

To: Glen Canyon Dam Adaptive Management Work Group (AMWG) Members
From: Secretary's Designee, Assistant Secretary Anne Castle
Date: January 22, 2010
Re: Desired Future Conditions

Dear AMWG Colleagues:

As I committed to you during the call on January 14, 2010 concerning Desired Future Conditions (DFCs) for the Glen Canyon Dam Adaptive Management Program (AMP), attached hereto is the initial draft of the DFCs developed by the five Department of Interior Adaptive Management Work Group agencies. These DFCs address ten different resource categories. The DFCs take into account both the Grand Canyon Protection Act's directive to "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" and its directive to implement the Act in a manner fully consistent with the specified provisions of the Law of the River.

The initial draft DFCs describe the objectives for various resource areas in qualitative, narrative terms, taking into account the fact that we are dealing with an altered ecosystem. These are objectives that the Interior agencies have determined would be our preferred future conditions. The purpose of this first phase in the development of DFCs is to flesh out in qualitative form the future conditions the AMWG would recommend to the Secretary of the Interior for adoption.

We recognize that there may be varying perspectives about the feasibility of achievement of certain of these individual objectives, as well as whether certain objectives are only achievable at the expense of others. In this document, we have not attempted to answer those questions, nor have we considered the expense of attaining any particular objective or performed any type of cost/benefit analysis. I am seeking your input on these broad expressions of preferred conditions. We will have time for discussion at the AMWG meeting on Feb. 3, and I anticipate forming a subcommittee or ad hoc group to put serious effort into the Phase 1 DFCs prior to the following AMWG meeting. At that time, I anticipate that we will have a thoroughly vetted set of DFCs for consideration by the full AMWG.

After qualitative DFCs are in place, the second phase of the DFC process will be the development of quantitative targets that align with the qualitative descriptions. We expect that this development effort will require thorough technical review that takes into account changing climatic conditions, cost, technical feasibility, and the nature of an altered ecosystem due to the existence of Glen Canyon Dam, among many others. In addition, it is clear that there will always be competing considerations and trade-offs among the various parameters that make up a suite of desired future conditions. In the second phase, I expect we will undertake the more difficult tasks of evaluating the Phase 1 DFCs from a technical standpoint to arrive at a better understanding of feasibility and achievability and developing appropriate metrics that would provide additional detail for the Phase 1 parameters.

I look forward to continuing to work with you on these issues and to our discussion on this effort in our upcoming February AMWG meeting.

January 22, 2010
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Department of the Interior
Draft Desired Future Conditions (DFCs) for the Colorado River Ecosystem*
(Based on the Adaptive Management Program Strategic Goals)

**For purposes of these DFCs the Colorado River Ecosystem is defined as the Colorado River and related resources and tributaries from Lake Powell to Lake Mead.*

Introduction

“As outlined in the Grand Canyon Protection Act of 1992, the actions considered in this EIS are intended to protect and mitigate adverse impacts to and improve the natural and cultural resource values for which Grand Canyon National Park and Glen Canyon National Recreation Area were established. Many resources in Glen and Grand Canyons developed in response to conditions created by the dam. Reasonable objectives, developed by the management agencies, are goals for future management of these resources and provide meaning to the terms ‘protect,’ ‘mitigate,’ and ‘improve.’” (1995 Glen Canyon Dam EIS at 54).

Also outlined in the GCPA is section 1802. Protection of Grand Canyon National Park.

(b) Compliance With Existing Law:

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

Section 1806, Rules of Construction, provides:

Nothing in this title is intended to affect in any way –
 (1) the allocations of water secured to the Colorado Basin States by any compact, law, or decree; or
 (2) any Federal environmental law, including the Endangered Species Act (16 U.S.C. 1531 et seq.).

Enforceability

This document, styled as “Desired Future Conditions” is a policy and guidance document. This document is intended to guide, assist and improve the internal and

ongoing efforts of the Glen Canyon Dam Adaptive Management Work Group to assess and prioritize its recommendations in the future, and assist decision-making as part of the Glen Canyon Dam Adaptive Management Program. This document is not intended to, and does not, create any right or benefit, substantive or procedural, enforceable at law or equity by a party against the United States, its departments, agencies, instrumentalities or entities, its officers or employees, or any other person. Nothing in this document is intended to interpret the provisions of federal law or establish enforceable requirements of any kind. This document is not a rule, regulation or requirement of the Department of the Interior, and is only to be used as a guidance document as part of the Glen Canyon Dam Adaptive Management Program.

Management Context

To carry out the direction of the GCPA and 1996 Glen Canyon Dam Record of Decision (ROD), the Department of the Interior (DOI) management agencies have developed 10 desired future condition goals (DFCs) and associated resource condition objectives. These goals and objectives are best realized given the following understandings and collaborative efforts.

- The DOI agencies agree to use the best information (scientific, social, economic, traditional and other) available to inform development of management direction (i.e., adaptive management) and achieve the desired future conditions.
- The DOI agencies agree to use the DOI Adaptive Management Technical Guide as a basis for implementing adaptive management that is consistent with the intent of the GCPA.
- The DOI agencies agree to use an interdisciplinary ecosystem approach to understand how resources respond to internal natural ecosystem drivers, human activities, and outside forces.
- The DOI agencies agree to use objective, scientifically valid and measurable research and monitoring data to assess progress towards attaining the DFCs.
- The DOI agencies agree to develop and implement a management decision process for evaluating tradeoffs among competing goals.
- The DOI agencies agree to maintain an effective stakeholder involvement process that functions on an advisory level to the agencies in fulfilling the requirements of the 1996 Glen Canyon Dam Record of Decision.
- The DOI agencies agree to manage high priority Colorado River ecosystem resources using an ecosystem approach that addresses the interrelationship among resources and natural ecosystem processes.
- The DOI agencies agree each bureau has unique defined responsibilities for the stewardship elements of the adaptive management process and specific resource and land management authorities that need to be met. Through collaboration the DOI agencies agree to respect and integrate those responsibilities into the adaptive management process.
- The DOI agencies agree to resolve issues concerning meeting Federal, Tribal and State (AZ) water quality standards.

- The DOI agencies agree that Government-to-Government consultation is an ongoing and effective protocol in addressing Tribal concerns for resources protection.
- The DOI agencies agree that administrative use, such as management and research activities, is conducted in a manner that is consistent with National Park Service Management Policies (i.e., the use of the minimum tool) and activities are managed in a manner consistent with the preservation of wilderness character of the river environment. Adverse effects and cumulative impacts on natural and cultural resources, as well as the visitor experience, will be minimized.
- The DOI agencies agree to use, learn from, recognize and evaluate Tribal traditional ecological knowledge.
- The DOI agencies agree to manage to sustain key resources and permit recovery and long-term sustainability of key downstream resources while limiting hydropower capability and flexibility only to the extent necessary to achieve recovery and long-term sustainability.

* Management agencies include the Bureau of Reclamation, Bureau of Indian Affairs, U.S. Fish and Wildlife Service, and the National Park Service. The US Geological Survey is a participating DOI agency, but USGS does not take a direct part in management decisions.

Ecological Concerns

There is a need to anticipate the ecological factors beyond our local human control and incorporate that understanding into scientific examination and management actions. For example, climate change is a major ecological concern and considerable uncertainty exists with regard to how climate change will alter the Colorado River ecosystem. Similarly, invasive and non-native species, diseases and/or parasites, and other factors may represent threats to conservation of humpback chub and other native species.

Desired Future Conditions Goals

1. Protect or improve the aquatic food base so that it supports viable populations of desired species at higher trophic levels.

Resource Elements to be addressed:

Biomass & Diversity

Primary producers

Macro-invertebrates

Resource Condition Objectives

- Critical biological elements of the aquatic food web (such as primary and secondary producers, their distribution, and biomass levels of these species in the Colorado River in Grand Canyon) have been determined.

- Critical biological elements necessary to support the aquatic food web are maintained.
- Critical physical elements necessary to support the aquatic food web are maintained. These elements may include, but are not limited to, carbon inputs, nutrients, water temperature, flow conditions and light regimes.
- Important food chain relationships necessary to maintain key terrestrial vertebrate species or species groups (e.g., riparian dependent bats, peregrine falcon, great blue heron, northern leopard frog, and neotropical migrant songbird species prey bases) have been identified and are maintained.

2. Maintain or attain viable populations of existing native fish, and prevent adverse modification to their habitat (including critical habitat).

Resource Elements to be addressed:

Humpback Chub

Critical Habitat

Threats from Non-native

Other native fish

Resource Condition Objectives

Humpback Chub Short-Term Objectives (10 years)

- The Grand Canyon population of humpback chub (including those found in the Little Colorado and Colorado Rivers) is maintained over a 5-year period (starting with the first point estimate acceptable to the Fish and Wildlife Service) such that the trend in adult (age 4+ years) humpback chub estimates and recruitment rates does not decline.
- The mainstem aggregations of humpback chub outside of the Little Colorado and Colorado Rivers are maintained.
- One spawning aggregation of humpback chub outside of the Little Colorado/Colorado River mainstem aggregation is established in an effort to partially restore the historic range of this species. Exact numbers to be targeted for this aggregation are to be estimated based on carrying capacity of the targeted aggregation area.
- At least one spawning aggregation in a tributary of the Colorado River in Grand Canyon other than the Little Colorado River has been established. Target tributaries and numbers of fish will be guided by the carrying capacity of the tributaries.

- Emerging threats are addressed and a contingency plans are developed and implemented, as needed.
- A broodstock management plan is established and being implemented, including the physical and genetic management of a humpback chub refuge population.
- A refuge population has been established in an appropriate facility to reduce or eliminate the potential for a catastrophic loss of the Grand Canyon population by providing a potential permanent source of genetically representative stock for emergency repatriation.
- The primary constituent elements of humpback chub critical habitat are provided and maintained.

Humpback Chub Long-Term Objectives (more than 10 years)

- A humpback chub population and their distribution have been maintained at a level that meets or exceeds short-term targets.
- Significant threats for this recovery unit have been addressed or eliminated (in particular, nonnative fish species have been reduced or controlled to levels that no longer constitute a threat to humpback chub).
- Refuges for humpback chub are maintained and supported.

Other Native Fish Species

- Viable populations of native fish in the river corridor (such as flannelmouth sucker, bluehead sucker and speckled dace) are maintained.
- Viable population numbers and age structure of these species have been determined and utilized to support target levels necessary to meet population maintenance needs.

3. Restore viable populations of extirpated species.

Resource Elements to be addressed:

Colorado Pikeminnow

Bonytail Chub

Roundtail Chub

Razorback Sucker

Northern Leopard Frog

River Otter

Extirpated Species Assessment

Resource Condition Objectives

- Populations of native fish, frogs, mammals, and other species, as appropriate and feasible, are restored.
- Biota in upriver and downriver reaches of the Colorado River have been compared to identify species that may be in decline or absent to support identification of potential extirpated species and to support their re-establishment.

4. Maintain a self-sustaining recreational trout fishery in the Lees Ferry reach.

Resource Elements to be addressed:

Rainbow trout population levels

Native fish population levels

Resource Condition Objectives

- Viable, self-sustaining recreational rainbow trout fishing is maintained in Lees Ferry reach above the Paria River confluence to the extent that the rainbow trout fishery has no significant detrimental impact on native fish populations below the Paria River.

5. Maintain or attain viable populations of the Kanab ambersnail.

Resource Elements to be addressed:

Population levels

Habitat

Resource Condition Objectives

- Maintain viable populations of Kanab ambersnails at Vasey's Paradise and Upper Elves' Chasm.

6. Protect or improve the biotic riparian, wetland, spring and old high water zone plant communities and their associated biological processes within the Colorado River ecosystem (including threatened and endangered species and their habitat).

Resource Elements to be addressed:

Diversity of neo-tropical bird species

Control of exotics

Stand density & diversity

Backwaters & springs

Resource Condition Objectives

- The abundance and distribution of key native plant species (e.g. honey mesquite, catclaw acacia, apache plum, netleaf hackberry, Gooding willow) in both New

High Water Zone (NHWZ) and Old High Water Zone (OHWZ) plant communities is maintained at or above the level of diversity.

- OHWZ vegetation and springs above the NHWZ portions of the Colorado River watershed are maintained in a natural condition with no net loss of native species.
- The functional relationship between the productivity of the aquatic and terrestrial systems in the Colorado River ecosystem is maintained.
- The abundance and distribution of invasive, non-native plant species in the riparian corridor are minimized.
- The natural and beneficial values of wetlands are enhanced with no net loss or degradation of wetlands. It is acknowledged that wetland vegetation may be lost for periods of time in association with beach habitat and high flow tests and/or other environmental factors.
- Restoration plans are developed with a goal of shifting noncompliant areas in a trajectory toward achieving wetland management goals and meeting applicable state and federal requirements.
- The health and stability of plant species of management concern (SOMC) are maintained or improved throughout the Colorado River ecosystem.
- The areal extent of five known habitat patches historically occupied by Southwestern willow flycatchers between River Miles 20 and 75 is maintained.
- Southwestern willow flycatcher marsh habitat (characterized by saturated soil and wetland vegetation) at Kwagunt and Cardenas Marshes is restored.
- Habitat quality is restored to 10 historical Southwestern willow flycatcher territories above the Lake Mead full pool level (elevation 1229'), between River Miles 246 and 278.
- Peregrine falcon abundance and distribution are maintained.
- Peregrine falcon and bat use of riparian and backwater habitats have increased over base-line conditions.
- Nesting and migratory neo-tropical songbird use of native riparian vegetation is maintained.
- The Northern leopard frog's occupied habitats are documented and protected and limiting factors identified.

- Occupancy and productivity of five Mexican spotted owl Protected Activity Centers are maintained.
- Important plant or food chain components necessary to support restoration of biological diversity are identified (as necessary) to support extirpated species if they are determined appropriate for re-establishment.

7. Maintain or attain levels of sediment storage within the main channel and along shorelines to achieve ecosystem goals.

Resource Elements to be addressed:

Sandbars (in the form of campsites, backwaters and other terrestrial/aquatic habitats; such as active dunes, marshes, etc.)

Sand mass-balance that is sufficiently positive to achieve sandbar and related habitat objectives

Cultural resources & native riparian community

Resource Condition Objectives

- High elevation open sand deposits are created and maintained along the Colorado River in sufficient volume, area, and distribution so as to allow transport of fine sediment by wind to other high elevation areas of the river corridor sufficient to sustain native plants, animals, and the cultural resources that depend on the perpetuation of wind blown sand habitat for their continued existence.
- Over the long term a generally positive mass balance of sediment is achieved in the system, recognizing that a negative mass balance (only for short durations) over some time periods (e.g. for short duration high flows) may be required to achieve objectives for sand bars, campsites, and backwater habitats. Specific objectives may include, but are not limited to, abundance, grain size, and distribution, including volume and areal extent.
- Encroachment of NHWZ vegetation into campsite boundaries is minimized.
- Sediment throughout the system is sufficient to enhance near shore habitat and restore riparian function.
- The old high water zone/terrace deposits and a dynamic ecosystem comprised of diverse representative groups of native and riparian vegetation species at different stages of succession and at different elevations above the water line are maintained.
- Emergent marsh vegetation is sustained as a functioning, dynamic resource providing wildlife habitat that change in location and extent in response to flow and geomorphic processes.

8. Maintain or improve the quality of recreational experiences for users of the Colorado River ecosystem, within the framework of ecosystem goals.

Resource Elements to be addressed:

Diversity of opportunity

Quality of experience & education

Wilderness

Recreation & user carrying capacity

Resource Condition Objectives

- A diverse range of quality recreational opportunities for visitors to experience and understand the environmental interrelationships, resources and values of Grand Canyon National Park is maintained. This range of opportunities is consistent with the preservation of wilderness character.
- The wilderness character of the Colorado River corridor is stable or improving.
- The wilderness ecological systems are substantially free from the effects of modern civilization.
- The wilderness character of the river corridor provides outstanding opportunities for people to experience solitude or primitive and unconfined recreation, including values of inspiration and physical and mental challenge.
- The quality, quantity, and distribution of campable areas are maintained for the benefit of the recreation users.

9. Maintain power production capacity and energy generation, and increase where feasible and advisable, within the framework of the Adaptive Management ecosystem goals.

Resource Elements to be addressed:

Energy

Load following

Capacity

Resource Condition Objectives

- When feasible within the framework of the ecosystem goals and in concert with progress toward the DFCs, marketable capacity and energy levels may be increased, if the increases can occur without impacting progress toward achieving the DFCs.

- Forty megawatts of regulation (an instantaneous variation of approximately plus or minus 1200 cfs in the release) is maintained as Glen Canyon Power Plant's share of overall system regulation within the power control area.¹
- Existing emergency criteria at Glen Canyon Dam is maintained for system reliability.

10. Preserve, protect, manage and treat cultural resources for the inspiration and benefit of past, present, and future generations.

Resource Elements to be addressed:

Archeological

Ethnographic

Historic

Cultural Landscapes

TCP's

Sacred places

Access for traditional places

Important Resources

Resource Condition Objectives

- Class I and II archaeological sites remain accessible to users of the river corridor while retaining their significance and integrity. Approximately 90% of Class I sites are stable and require no preservation treatment.
- Class III sites maintain their significance and integrity. At least 60% of Class II and Class III are stable and require no preservation treatment.
- Class IV sites show no impacts from visitation beyond traditional cultural use and show limited impacts from non-human agents of deterioration and maintain significance and integrity.
- Preservation treatments are implemented in a timeframe that does not allow site integrity to degrade and impact mitigation activities are implemented when irretrievable loss is imminent.

¹ Regulation (also called Automated Generation Control) allows for very short instantaneous responses to unanticipated changes in demand on the power grid and is important for power system reliability. At Glen Canyon Dam 40 MW of regulation has historically been maintained. The 40 MW of regulation at Glen Canyon is "zeroed" out over every hour, such that for any given hour the scheduled volume of release is maintained. Because responses under the 40 MW of regulation are very short in duration and zeroed out over the hour, typically, there is no perceptible change in flow at the Lees Ferry gaging station due to the 40 MW of regulation at Glen Canyon Dam.

- The integrity of all National Register eligible or listed historic properties is maintained, in situ where possible, with preservation methods employed on a site specific basis.
- Appropriate types of data recovery is implemented (in consultation with tribes) when integrity is threatened and properties cannot be preserved.

Tribal Resource Condition Objectives

**Recommend that the agencies consult with the Tribes to insure these objectives are consistent with Tribal perspectives.*

- Tribal resources are intact and accessible for traditional uses.
- Traditional Cultural Properties (TCPs) are indentified by Tribes and are protected pursuant to the National Historic Preservation Act.
- Associated groups can access ethnographic resources and places and utilize them in a traditional manner.
- Tribal users will evaluate ethnographic resources to determine which sites are in “good” condition.
- Tribal use values are incorporated into vegetation, wildlife, and other biological and physical monitoring programs.
- Important resources are identified by traditional ecological knowledge sources as developed in cooperation with the Tribes. Traditional ecological knowledge is used, recognized, and evaluated in management decisions.

ACTION: Public Scoping on Interior's proposal to develop an experimental high flow protocol.

SUMMARY: On December 10, 2009, Secretary of the Interior Salazar announced that the Department will undertake an important experimental initiative to improve the management of Glen Canyon Dam and the Colorado River as it flows through Grand Canyon National Park. The Secretary identified the initiative as the development of a protocol for conducting additional High Flow Experiments at the dam, building on knowledge accrued during three previous high flow experiments. Sediment is a primary component of the Colorado River ecosystem, and determining how sand conservation can be achieved has been identified as a high priority by AMWG stakeholders. The Department will develop a trigger for high flow releases that considers tributary sand inputs, as well as duration and timing considerations based on the 2008 HFE results and other information. The Department proposes to conduct a high flow test whenever the trigger conditions are met. This proposed protocol is the next step in determining the extent to which multiple high flows conducted under conditions of sand enrichment result in cumulative net increases in sandbar size. The experimental protocol is intended to develop information that will allow for evaluation of cumulative sandbar building and maintenance under repeated, sand-enriched high-flow experiments.