement of the status of and habitat for humpback chub and other native fish in Grand Canyon. Research also suggests that increasing temperatures in the river may trigger increases of some nonnative warmwater fishes resident in Grand Canyon or stimulate parasites or disease agents that are held in check by colder water.

A temperature control device will allow dam operators to raise and lower water temperatures as appropriate to maximize the beneficial effects of warmer water and to minimize the potential negative effects. Planning for the operation of a temperature control device will include addressing future management in the event warm water releases result in

unacceptable levels of competition or predation by nonnative fishes, diseases or parasites that could detrimentally affect

humpback chub or other fishes of concern to the Adaptive Management Program.

Flaming Gorge Dam, upstream on the Green River in Utah, provides an example of the benefits that a temperature control device would provide Glen Canyon Dam. Since 1978, when Flaming Gorge's intake structures were modified to accommodate warm water releases, native fish have done better downstream near the Yampa River, while trout growth rates below the dam increased significantly. Temperature control devices also have been successfully installed and operated on several other Reclamation dams to benefit other fish species.

Status of the Temperature Control Device

The temperature control device is currently undergoing a feasibility assessment to satisfy provisions outlined in the FWS biological opinion. A risk assessment has been completed and the Adaptive Management Work Group (AMWG) of the Glen Canyon Dam Adaptive Management Program has recommended to the Secretary of the Interior that Reclamation move forward to complete National Environmental Policy Act (NEPA) compliance on the device. Reclamation has distributed a scoping letter on a proposal to modify two of the dam's penstocks, test them, and, with review/input of the Adaptive Management Program, determine if more modifications are necessary.

Reclamation is also developing preliminary design parameters that would be needed to maintain cold water flows to cool turbines and transformers at Glen Canyon Dam - should the device be installed - thus allowing the powerplant to continue to operate at full capacity.

Design Features and Cost

Based on late 1990s cost estimates, development and installation of temperature control devices on the penstocks at Glen Canyon Dam could cost between $40 and $100 million, depending upon the type and scale of design. A design study is currently being conducted to update these estimates.

FINAL REVIEW

Colorado River Storage Project

Investigations of the means to develop the waters of the Upper Colorado River system were started by the Reclamation Service in 1902, the year of its inception. Since 1902, Reclamation has constructed 25 projects to utilize water in the Upper Colorado River Basin. The CRSP was envisioned at the time of the Colorado River Compact of 1922. In dividing Colorado River water between the Upper and Lower Colorado River Basins, the compact set aside for consumption in the upper basin 7.5 million acre-feet of water each year.

However, this allocation is contingent upon the Upper Basin's delivering to the Lower Basin not less than 75 million acre-feet of water in any consecutive 10 year period and delivering additional water for use in Mexico under certain circumstances. The dividing point between the two basins is at Lees Ferry, near the northern border of Arizona.

Water allocated to the Upper Basin was further apportioned to the individual States of Arizona, Colorado, New Mexico, Utah, and Wyoming by the Upper Colorado River Basin Compact of 1948.

Spring runoff from the Colorado River is extremely erratic, varying from 4 to 22 million acre-feet annually. In prolonged dry periods, there is not enough water to permit the upper basin to increase its use of water under the 1922 compact and, at the same time, make the required deliveries to the lower basin. In wetter periods, however, flows are more than sufficient for these purposes. To weather the dry hydrologic cycles, large storage reservoirs, that could be filled when flows are high and can provide additional water when needed for compact fulfillment, were required.

Favorable sites for such reservoirs were found in the deep canyons of the Colorado River and its principal tributaries in the Upper Basin. A plan for the CRSP, including a series of dams and reservoirs to provide storage capacity in combination with power development and other purposes, was presented to Congress in a Bureau of Reclamation report in 1950. An initial group of participating projects that would develop water for irrigation and other purposes in the Upper Basin was described in the 1950 report.

Development of the Colorado River Storage Project

Construction of four storage units of the Colorado River Storage Project and 11 participating projects was authorized by the act of April 11, 1956 Additional projects have been added since the original legislation was adopted.

The initial authorized features included:

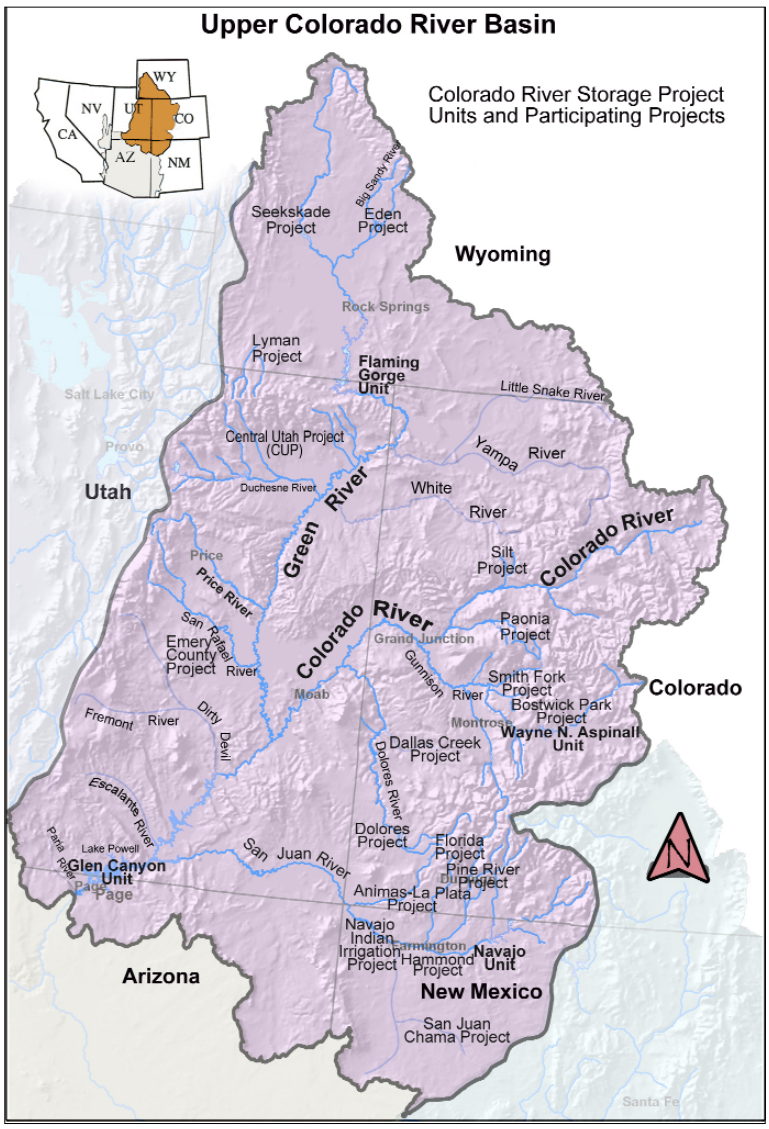
- Glen Canyon Unit on the Colorado River in Arizona and Utah
- Flaming Gorge Unit on the Green River in Utah and Wyoming
- Navajo Unit on the San Juan River in New Mexico and Colorado
- Curecanti Unit, consisting of three dams on the Gunnison River in Colorado. In November 1980, this unit was renamed the Wayne N. Aspinall Storage Unit in honor of former Congressman Aspinall, a strong advocate of water resource development in the west.

Intended Purposes of the CRSP

The CRSP was authorized to provide for the comprehensive development of the Upper Colorado River Basin. The project furnishes the long-time regulatory storage needed to permit States in the upper basin to meet their flow obligation at Lees Ferry, Arizona, as defined in the Colorado River Compact, and still utilize their apportioned water for beneficial purposes. The storage reservoirs formed by four units of the CRSP have a total capacity of nearly 30.6 million acre-feet of active storage for the benefit of the Upper Basin states.

Glen Canyon Dam and Lake Powell are the primary long-term carryover storage features of the CRSP. By itself, Lake Powell provides more storage capacity than all other storage features of the project combined. Total capacity for Lake Powell - when entirely full - is 27 million acre-feet, and the active capacity is 20,876,000 acre-feet. At normal water surface elevation, the reservoir has a length of 186 miles and a surface area of 161,390 acres.

Glen Canyon Dam enables both the Upper Basin and the Lower Basin systems to operate the Colorado River more effectively. Glen Canyon Dam is integral in meeting the water delivery obligations established under the Law of the River by meeting the authorized purposes of the CRSP, including irrigation, flood control, municipal and industrial water supply and power generation.



Units of the CRSP and Participating Projects.

Key Benefits of the Colorado River Storage Project

The Colorado River system - unique in terms of its storage capacity - can store more than 60 million acre-feet of water in Colorado River reservoirs, equivalent to four years of average annual runoff in the basin. This storage provides irrigation supplies for about 2 million acres of land while serving more than 23 million people.

Endangered Species

The Endangered Species Act (ESA) calls upon all Federal agencies to conserve endangered and threatened species and insure that agency actions are not likely to jeopardize the continued existence of those species or result in the destruction or adverse modification of their critical habitat, consistent with applicable federal law.

Responsibilities under the Endangered Species Act of 1973

A goal of the Adaptive Management Program (AMP) is to be consistent with the ESA. Full restoration of the pre-dam ecosystem and annual and seasonal river flows and temperatures are not realistic objectives for the AMP. However, efforts to regain the function of the river and its ecological attributes so that the most disadvantaged species along the river are not jeopardized with extinction are laudable goals and are fully consistent with the ESA. Operational activities undertaken by federal agencies that may affect threatened and endangered species - which were recommended by the AMP - must be consulted upon with the U.S. Fish and Wildlife Service.

Threatened and Endangered Species of Glen, Marble and Grand Canyons

Southwestern willow flycatcher (endangered)*
Bald eagle (threatened)
Mexican spotted owl (threatened)
California condor (endangered)
Peregrine falcon (recovered)
Humpback chub (endangered)*
Razorback sucker (endangered)*
Kanab ambersnail (endangered)*
Colorado pikeminnow (endangered)*
Bonytail chub (endangered)*
Sentry milk-vetch (endangered)
Siler pincushion cactus (threatened)

*Riverine/riparian species affected by Glen Canyon Dam operations

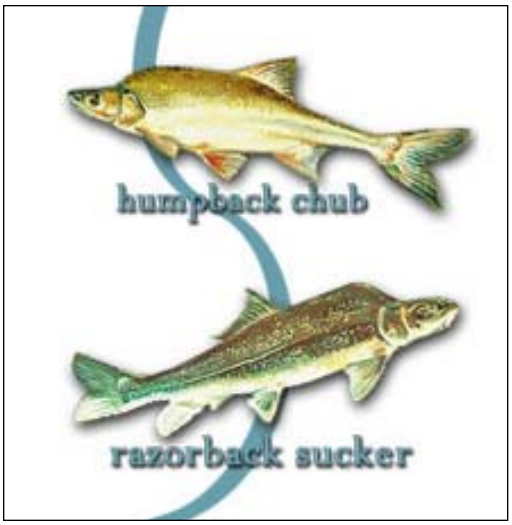
Endangered Species Affected by River Operations

Glen, Marble and Grand canyons are treasure troves of threatened, endangered and recovered species (see inset box). River operations do not affect all of these species. However, flow releases that may affect the southwestern willow flycatcher, humpback chub, razorback sucker and Kanab ambersnail are routinely considered by the AMWG.

Southwestern willow flycatcher

This small, endangered, migratory bird returns to the Southwest to breed each spring and summer. Small populations of southwestern willow flycatchers breed in dense riparian vegetation along the Colorado River in Grand Canyon. Breeding populations use the narrow riparian corridor through the canyon; however, broader expanses of flycatcher habitat are found downstream at upper Lake Mead. Flycatchers tend to breed in dense, young willow and saltcedar stands over water or moist soils. This breeding habitat is dynamic, growing out of suitability and then being rejuvenated or replaced by flood events, or contracting and expanding by scouring and sediment deposition.

AMP efforts to restore sediment deposition through flow experiments create new beaches upon which riparian habitat can become established. While experimental floods may immediately reduce ground cover and low lying branches in some flycatcher habitat, they open new patch areas for establishing dense new plants and can improve habitat in the long term.



Humpback chub[1]

This large (20 in) endangered minnow occurred throughout the Colorado River and its tributaries in Grand Canyon. Among other factors, greatly reduced water temperatures, changes in daily and seasonal river flows from dam operations, and increased competition and predation by non-native fishes aided by dam operations, have detrimentally impacted the humpback chub and other species. Spawning and young survival are primarily limited to the Little Colorado River and areas near the confluence of this tributary with the mainstem river.

The AMP has worked to improve humpback chub populations and we've seen stabilization in this species numbers. The magnitude of daily river fluctuations has been reduced and flow experiments are being conducted to attempt to improve habitat for humpback chub. Trout, carp and other non-native fishes are being mechanically removed from the mainstem river in the vicinity of the Little Colorado River confluence (an area approximately 60 miles downstream of Lees Ferry). Flow and sediment deposition experiments are designed to improve native fish rearing habitat. The Bureau of Reclamation is investigating the feasibility of installing a selective withdraw structure[2] at Glen Canyon Dam that will allow for the flexible release of warmer water more suitable to chub spawning and survival of their young.

Razorback sucker

This long-lived sucker can reach three feet in length and has a prominent "keel" behind its head. It is magnificently adapted to living in the wild rivers of the Southwest - swift and turbulent spring runoffs, low fall and winter flows and prolonged droughts. Yet, razorbacks do not spawn in reservoir-chilled waters. Their young are eaten by non-native species and succumb to competitive pressures of non-native fishes. Razorbacks have become very rare in Grand Canyon, and may be absent; although a reproducing population still occurs in Lake Mead, just downstream.

Many of the AMP programs designed to benefit the humpback chub are also designed to restore conditions essential to a healthy razorback population. Conservation of all native fish in Grand Canyon is a recognized AMP goal.

Kanab ambersnail

This small (3/4 in) terrestrial snail is known to historically occur at only three locations. One is along the Colorado River in Grand Canyon. Vaseys Paradise is a monkey flower- and watercress-dominated area created by a perennial stream flowing from the base of a limestone cliff. The ambersnail is found in this unique habitat. Lower portion of the snail's habitat and snails can be swept way when the Colorado River floods.

In advance of experimental high flows, the AMP established a refugium population of Kanab ambersnails at Upper Elves Chasm in Grand Canyon. Additionally, low-lying sod-like patches of snail habitat have been removed prior to experimental floods and successfully replanted once water levels subside.

[1] See Native Fish Fact Sheet for description of this species and its natural history.
[2] See Glen Canyon Dam Temperature Control Device Fact Sheet.

FINAL REVIEW

ADAPTIVE MANAGEMENT PROGRAM

Using Science to Manage River Resources in Grand Canyon

Sand Bars in the Grand Canyon

Below Glen Canyon Dam, the Colorado River winds for nearly 300 miles through gorges of Glen Canyon and Grand Canyon in one of the most pristine environments in the world. Bordering the river are thousands of sand bars that provide habitat for a fascinating variety of plants and animals, including some endangered species. Native plants and animals are actively protected by the National Park Service, as are camping beaches and archeological features dependent upon the sand bar habitat. Dam operations and management actions impact the sand bars. The Adaptive Management Work Group develops recommendations to conserve and enhance the sand bars of Grand Canyon.

Glen Canyon Dam's Effect on Sand Bars

- **Glen Canyon Dam collects and retains 95 percent of the river's sediment in its reservoir, Lake Powell:** Glen Canyon Dam regulates the flow of water through Grand Canyon, but does not allow the passage of sediment that once built sand bars and formed an important component of the river ecosystem. The Colorado River was once known for its large annual spring floods of extremely muddy water that were "too thick to drink, too thin to plow." Now, with the settling of the sediment in the reservoir, the dam's turbines release clear water throughout the year, resulting in a sediment-deprived system. Without large annual floods in a sediment-rich river, sand bars are not restored, and vegetation encroachment continues to reduce open sand bar habitat.
- **Water releases from the dam fluctuate daily to meet electrical needs:** This fluctuation tends to erode sand bars, which can have an impact on other parts of the river ecosystem.
- **Aquatic and terrestrial ecosystems:** Together with organic nutrients in the sand, this habitat is crucial for the growth and survival of the intricate food web found along the river. Many species evolved through geologic time in this sediment-rich habitat, including the endangered humpback chub, a species still struggling for survival in what remains of its natural habitat. Backwater ponds behind the sand bars are calm, warm water habitats that may prove crucial for the survival of young fish into adulthood.
- **Campsites for river visitors:** With more than 20,000 river visitors annually and river trips that last from seven to 21 days, river users need numerous and well-distributed sand bars of sufficient size for camping. A rocky, barren shore line or one exhibiting severe vegetation encroachment would make river visitation difficult, if not impossible, in this unique and greatly sought after region.
- **Archeological sites:** Many sites are located on the high sand terraces of pre-dam age. Although located above the normal fluctuation level of dam releases, erosion at a number of these sites may be related to the overall decrease in sediment. Appropriate management of the remaining sediment may help preserve these archeological sites, some of which have been in place for thousands of years.

Steps Taken to Restore Sand Bars

- **Glen Canyon Dam release fluctuations:** The Adaptive Management Program continues to study various Glen Canyon Dam release fluctuation patterns designed to slow the amount of sand bar erosion and overall transport of sediment out of the Grand Canyon into Lake Mead. This could provide more dry camping area and enhance cultural sites and riparian habitat, while minimizing impacts to power generation.

- **Artificial floods:** Large tributary streams that enter the river below the dam occasionally flood and deliver large amounts of sand, silt and clay into the river. Scientists have shown that a well-timed "artificial flood" release from the dam stirs up this sediment load and allows it to be re-deposited along the river banks as the water drops following the high release.

- **Sediment augmentation:** Pilot studies are being conducted to determine whether sediment can be dredged from Lake Powell and transported around the dam in order to increase the sediment in the downstream environment.

The sand bars of Grand Canyon are an integral part of the river ecosystem. They are critical to the health of the river habitat, to the recreational resources, and to the irreplaceable cultural sites along the river corridor. Through the Adaptive Management Program, we seek and utilize the best scientific knowledge to achieve the program goals. This includes giving voice to the needs of this sand bar habitat while continuing to build our knowledge of the evolving state of Grand Canyon beaches.

ADAPTIVE MANAGEMENT PROGRAM

Public Outreach Ad Hoc Group Report

AMWG Meeting – Phoenix, AZ

December 2006

POAHG Agenda Items
December 2006 AMWG Meeting

Requesting Approval of:

- **Adaptive Management Program website**

- **Proposed Website Modification Process for determining what future content or materials for posting need AMWG review and approval**

- **Approval of six fact sheets as final for public distribution:**
  - **Lee Ferry Trout Fishery**
  - **Historical Native Fishes of Glen & Grand Canyon**
  - **Temperature Control Device**
  - **Overview of the Colorado River Storage Project**
  - **Endangered Species and the GCD Adaptive Mgmnt. Program**
  - **Sediment & Sandbars in the Grand Canyon**

Update on POAHG Activities

Previous AMWG Actions

Previous Actions Taken by AMWG (March 2006)

AMWG approved as presented:

- **Motion # 1: Design, content & installation of the AMP Stationary Display for the Carl Hayden Visitor Center at GCD**
- **Motion # 2: Layout & functionality of the AMP Website**
- **Motion # 3: Public outreach fact sheets as final, including:**
  - **Cultural Resources**
  - **Recreational River Rafting**
  - **Hydropower and the AMP (graphic only)**

POAHG Presentations

December 2006 AMWG Meeting

- AMP Public Outreach Website link:
  - www.gcdamp.gov
  - Note pre-launch operational considerations
- Proposed Website Modification Process
- Fact Sheets for Final Approval –
  - Lee Ferry Trout Fishery
  - Historical Native Fishes of Glen & Grand Canyon
  - Temperature Control Device
  - Overview of the Colorado River Storage Project
  - Endangered Species and the GCD Adaptive Mgmnt. Program
  - Sediment & Sandbars in the Grand Canyon

AMWG Approval Considerations

Public Outreach Website

Pre-launch Operational Considerations:

- **Final approval of site requested at December mtg.**
- **Content has been extensively reviewed by POAHG**
- **Stylistic input is not being sought as "look, feel & functionality" previously approved by AMWG**
- **Please review site from the perspective of the broad intended public audience**
- **Website designed to accommodate future expansion**

Public Outreach Campaign Priorities & Considerations

Public Outreach Campaign (Phase 1)

<u>Rollout Dates:</u>

- **Completed:**
  - **Stationary Display (GCD): Memorial Day 2006**

- **Upcoming Target Dates:**
  - **DOI approval for launch of entire campaign: Spring 2007**
  - **Soft launch of Website: Spring 2007**
  - **Official Phase I Campaign Rollout: Summer 2007**
    - **Utah Water Users Association**
    - **Outdoor Writers Association**

AMWG Action
December 2006

For Final Approval

- **Motion # 1: AMWG Approves as final the content of the public outreach website**

- **Motion # 2: AMWG approves the proposed Website Modification Process for determining what future content or materials for posting need AMWG review and approval**

- **Motion # 3: AMWG approves the following fact sheets as final for public distribution:**
  - **Lee Ferry Trout Fishery**
  - **Historical Native Fishes of Glen & Grand Canyon**
  - **Temperature Control Device**
  - **Overview of the Colorado River Storage Project**
  - **Endangered Species and the GCD Adaptive Mgmnt. Program**
  - **Sediment & Sandbars in the Grand Canyon**

Public Outreach Campaign
FY 06 POAHG Expenses

FY 06 Expenditures **(Includes $6K for AAB proposal)**	**87,595**
Obligations (Oct. 31, 2006)	**84,290**
Ending balance for FY 06	**6,405**
Beginning budget balance for FY 07	**51,500**
Total available budget for FY 07	**57,905**

Upcoming Issues for Consideration POAHG

- ✓ Long-term Role of POAHG
- ✓ Tribal Outreach Materials
- ✓ Guide Resource Materials
  - Wallet Cards
- ✓ Develop website update policy/protocol
- ✓ Phase II Public Outreach Plan & Projects