



United States Department of the Interior

OFFICE OF THE SECRETARY
Washington, D.C. 20240

W-2000
PRJ-2.00

MEMORANDUM

To: Secretary of the Interior

From: Mark Limbaugh  JAN 26 2007
Secretary's Designee and Chairman,
Glen Canyon Dam Adaptive Management Program

Subject: Report and Recommendations from the Glen Canyon Dam Adaptive Management Program Federal Advisory Committee

The Glen Canyon Dam Adaptive Management Work Group (AMWG) met on December 5-6, 2006, to discuss actions taken to meet responsibilities under the Federal Advisory Committee Act (FACA), the Grand Canyon Protection Act, and the Glen Canyon Dam Environmental Impact Record of Decision. As your designee and chairman of the AMWG, and in accordance with the Group's charter under the FACA, the following recommendations are hereby formally transmitted:

- **Recommend to the Secretary of the Interior to accept the GCMRC Strategic Science Plan dated October 27, 2006.**

The motion was passed by consensus.

Because of its size, the GCMRC Strategic Science Plan is not attached but can be viewed electronically at the Upper Colorado Region Bureau of Reclamation web site. The link to this document is as follows:

http://www.usbr.gov/uc/rm/amp/amwg/mtgs/06dec05/AIF_Science_Plans.pdf

- **AMWG approves the Monitoring and Research Plan (MRP) as a working document to help guide preparation of the FY 08-09 workplan and budget; and recommends to the Secretary of the Interior the GCMRC be charged with (1) addressing the concerns listed in the TWG Minority report in a final FY 07-11 document, and (2) bringing that document to the AMWG for further consideration in the summer of 2007.**

The motion passed by the following vote: Yes = 19; No = 1; Abstaining = 2.

The referenced TWG Minority report is provided as an attachment to this memorandum. Because of its size, the Monitoring and Research Plan is not attached but can be viewed electronically at the Upper Colorado Region Bureau of Reclamation web site. The link to this document is as follows:

http://www.usbr.gov/uc/rm/amp/amwg/mtgs/06dec05/MRP_Nov14.pdf

- **AMWG recommends that the Secretary of the Interior consider the following scope in developing the Long Term Experimental Plan EIS:**

The alternatives should maintain the balance of benefits to all resources as described in the ROD of the Glen Canyon Dam EIS, while focusing on humpback chub and sediment resources. Insofar as they are consistent with this balance and focus, the elements of the alternatives should:

- include a range of flow events, patterns, and timing;
- include non-flow experiments;
- be based on credible science planning;
- maximize hydropower capacity and flexibility to the extent possible; and
- address tribal and cultural resources.

The experiments in the plan should be of adequate (but not excessive) duration to allow the determination of actions needed to sustain and, where possible, improve key resources and the balance of benefits to all resources.

The AMWG also forwards to the Secretary for consideration, four options¹ and the Modified Low Fluctuating Flow regime from the Glen Canyon Dam EIS ROD, as examples of mixtures of flow and non-flow experiments that have been rigorously debated within the Glen Canyon Dam Adaptive Management Program.

The motion was passed by consensus.

The referenced table outlining the four options is provided as an attachment to this memorandum.

- **AMWG recommends to the Secretary of the Interior to charge GCMRC to develop a science plan for a Beach Habitat Building Flow (BHBF) that addresses the concerns raised at the AMWG meeting on December 6, 2006, and AMWG further charges the TWG to work with GCMRC to review the Draft Science Plan and make a recommendation to the AMWG.**

The motion passed unanimously with one abstention (Grand Canyon Trust).

¹ GCMRC, 2006, *Assessment of the Estimated Effects of Four Experimental Options on Resources below Glen Canyon Dam, table E.1, page 3 (USGS, Flagstaff).*

- **AMWG recommends that the Secretary of the Interior approve as final the content of the public outreach website at www.gcdamp.gov; and 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; and that the Secretary approve the following five fact sheets as final for public distribution:**
 1. Lees Ferry Trout Fishery
 2. Historical Native Fishes of Glen and Grand Canyons
 3. Glen Canyon Dam Temperature Control Device
 4. Endangered Species
 5. Sand Bars in the Grand Canyon Recovery Implementation Program

The motion was passed by consensus.

The five fact sheets are provided as attachments to this memorandum.

- **Because the lack of a recovery program for the humpback chub is impeding the progress of the GCDAMP, AMWG recommends that the Secretary of the Interior charge the Fish and Wildlife Service to lead the development of a Lower Colorado River fish recovery implementation program (LCRRIP), to include the humpback chub in Marble and Grand Canyons, by the end of 2008.**

The motion was passed unanimously with one abstention (Hualapai Tribe).

- **The AMWG recommends that the Secretary of the Interior support development of refuges to assist in the conservation of the Grand Canyon population of humpback chub. Developing these refuges needs to be a collaborative effort, among the actions taken for this conservation. Further development and operation of refuges should be led under the auspices of a lower Colorado River fish recovery implementation program when this program is underway.**

The motion was passed by consensus.

- **AMWG accepts and approves the Science Advisors' FY 2007-08 Review and Advisory Services Program as presented.**

The motion was passed by consensus.

The referenced Science Advisors' FY 2007-08 Review and Advisory Services Program are provided as attachments to this memorandum.

8 Attachments

cc: Deputy Secretary

Acting Assistant Secretary, Fish and Wildlife & Parks

Acting Assistant Secretary, Bureau of Indian Affairs

Commissioner, Bureau of Reclamation

Director, National Park Service

Director, Fish and Wildlife Service

Deputy Director, U.S. Geological Survey

Assistant Director, Wildlife Management, Arizona Game and Fish Department,

2221 W. Greenway Road, Phoenix, Arizona 85023-4399

Attention: Bob Broscheid

Bureau of Indian Affairs, PO Box 10, Phoenix, Arizona 85001

Attention: Ms. Amy L. Heuslein

Department of Energy-WAPA, Western Area Power Administration,

150 E. Social Hall Avenue, Salt Lake City UT 84111

Attention: Brad Warren

The Hualapai Tribe, PO Box 179, Peach Springs AZ 86434

Attention: Ms. Loretta Jackson Kelly

Director, Cultural Preservation Office, The Hopi Tribe, PO Box 123,

Kykotsmovi AZ 86039

Attention: Leigh Kuwanwisiwma

National Park Service, Grand Canyon National Park, PO Box 129,

Grand Canyon AZ 86023

Attention: Joe Alston

Navajo Nation, Navajo Nation Inn Office Complex, PO Box 4950,

Window Rock AZ 86515-4350

Attention: Steven Begay

Pueblo of Zuni, PO Box 339, Zuni NM 87327

Attention: Carleton Albert, Sr.

San Juan Southern Paiute Tribe, PO Box 2656, Tuba City AZ 86045

Southern Paiute Indian Consortium, Kaibab Paiute Indian Reservation,

Tribal Affairs Bldg., HC 65 Box 2, Pipe Springs AZ 86022

Attention: Mr. Charley Bullets

State Supervisor, U.S. Fish and Wildlife Service, Arizona Ecological Services
Office, 2321 W. Royal Palm Road, Suite 103, Phoenix AZ 85021-4951
Attention: Sam Spiller

Arizona Department of Water Resources, Office of Colorado River Management,
500 N. Third Street, Phoenix AZ 85004-3921
Attention: Bill Werner

Executive Director, Colorado River Board of California, 770 Fairmont Avenue,
Suite 100, Glendale CA 91203-1035
Attention: Gerald Zimmerman

Colorado Water Conservation Board, 1313 Sherman Street, Room 718,
Denver CO 80203-2279
Attention: Rod Kuharich

Colorado River Commission of Nevada, 555 E. Washington Avenue, Suite 3100,
Las Vegas NV 89101-1048
Attention: Phillip Lehr

New Mexico Interstate Stream Commission, PO Box 25102, Santa Fe NM 87504
Attention: Jay C. Groseclose

Interstate Streams Engineer, Herschler Building, 4-E, 122 W. 25th Street,
Cheyenne WY 82002
Attention: John W. Shields

Director, Division of Water Resources, PO Box 146201, Salt Lake City UT 84114
Attention: Dennis Strong

Grand Canyon Wildlands Council, 7 Teypana Drive, Tijeras NM 87059
Attention: Mr. Max Oelschlaeger

President, Grand Canyon Trust, 2601 North Fort Valley Road, Flagstaff AZ 86001
Attention: Nikolai Ramsey

Federation of Fly Fishers, Northern Arizona Flycasters, 11475 Homestead Lane,
Flagstaff AZ 86004
Attention: Mark Steffen

Grand Canyon River Guides, PO Box 1934, Flagstaff AZ 86002
Attention: Andre Potochnik

Colorado River Energy Distributors Association, 4625 S. Wendler Drive, Suite 111,
Tempe AZ 85282
Attention: Ms. Leslie James

Utah Associated Municipal Power Systems, 2825 E. Cottonwood Parkway,
Suite 200, Salt Lake City UT 84121
Attention: Ted Rampton

Deputy Regional Director, Upper Colorado Region, U.S. Bureau of Reclamation,
125 S. State Street, Salt Lake City UT 84138
Attention: Darryl Beckmann

Regional Director, Upper Colorado Region, U.S. Bureau of Reclamation,
125 S. State Street, Salt Lake City UT 84138
Attention: Dennis Kubly

Minority Report

Date: 12/1/06

To: AMWG and Secretary's Designee

From: Grand Canyon River Guides, Grand Canyon Trust, Grand Canyon Wildlands Council, and the Hopi Tribe.

The TWG representatives from the above listed stakeholders wish to express our objections to the vote and motion on the Long-term Experimental Plan as follows:

1. The EIS process recently initiated by the Department of Interior will require public scoping and development of alternatives. At this time, any preferences expressed by the TWG or AMWG for alternatives that are potentially going to be included in the range alternatives is pre-decisional, ill-timed, and inappropriate.
2. The SPG did not develop a full range of options for consideration or define explicitly the goals for the options (e.g., desired outcomes for all resources and or research questions to be addressed).
3. These proposals are broad conceptual outlines with no detailed experimental plans that follow specific hypothesis-testing procedures. There is no synthesis of projected outcomes when treatments are combined in various ways. There is no acknowledgement and estimation of the scientific uncertainty around the flow options described.
4. The GCMRC scientific assessment and the "economic" assessment presented at the TWG meeting have not been fully discussed nor accepted by the TWG as a fair and accurate portrayal of the options.
5. A full economic assessment, including the effects of the different options on non-use values, has not been conducted.
6. The options have not been assessed in regards to whether they: 1) meet the intent of the Grand Canyon Protection Act (i.e. contribute to the protection of park resources and values as described in the NPS Management Policies and GRCA management plans); 2) comply with the Endangered Species Act; 3) result in progress in meeting the terms of the RPA; or 4) are consistent with other relevant legal imperatives.
7. An objective set of criteria for ranking the 3-4 alternatives was not developed and agreed to by the TWG. There is no uniform rationale that exists for the recommendation.
8. The two TWG motions contradict one another. Motion #1 forwards all current possibilities, including the MLFF alternative. Motion #2 does not consider MLFF in the ranking.
9. Only 15 members voted, 10 abstained (40% of members present). Clearly there was much discomfort about this motion.

We recommend that the AMWG and the Secretary provide clear and unambiguous direction to the TWG to use their time to evaluate scientific and technical issues to inform the AMWG, and refrain from making ad hoc policy recommendations by popular vote.

Table E.1 Summary of flow and nonflow components of the four experimental options under consideration by the Glen Canyon Dam Adaptive Management Program. BASE operations (modified low fluctuating flow regime) are provided for comparison.

| | Flow/Nonflow Treatment | BASE operations | Option A | Option A Variation | Option B | Option C |
|---------------------|---|--|--|--|---|---|
| Flow | Increased daily flow fluctuations | No | Yes (increased by 50% to 66% in winter months and by 25% in summer months) | Yes (increased by 25% to 66% in all months except April and May) | No | Yes (increased by 50% to 66% in winter months) |
| Flow | Stable flows | No | No | No | Yes, (tests of 4, 8, and 12 months) | Yes, (September through October) |
| Flow | Beach/habitat-building flows | Possible, but only under hydrologic triggers | Yes, as tests under sediment input triggering | Yes, as tests under sediment input triggering | Yes, as tests under sediment input triggering | Yes, as tests under sediment input triggering |
| Flow | Alternative ramping rates | No | Yes (hourly downramping rate increased 100% in all months) | Yes (hourly downramping rate increased 100% in Apr-Oct and 167% in Nov-Mar) | No | Yes (hourly downramping rate increased by 100% in Nov-Jul only) |
| Nonflow | Temperature control device | No | Yes | Yes | Yes | Yes, 2 units assumed |
| Nonflow | Control of nonnative coldwater fish | No | Yes, as needed | Yes, as needed | Yes, as needed | Yes |
| Nonflow | Control of nonnative warmwater Fish | No | Yes, as needed, with R&D starting in 2007 | Yes, as needed, with R&D starting in 2007 | Yes, as needed, with R&D starting in 2007 | Yes, with R&D starting 2007 |
| Nonflow | Humpback chub disease/parasite research | No | Yes | Yes | Yes | Yes, with R&D starting 2008 |
| Nonflow | HBC translocation | No | Yes | Yes | No | ¹ Yes |
| Nonflow | Humpback chub refuge(s) | No | Yes | Yes | Possibly | ¹ Yes |
| Nonflow | HBC population augmentation planning | No | Yes, Planning efforts toward implementation, as needed | Yes, Planning efforts and implementation | No | ¹ Yes, planning phase |
| Flow and Nonflow | ² Mini experiments | No | Yes | Possibly | Yes | ¹ Yes |
| Experimental Design | | Not applicable | Reverse Titration | Reverse Titration | Factorial | Forward Titration |

NOTE: 1) For Option C: Ancillary projects not considered part of the main experiment; implementation decision includes consideration of confounding the main experiment. 2) Mini experiments are short-term field experiments that do not confound main experimental treatment effects. For Option C: These experiments are considered undefined concepts and would be incorporated if defined and not in conflict with the main experiment.

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ADAPTIVE MANAGEMENT PROGRAM

Using Science to Manage River Resources in Grand Canyon



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 flies 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.

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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

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Using Science to Manage River Resources in Grand Canyon



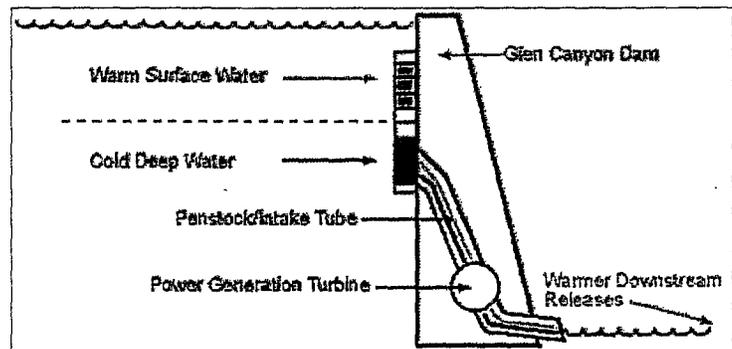
Glen Canyon Dam Temperature Control Device

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

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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.

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.

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

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Sand Bars in the Grand Canyon

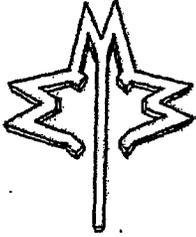
Below Glen Canyon Dam, the Colorado River winds for nearly 300 miles through gorges of Glen Canyon and Grand Canyon in one of the most pristine environments in the world. Bordering the river are thousands of sand bars that provide habitat for a fascinating variety of plants and animals, including some 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.



M3 RESEARCH

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TO: Dr. Kurt Dongoske, TWG Chair
FROM: L.D. Garrett, SA Executive Secretary
DATE: October 24, 2006
SUBJECT: Annual Report: FY 2006 Science Advisor Accomplishments and Proposed FY 2007/2008 GCD AMP Science Advisor Review and Advisory Service Program

**ANNUAL REPORT:
FY 2006 SCIENCE ADVISOR
ACCOMPLISHMENTS and
PROPOSED FY 2007/2008
SCIENCE ADVISOR REVIEW and
ADVISORY SERVICE PROGRAM**

A Fy 2004 amendment to Science Advisor protocol requires an annual report to AMWG of current year accomplishments of SA review and advisory services programs and proposed review and advisory service program for the SAs for the next two years. Fy 2007 is the third year in which the GCD AMP SAs have had their two year program of reviews and advisory services approved by AMWG. Services for the 2007-2008 period may include annual adjustments due to current dynamics in the programs.

FY 2006 SCIENCE ADVISOR ACCOMPLISHMENTS

Science Advisor Replacements

Two Science Advisors positions were open from 2005, and three SAs resigned in 2006 at the end of their appointment period. A proposal by GCMRC to AMWG to reduce the Science Advisor group from 10 to 8 was accepted, and three of the five open positions were refilled. Dr. Harold Tyus, fish/aquatic ecologist from UC Boulder; Dr. Don Fowler, anthropologist from UN Reno, and Dr. Ellen Wohl, geomorphologist from CSU were appointed by the GCMRC Chief as Science Advisor replacements. All three specialists are currently working with existing SAs on review projects.

Continuing SA Appointments are:

Jill Baron, Plant Ecologist, USGS/CSU

Virginia Dale, Systems Specialist, TVA

Lance Gunderson, Adaptive Management Specialist, Emory College

Jim Kitchell, Fish Ecologist, Univ of Wisconsin



- HBC Comprehensive Plan
- HBC Genetics Plan
- GCMRC/GCD AMP Core Monitoring Procedures and Program
- FY 2008/2009 GCD AMP Biannual Work Plans and Budgets
- Risk Assessment of MRP (Experimental Options)
- GCMRC Conceptual Ecosystem Model

Advisory Services

- SA Assessment of overall GCD AMP Effectiveness
- SA Executive Secretary facilitation, coordination, advisory service to GCMRC, AMWG or TWG as defined
- SA Executive Secretary and SAs advisory services to GCMRC, TWG, GCD AMP Ad Hoc on science program implementation, i.e., PEP panels, management/science guidelines etc.
- SAs and Executive Secretary facilitation and development activities on new GCMRC Ecosystem Science Program development, biometrics, and risk assessments reviews, etc.

FY 2008 SA Review and Advisory Services Program

Formal Reviews

- GCD AMP RBT Control Project Evaluation
- GCMRC/GCD AMP Revised Core Monitoring Program Review; Fy 2008
- GCD AMP Management Guidelines Review
- GCMRC/GCD AMP Biannual Work Plan and Budget; Fy 2009-2010

Advisory Services

- Executive Secretary and SA Advisory Service to AMWG, GCMRC, TWG, and GCD AMP Ad Hoc Groups on Science and Management Program Implementation

Requested Budget Level

The GCMRC proposed budget for the SA programs in FY 2007 is \$185,000.00.