FINAL DRAFT

Glen Canyon Dam
Adaptive Management Work Group

Ad Hoc Committee on Strategic Planning

Report to AMWG, January 2000
Principles and Goals

At the January 2000 meeting of the Glen Canyon Dam Adaptive Management Work Group (AMWG), you will be asked to adopt a set of Principles and Goals for our program. The Ad Hoc Committee on Strategic Planning recommends the attached document to you for adoption.

We have included the AMWG Vision and Mission in this document because they are an integral part of our strategic planning, and the Goals must be understood in the context of the Vision and Mission. In addition, where a concept or a commitment is included in the Vision, Mission, or Principles, we have not repeated it in the Goals.

We have also added a Glossary to ensure that we all assign the same meaning to some of the words and phrases included in this document. Note that Management Objectives are not detailed here, as the Objectives have not yet been fully developed.

This document consists of the following components, which should be viewed as an integrated whole. Together, they guide the work of the Glen Canyon Dam Adaptive Management Work Group.

- Vision and Mission
- Principles
- Goals and Objectives
- Glossary

VISION AND MISSION

Adopted by the Glen Canyon Dam Adaptive Management Work Group

July 21, 1999

The Grand Canyon is a homeland for some, sacred to many, and a national treasure for all. In honor of past generations, and on behalf of those of the present and future, we envision an **ecosystem** where the resources and natural **processes** are in harmony under a stewardship worthy of the Grand Canyon.

We advise the Secretary of the Interior on how best to protect, mitigate adverse impacts to, and improve the **integrity** of the **Colorado River ecosystem** affected by Glen Canyon Dam, including natural biological diversity (emphasizing native **biodiversity**), traditional cultural properties, spiritual values, and cultural, physical, and recreational resources through the operation of Glen Canyon Dam and other means.

We do so in keeping with the federal trust responsibilities to Indian tribes, in compliance with applicable federal, state, and tribal laws, including the water delivery obligations of the Law of the River, and with due consideration to the economic value of power resources.

This will be accomplished through our long-term partnership utilizing the best available scientific and other information through an adaptive **ecosystem management** process.

PRINCIPLES

The Glen Canyon Dam Adaptive Management Work Group embraces the following Principles. They guided development of the Goals and Objectives for the Glen Canyon Dam **Adaptive Management** Program (GCDAMP). These Principles are:

1. The Goals represent a set of desired outcomes that together will accomplish our Vision and achieve the purpose of the Grand Canyon Protection Act. Some of the Objectives and actions that fall under these Goals may not be the responsibility of the GCDAMP, and may be funded by other sources, but are included here for completeness.

2. The construction of Glen Canyon Dam and the introduction of non-native species have irreversibly changed the **Colorado River ecosystem**.

3. Much remains unknown about the **Colorado River ecosystem** below Glen Canyon Dam and how to achieve GCDAMP **ecosystem Goals**.

4. The **Colorado River ecosystem** is a managed **ecosystem**. An **ecosystem management** approach, in lieu of an issues, species, or resources approach, will guide our efforts. Management efforts will prevent any further human-induced extirpation or extinction of native species.

5. An **adaptive management** approach will be used to achieve GCDAMP **ecosystem** Goals, through experimentation and **monitoring,** to meet the intent of the Grand Canyon Protection Act, the Environmental Impact Statement, and the Record of Decision.

6. Management actions will be tried that attempt to return **ecosystem patterns** and **processes** to their **range of natural variability**. When this is not appropriate, experiments will be conducted to test other approaches.

7. Because management actions to achieve a Goal may benefit one resource or value and adversely affect another, those action alternatives that benefit all resources and values will be pursued first. When this is not possible, actions that have a neutral impact, or as a last resort, actions that minimize negative impacts on other resources will be pursued, consistent with the final Glen Canyon Dam EIS and the Record of Decision.

8. Recognizing the diverse perspectives and spiritual values of the stakeholders, the unique aesthetic value of the Grand Canyon will be respected and enhanced.

GOALS

Category A: Riverine Ecosystem

Goal 1. Protect or improve the aquatic foodbase so that it will support **viable populations** of species at higher trophic levels.

Goal 2. Maintain or attain viable populations of existing native fish and **remove jeopardy** from humpback chub and razorback sucker.

Goal 3. Restore populations of extirpated species, as feasible.

Goal 4. Maintain a wild reproducing population of rainbow trout above Lees Ferry, to the extent practicable and consistent with the maintenance of **viable populations** of native fish.

Goal 5. Establish water temperature, chemistry, and flow dynamics to achieve GCDAMP **ecosystem** Goals.

Goal 6. Increase fine sediment storage within the main channel and along shorelines to achieve GCDAMP **ecosystem** Goals.

Category B: Riparian Ecosystem

Goal 7. Maintain or attain **viable populations** of Kanab ambersnail.

Goal 8. Protect the presence of Southwestern willow flycatcher in a manner consistent with **riparian ecosystem** Goals.

Goal 9. Protect or improve the biotic riparian and spring communities.

Category C: Socio-cultural Resources

Goal 10. Maintain or improve the quality of recreational experiences for users of the **Colorado River ecosystem**, within the framework of GCDAMP ecosystem goals.

Goal 11. Maintain or increase power and energy generation within the framework of GCDAMP ecosystem Goals.

Goal 12. Preserve, manage and maintain **cultural resources** for the inspiration and benefit of present and future generations, while making management decisions in consultation with Agency officials, State and Tribal Historic Preservation Officers, local governments, Indian tribes, and the interested public, as appropriate.

Category D: Administration

Goal 13. Maintain a high quality **monitoring**, research and **adaptive management** program.

Goal 14. Build a broad, effective outreach program.

Goal 15. Broaden the revenue base to achieve GCDAMP Goals and Objectives.

GLOSSARY

Adaptive Management

Adaptive management is an iterative process, designed to experimentally compare selected management actions by evaluating alternative hypotheses about the ecosystem being managed. It consists of three parts: management actions, monitoring, and adaptation. Management actions are treated as experiments subject to modification. Monitoring is conducted to detect the effects of the management actions. Finally, management actions are refined based on the enhanced understanding about how the ecosystem responds.

Biodiversity

Biodiversity is "the variety of organisms considered at all levels, from genetic variants belonging to the same species through arrays of species to arrays of genera, families, and still higher taxonomic levels [including] … the variety of ecosystems… (Wilson 1992)."

Biotic Community

A biotic community is a "group of organisms … that co-occur in the same habitat or area and interact through trophic and spatial relationships…(Lincoln et al. 1998)."

Colorado River Ecosystem

The Colorado River ecosystem is the Colorado River mainstem corridor and interacting resources in associated riparian and terrace zones, located primarily from the forebay of Glen Canyon Dam to the western boundary of Grand Canyon National Park. It includes the downstream inundation level to which dam operations impact physical, biological, recreational, cultural, and other resources. The scope of GCDAMP activities may include limited investigations into some tributaries (e.g., the Little Colorado and Paria Rivers).

Conceptual Model

A conceptual model is an "assessment of the dynamics of the more important compartments and fluxes of material or energy in a system [*i.e*., patterns and processes], or of changes in a population (Lincoln et al. 1998)." A conceptual model is a heuristic tool to provide a framework for thinking about how an ecosystem functions and to discover gaps in our knowledge.

Cultural Resources

Cultural resources includes, but is not necessarily limited to, any prehistoric or historic district, site, building, structure, landscape, or object included in, or eligible for inclusion in the National Register, including artifacts, records, and material remains related to such a property or resource. Properties of traditional religious and cultural importance to an Indian tribe are included in this

definition under Section 101(d)(6)(A) of NHPA.

Ecosystem

An ecosystem is "a community of organisms and their physical environment interacting as an ecological unit (Lincoln et al. 1998)." An ecosystem consists of patterns and processes that are dynamic and occur within a particular range of temporal and spatial variability.

Ecosystem Integrity

Ecosystem integrity is "the ability to support and maintain a balanced, integrated, adaptive biological system having the full range of elements (genes, species, and assemblages) and processes (mutation, demography, biotic interactions, nutrient and energy dynamics, and metapopulation processes) expected in the natural habitat of a region (Karr 1996)." Ecosystem integrity is related to ecosystem resilience (*i.e.,* the capacity to maintain characteristic patterns and processes) following a disturbance.

Ecosystem Management

An ecosystem management approach differs from an issue-, species-, or resource-specific approach. Ecosystem management is a method for sustaining or restoring ecosystems and their functions and values. "It is goal driven, and it is based on a collaboratively developed vision of desired future conditions that integrates ecological, economic, and social factors. It is applied within a geographic framework defined primarily by ecological boundaries (Interagency Ecosystem Management Task Force 1995)." Ecosystem management is a process that attempts to mimic appropriate ecosystem patterns (abundance and distribution of species and habitats) and ecosystem processes (drivers of ecosystem patterns). It includes managing for viable populations of all native species.

Ecosystem Patterns

Ecosystem pattern is the abundance of species, biotic communities, and physical habitats, as well as their spatial and temporal distribution. This is a broader concept than "composition and structure." Composition usually refers only to species presence or absence, and structure usually refers to the distribution of biotic communities.

Ecosystem Processes

Ecosystem processes are the abiotic (*i.e*., non-living) and biotic (*i.e.,* living) functions, disturbances, or events that shape ecosystem patterns. There are physical processes (*e.g.,* fire, hydrologic, geomorphic, and climatic regimes; air chemistry, nutrient cycling), biological processes (*e.g.,* competition, predation, herbivory, parasitism, disease, migration, dispersal, gene flow, succession, recruitment, maturation), and anthropogenic processes (*e.g.,* habitat conversion, novel toxins, vandalism).

Monitoring

Monitoring is the "collection and analysis of repeated observations or measurements to evaluate changes in condition and progress toward meeting a management objective (Elzinga et al. 1998)." Monitoring needs to produce data of sufficient statistical power to detect a trend if in fact it is occurring (Gibbs et al. 1998). Monitoring differs from inventorying, which is the measurement of environmental attributes at a given point in time to determine what is there. It also differs from research, which is the measurement of environmental attributes to test a specific hypothesis.

Range of Natural Variability

The Range of Natural Variability is the spatial and temporal variation in ecosystem patterns and ecosystem processes under which the ecosystem has evolved. The range of natural variability for ecological processes is usually defined by their frequency (e.g., number/year), intensity (e.g., cubic feet per second), duration (e.g., number of days), magnitude (e.g., acres), seasonally, and rate of change. See Landres (Landres et al. 1999) for a full discussion.

Reasonable and Prudent Alternative

"Reasonable and prudent alternatives refer to alternative actions identified during formal consultation that can be implemented in a manner consistent with the intended purpose of the action, that can be implemented consistent with the scope of the Federal agency's legal authority and jurisdiction, that is economically and technologically feasible, and that the [Regional] Director believes would avoid the likelihood of jeopardizing the continued existence of listed species or resulting in the destruction or adverse modification of critical habitat (Fish and Wildlife Service and National Oceanic and Atmosphere Administration 1986)."

Reasonable and Prudent Measure

"Reasonable and prudent measures refer to those actions the [Regional] Director believes necessary or appropriate to minimize the impacts, i.e., amount or extent of incidental take (Fish and Wildlife Service and National Oceanic and Atmosphere Administration 1986)."

Recovery

Recovery is improvement in the status of a listed species to the point at which listing is no longer appropriate, under the criteria set out in section 4(a)(1) of the Endangered Species Act (Fish and Wildlife Service and National Oceanic and Atmospheric Administration 1986).

Removal of Jeopardy

To "jeopardize the continued existence of [a listed species] means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species (Fish and Wildlife Service and National Oceanic and Atmosphere

Administration 1986)." Removing (or avoiding) jeopardy is done through the implementation of reasonable and prudent alternatives.

Riparian Ecosystem

The riparian ecosystem is the streamside zone that is influenced by riverine processes, e.g., flood regime and distance to subsurface water.

Riverine Ecosystem

The riverine ecosystem is any area typically inundated by the river.

Viable Population

A population is considered viable when there is a high chance of persistence over a long timeframe without demographic or genetic augmentation. Population viability is not the same as "recovery" or "removal of jeopardy" for a species. However, the concept of population viability is an important consideration in determining recovery and removal of jeopardy.

References

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