AMP Narrative of Desired Future Resource Conditions

Introduction

The strategic plan for the Glen Canyon Dam Adaptive Management Program (AMP) is based on the premise that key elements of natural ecological processes can, to a sufficient degree, be simulated by management actions to achieve desired future resource conditions for the Colorado River ecosystem (CRE)[1]. In addition, the principles developed by the Adaptive Management Work Group (AMWG) explicitly recognize that Glen Canyon Dam and its provision of water and power resources are an integral part of this ecosystem. The operation of Glen Canyon Dam has altered the natural processes and habitat that support the natural, physical, and cultural resources of the CRE.

The biological and physical attributes of the river prior to dam construction, introductions of nonnative plants and fish, and other recent human alterations represent the conditions under which the natural, physical, and cultural resources in the CRE developed. The AMP seeks to return resource conditions of the CRE to a more natural state. It is assumed that management actions that restore elements of these conditions, consistent with the Grand Canyon Protection Act, "Law of the River," NPS Organic Act (and amending legislation), the operational flexibility of the dam, and other guiding legal imperatives, will improve conditions of the CRE.

The AMP desired future resource condition for the CRE centers on maintaining viable populations and communities of native plants and animals while retaining valued components of the post-dam system. We desire a CRE, including the dam and humans, that is dynamic in nature and is temporally punctuated by flow events such as BHBFs, HMFs, LSSFs, daily/monthly hydropower operations, and tributary flows. Adaptation to these events (i.e., disturbance regimes), will predominately influence the structure and composition of the plant and animal communities within the CRE, as well as recreational quality and the protection of cultural values within the corridor. Thus individual

[1] The Colorado River ecosystem is defined as 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, a distance of approximately 293 river miles (Figure 1).

resources will vary both spatially, depending on their location in the CRE, and temporally depending on the nature (i.e., timing, magnitude, duration, periodicity) of the event. **See Figure ?** for a portrayal of these temporal effects. The desired future resource conditions described below represent the AMP vision for what will result from successful implementation of the AMP strategic plan.

Desired Future Aquatic Resource Conditions

We envision a system where ROD flows significantly increase the productivity of the aquatic environment, maintaining the nature of the aquatic plant and invertebrate food base to the benefit of naturally reproducing rainbow trout in the Lees Ferry reach and native fish throughout the CRE. Viability of native fish populations is not constrained or threatened by non-native predation or competition. Except for the Lees Ferry population of rainbow trout, positive efforts continue to control numbers of non-native fish. Below the Paria River, the Colorado and its tributaries support a community of viable, self-sustaining, native fish populations that benefit from purposeful variations in dam releases. The ROD tests both flow and temperature variables in the determination of the full extent to which the Dam can continue to be used as a tool to manage the CRE.

Water quality varies through time and space dependent upon dam releases and tributary flows, greatly influencing the aquatic environment. The most conspicuous changes result from sediment-bearing tributaries. The Paria and Little Colorado rivers produce major amounts of fine sediments during floods. Other ungaged tributaries, with their sporadic floods, continue to add their sediment contributions to the flow. These fine clays, silts, and sands entering the Colorado dramatically alter the character of the CRE below the Paria. The native species, adapted to the pre-dam extremes, continue to persist and flourish within this dynamic environment.

This system allows anglers to experience quality fishing, native fish communities to remain viable and healthy, and our grandchildren to enjoy the CRE as the experience of a lifetime.

Desired Future Riparian Resource Conditions

We envision a resource that varies longitudinally and temporally down river in response to substrate geomorphology, water availability, climate and the disturbance regime. System disturbance is largely controlled flooding by the operations of Glen Canyon Dam. Managed floods are triggered if sufficient sand is available for redeposition. Such flooding within the CRE preserves the variability of system disturbance and supports native plant and animal communities and their habitats.

The natural communities native to the Grand Canyon dominate the riparian ecosystem. The area above the high-water line of major floods supports native riparian communities dominated by Apache plume above river mile 40, and mesquite-acacia below river mile 40. Below the high-water line, broad sand beaches sparsely vegetated with native herbaceous species dominate the scour zone.

The frequency associated with the presence/absence (coming or going) of riparian features, such as ephemeral communities is directly correlated with the frequency of flood events. As large flows reset the system and force plant communities back to earlier successional stages, a patchwork mosaic of open beaches and vegetated zones is created. There is a dynamic mix of both pre- and post-dam riparian communities, such as the old high-water zone (OHWZ), new high-water zone (NHWZ), and bare sand beaches and marshes. Managed beach/habitat-building flows (BHBFs) enhance the OHWZ community species and bare sand beaches. In years without flood disturbance, the NHWZ community and marshes flourish. (See Figure ? for a diagram of how the channel cross section might change with time).

Non-native species, where present, are not dominant, and do not impair the abundance, composition, and distribution of natural communities nor alter the natural processes that shape these communities. However, aggressive management action may have been used to accomplish this.

The vertebrates native to the CRE dominate the ecosystem. Native species resident to the CRE exist as viable populations. The natural processes imposed by species that were transient to the CRE, then extirpated, are mimicked by the creation of small resident populations or other management actions.

As dynamic riparian communities change, we continually assess our protection of endangered species from the perspective of threshold levels of habitat that will not jeopardize the future existence of the species.

Desired Future Cultural Resource Conditions

The future for cultural resources affected by Glen Canyon Dam operations envisions these resources preserved, protected, and interpreted where feasible; and all future resource management activities and decisions based on principles of stewardship, accountability, consultation, and public education and outreach. All sites unaffected by dam operations are left to the natural processes of erosion and deposition.

Desired Future Recreational Resource Conditions

We envision the CRE with an appropriate spectrum of recreational activities within the context of a full wilderness setting. Available activities include hiking, fishing, boating and river running, photography, wildlife viewing, etc. Specifically, visitor experiences emphasize the appreciation of wilderness values.

The nature of recreational camping beaches changes from year to year as sediment is deposited and eroded. When high runoff years occur, large magnitude BHBFs, two or three times power plant capacity, deposit sand high on the banks available for visitor use. When low runoff years occur, fall habitat maintenance flows (HMFs) redistribute fall tributary sediment inputs above normal, daily power plant releases.

Recreational activities do not impair the aesthetic, ecological, cultural and spiritual values of the Grand Canyon, but provide deep appreciation for these values. Visitors accept the river "on its own terms" and celebrate the primitive conditions of one of the seven wonders of the world.

Recreational opportunities are enhanced and research activities have minimal impact on the CRE. A high value is placed on the extensive wilderness qualities of the river corridor. The CRE is remarkable in the length and breadth of its unbroken primitive character. It provides unique opportunities for experiencing the natural sounds and natural quiet of the desert and river. Opportunities for solitude, connection to nature, and personal contemplation outside the trappings of civilization are deeply valued.

Desired Future Water and Power Resource Conditions

Glen Canyon Dam and the Power Plant continue to operate in a manner consistent with the "Law of the River," including the Grand Canyon Protection Act. The Upper Basin States develop their compact allocations of water and deliver water to the Lower Basin States as required by compact. The power plant operates to maximize the value of the power resource consistent with the resource balancing anticipated in the EIS, ROD, and the operating criteria established by the Secretary. Operating criteria continue to be modified as the result of long-term monitoring of their effects and further research, through the adaptive management process.