LOWER Grand Canyon RIVER CORRIDOR
MANAGEMENT PLAN

HUALAPAI INDIAN RESERVATION

Prepared by:

Dr. Kerry Christensen
Mr. Dave Wegner
Mr. Donald E. Bay

Hualapai Tribe

Department of Natural Resources

P.O. Box 300

Peach Springs, Arizona 86434

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1.0 BACKGROUND

The Hualapai Indian Reservation was established on January, 4th, 1883 by an Executive Order by then President of the United States, Chester Arthur. The legal description of the land set aside for the Reservation states that the northern boundary of the Reservation is “to a point on the Colorado River and hence along said river”. The Hualapai Tribe interprets this language to mean that the northern boundary of the Reservation is the middle of the Colorado River. While this interpretation has been disputed by the U.S. National Park Service and others, the Tribe maintains its position, and this interpretation also appears on government topographic maps from the 1960’s.

Over the last twenty years, there has been a significant increase in tourism, visitation and utilization of resources in lower Grand Canyon on the Hualapai Reservation. This increased use has escalated impacts to the natural and cultural resources of the tribe and has led to a need for a plan to direct protection and management of these resources while allowing the tribe to enhance economic development in lower Grand Canyon. In addition, neither Grand Canyon National Park nor Lake Mead National Recreation Area has plans that address protection or management of the resources of the Hualapai Tribe. For these reasons, this management plan has been developed by the Hualapai Tribe to establish policies and procedures for the myriad of activities that occur along the river in lower Grand Canyon involving both Hualapai Tribal Members and the General Public. This plan has taken into account the requirements of the Clean Water Act, Clean Air Act, Wetland Protection Act and other pertinent legislation. As the tribe has developed and implemented their own ordinances regarding protection of these vital resources, we believe that the union of those ordinances with this plan will best protect the water and natural and cultural resources of the lower Grand Canyon River Corridor on the Hualapai Reservation.
1.1 Process for Plan Development

This plan has been developed in cooperation and coordination with a variety of outside entities including Grand Canyon National Park, Lake Mead National Recreation Area, the U.S. Fish and Wildlife Service, Arizona Game and Fish Department, Grand Canyon River Guides, Grand Canyon Resort Corporation and others. We have also conducted public meetings following the release of this document in draft form and have incorporated comments from the public where appropriate.

1.2 Relationship to GCNPS and LMNRA Plans

This management plan is designed to be implemented independently of any other management plans for Grand Canyon National Park or Lake Mead National Recreation Area. Through cooperation with Grand Canyon National Park and Lake Mead National Recreation Area in development of this plan, however, we believe that we have incorporated the views of these agencies where they did not conflict with the wishes of the Hualapai Tribe. We hope that continued communication with outside agencies will allow for fine-tuning of the plan and for cooperative implementation.

2.0 INTRODUCTION

2.1 Purpose and Need

The purpose of this document is to define an overall perspective for activities and operations of Tribal, governmental and public entities in lower Grand Canyon on the Hualapai Reservation. This plan is needed to avoid conflicts and trespass resulting from unauthorized and/or illegal actions affecting the natural and/or
cultural resources of the Hualapai Tribe and to ensure that requirements of the Clean Water Act, Clean Air Act and Hualapai Ordinances are met along the lower Grand Canyon River Corridor on the Hualapai Reservation. This plan also outlines processes that allow access to lower Grand Canyon and provides direction for the lawful enjoyment of the wonders of the Hualapai Reservation in Grand Canyon. The plan includes descriptions of the natural resources of lower Grand Canyon including wildlife, vegetation, camping and hiking opportunities as well as hydrologic conditions and other factors affecting these resources.

2.2 Geographic Scope

The geographic scope of this plan encompasses the Colorado River, its southern bank (within the zone of riparian vegetation) and its tributaries (to the extent of day use) extending from National Canyon at river mile 165.0 to the western boundary of the Hualapai Reservation at approximately river mile 276.7 (Figure 1). Utilization and protection of the resources on the northern border of the river are not included in this plan.

2.3 Jurisdiction

The Hualapai Tribe has jurisdiction over the lands and waters of the Colorado River in Grand Canyon from river mile 165.0L to 276.7L (Figure 1). Nothing in this plan forfeits the Hualapai Tribe’s sovereignty.

2.4 Relevant Tribal Codes and Ordinances

In addition to various state and federal laws, several tribal codes and ordinances dictate the conditions concerning many of the allowable activities and management actions in lower Grand Canyon on the Hualapai Reservation. The tribal codes and ordinances are attached to this document as appendices and
are referenced at appropriate sections within this document. These documents include the Wildlife Conservation Ordinance 24-70, Cultural Resources Ordinance, Agriculture Ordinance, Water Resources Ordinance, Wetlands Ordinance, Air Quality Ordinance, Tribal Environmental Review Code and the Tribal Law and Order Code.

### 3.0 GENERAL MANAGEMENT OBJECTIVE

The Hualapai Tribe’s general management objective is to protect, maintain and enhance the natural and cultural resources of lower Grand Canyon while allowing for sustainable, multiple consumptive and non-consumptive uses of those resources by current and future generations.

Specific management objectives relating to these resources will be identified below under the appropriate sections.

### 3.1 Management Constraints

Following are constraining factors, which, because of law, policy, regulation or circumstance, have influenced the development of existing management activities of lower Grand Canyon on the Hualapai Reservation.

2. Provisions identified in the 1996 Glen Canyon Dam Operations Environmental Impact Statement (EIS) have been implemented. The Hualapai Tribe was a cooperating Agency in the EIS process.
3.2 Management Considerations

1. The Hualapai Tribe seeks to further develop additional Memorandums of Understanding with the National Park Service and other Federal and State entities for future management of the lower Colorado River corridor and the resources that it supports.

2. The tribe seeks funding to support a river ranger position for the lower Colorado River corridor.

3. Reaffirmation of the permitting abilities of the Hualapai Tribe for the use of tribal resources by river recreationists along the lower Colorado River corridor.

4. Develop a specific air and water management plan for the lower Colorado River corridor.

5. The desire of the Hualapai Tribe to enhance economic development in the lower Grand Canyon River Corridor on the Hualapai Reservation.

4.0 SOCIOECONOMICS

4.1 Recreation

The majority of the income that the Hualapai Tribe receives results from tourism
activities on the Hualapai Reservation. In the lower Grand Canyon River Corridor, the Hualapai Tribe realizes income from the Hualapai River Running operation, commercial river running companies, private rafting trips, helicopter tours, power boat tours, camping, fishing and sightseeing. While the tribe wishes to increase the level of income from these activities, protection of the natural and cultural resources is also of utmost importance to the tribe. In this section, we describe the ongoing recreational activities that occur in lower Grand Canyon and the tribe’s position regarding management of these activities. Please note that all fees described in this document are subject to change by the Hualapai Tribal Council.

4.1.1 Rafting

Present Commercial Rafting Activities: The Grand Canyon Resort Corporation (GCRC) presently operates under authority granted by the Hualapai Tribe. The purpose of GCRC is to create and manage economic development and to enhance the quality of life for the Hualapai people while conserving and promoting cultural and natural resources for the Tribe (Article VII.A Federal Charter). River recreation in the lower Colorado River corridor is managed by the Native Outfitters of Arizona - Hualapai also referred to as the Hualapai River Runners.

GCRC is presently marketing two types of day river trips along the lower Colorado River corridor. No overnight trips are currently marketed, but they have occurred in the past and may occur in the future.

1. Whitewater trip from Diamond Creek to Grand Canyon West with a takeout at River Mile 266. Clients disembark at the takeout at RM 266 and are taken by helicopter to Grand Canyon West. Passengers generally depart Diamond Creek at 9 am and arrive at RM 266 at approximately 2:00 PM.
2. An afternoon and evening smooth water trip from River Mile 266 to Pearce Ferry. Scenic Airlines and Heli USA Airways have a concession with the Hualapai Tribe to transport passengers from the helipad at River Mile 266 to Grand Canyon West where they are either bused or flown back to Peach Springs or Las Vegas.

**Current Use Levels.** There are 14,400-19,200 river seats to marketed during the six to eight month river recreation season. These seats are marketed through direct marketing to the Las Vegas market and from drive-ins or *Free and Independent Travelers*. For the 2000 season, the use numbers are increasing with approximately 60% of the sales occurring over the phone. Currently, sales are at a 25-30% load factor. Private charter trips can be provided at a rate of $4,000.00 for eight people. Currently, one-day trips downstream constitute 95% of the GCRC river recreation market. The other 5% are for upstream use (RM 225 to 217).

Concessionaires providing commercial trips originating at Lee’s Ferry and taking out at Diamond Creek currently pay a fee of $18.50 per person to the Hualapai Tribe. Private river trips are also allowed by the Hualapai Tribe. Currently, $18.50 is charged per vehicle for accessing the river at Diamond Creek. An additional $18.50 is charged per person for private trips. These fees allow the visitors to camp on the Hualapai side of the river and to fish. These permits can be obtained from Hualapai River Runners (at the Hualapai Lodge).

All raft trips that camp on the south shore of the river between river mile 165.0 and 276.5 must have a porta-potty or other facility to accept human waste. Urinating on the ground on the south shore of the river on the Hualapai Reservation is prohibited. Permitted rafters are allowed to utilize the restroom
facilities at Spencer Beach so long as the facility remains functional.

Any campfire must be contained within a barbecue pan or similar container that prevents the coals from touching the ground or vegetation. Littering on the south side of the river on the Hualapai Reservation is punishable by a minimum fine of $150. Higher fines can be imposed at the discretion of the Hualapai Tribal Council.

4.1.2 Boating from Lake Mead

Boating up into lower Grand Canyon is permitted upstream to Separation Canyon without a permit from the Hualapai Tribe. If, however, a boater wishes to come ashore on the Hualapai Reservation, a permit is required. To obtain a permit, contact the Hualapai Wildlife Conservation Office at 520-769-2227 or at P.O. Box 249, Peach Springs, Arizona 86434. Boats entering the Hualapai Reservation will be expected to adhere to the safety equipment and registration regulations as described above for rafts. Discharge of gas, oil or other pollutant into the river or on shore is prohibited as described in the Hualapai Tribe’s Water Resources Ordinance (Appendix 2).

4.1.3 Fishing

Tribal Members are not required to obtain a fishing permit except for fee fishing areas if established. Non tribal members are required to obtain a Tribal fishing permit to fish the waters of the Colorado River if they fish from the southern shore of the river on the Hualapai Reservation. Permits may be obtained from the Wildlife Conservation Office as described above.

The number of fish allowed in possession is determined annually by the Hualapai Tribal Council following a recommendation by the Wildlife, Fisheries and Parks Program Manager in April. Currently, eight game fish (as defined
in the Wildlife Conservation Ordinance 24-70; Appendix 1) of any species are allowed in possession by a valid permit holder. Fish can only be taken with a fishing rod using a single hook with not more than three barbs. It is illegal to possess native fish (humpback chub, razorback sucker, speckled dace, flannelmouth sucker or blue-head sucker) without the appropriate scientific collecting permit subject to penalties as outlined in the Wildlife Conservation 24-70 Ordinance (Appendix 1).

Fish may be taken using nets and/or by electrofishing for scientific purposes only and only by those in possession of a scientific collecting permit issued by the Hualapai Department of Natural Resources. The department can be contacted at 520-769-2255, P.O. Box 300 Peach Springs, Arizona 86434. Otherwise, all regulations established in the Hualapai Tribe’s Wildlife Conservation Ordinance 24-70 apply regarding the taking of fish.

4.1.4 Hunting

Hunting of waterfowl is permitted on the Colorado River on the Hualapai Reservation with a valid permit obtained from the Hualapai Wildlife Conservation Office and a Federal Migratory Bird stamp. Hunting of big and small game are permitted as dictated in the Hualapai Wildlife Conservation Ordinance 24-70 (Appendix 1).

4.1.5 Camping

Camping along the Colorado River on the Hualapai Reservation is allowed with a valid camping permit and as described in the Hualapai Wildlife Conservation Ordinance 24-70. Campers at Spencer Beach from May 1 to August 15 of each year are encouraged to not disturb nesting Southwestern Willow Flycatchers within the vegetated areas of the beach. Campers at Spencer Beach are not
allowed to travel more than 100 yards upstream in Spencer Canyon from the confluence with the Colorado River.

4.1.6 Camping Beaches

Any beach on the Hualapai Reservation can be camped on if the camper is in possession of a valid camping permit issued by the Hualapai Wildlife Conservation Department and if the health and safety measures described above are observed. Camping on a beach occupied by Hualapai River Runners is not allowed without consent of the Hualapai River Runners boatmen present at the beach.

4.1.7 Bird Watching

Bird watching on the Hualapai Reservation in the lower Grand Canyon Corridor is permitted with a valid sightseeing permit issued by the Hualapai Wildlife Conservation Department (as described above). Bird watchers are discouraged from harassing Southwestern Willow Flycatchers wherever found. No nests shall be disturbed of any species subject to a minimum $300 fine as described in the Wildlife Conservation Ordinance 24-70 (Appendix 1).

4.1.8 Swimming

Swimming is allowed in the Colorado River on the Hualapai Reservation only while wearing a Hualapai Tribe approved life preserver (Coast Guard approved). Swimming or sitting in pools in Spencer Creek is prohibited beyond 100 yards upstream from the confluence with the Colorado River.

4.1.9 Hiking
Hiking in the Lower Grand Canyon River Corridor on the Hualapai Reservation is limited to National Canyon, Mohawk Canyon, Peach Springs Canyon and Travertine Canyon with the appropriate permit. These hikes must originate from the Colorado River. Hikes originating on the rim of the canyon fall under the authority of the Hualapai Wildlife Conservation Department and as dictated in the Wildlife Conservation Ordinance 24-70 (Appendix 1).

4.1.10 Helicopter Tours

Grand Canyon Resort Corporation permits and monitors helicopter tours of Grand Canyon West, Quartermaster Canyon and at the ramadas along the river below Quartermaster Canyon. A recent Labor Day survey of the ramada area showed that 72 helicopters landed in one 24 hour period at the ramadas and two of the upper Quartermaster landing sites. This survey did not count the shuttle landings taking clients from the ramadas to Grand Canyon West. As discussed below, this plan proposes that composting restrooms be constructed at the ramadas and at the upper Quartermaster helipad sites for sanitation purposes.

4.1.11 Concessionaire Boat Tours

At the ramadas along the river below Quartermaster Canyon, the Tribe has contracted with Orient Enterprises to provide boat tours from the ramadas up and down the Colorado River. The current contract with the concessionaire is for a five year period. The tours generally last for 30 minutes.

4.2 Grand Canyon West

The Hualapai Tribe in conjunction with Grand Canyon Resort Corporation operate a tourist destination at Grand Canyon West on the northwestern end
of the Hualapai Reservation. Opened in 1982, tourists are treated to a barbecue lunch and breath-taking views of Lower Grand Canyon and the Colorado River. The facilities consist of an airstrip, terminal building, gift shop and a covered dining area. Tours originate at the terminal where buses take visitors to Guano Point where the meals are served. Tourists are told about the Hualapai people, the canyon and their lands and customs.

The majority of tourists arrive by way of bus from Las Vegas, Nevada. Airplanes and private cars also deliver visitors to Grand Canyon West. Currently, over 100,000 tourists visit Grand Canyon West per year.

4.3 Cattle Operations

Cattle are not permitted in the Lower Grand Canyon Corridor. Trespass livestock are dealt with in the Agriculture Ordinance 2B (Appendix 5).

4.4 Commercial Film and Video Permitting

With consent from the Hualapai Tribal Council, film makers are allowed to make films of Lower Grand Canyon on the Hualapai Reservation. All rules and regulations that apply to the general public are also applicable to film making crews.

4.5 Major Socioeconomic Management Issues and Concerns

Issue 1: At some level of recreational use, visitor experience and the condition of natural and cultural resources in lower Grand Canyon begin to be compromised.

Situation: One objective of GCRC is to increase revenues to the Hualapai Tribe through increases in the number of visitors to lower Grand Canyon. With increasing
visitation, the natural and cultural landscapes can become impaired due to the physical presence of people and due to their activities (e.g. hiking, trampling). In addition, with increased numbers of visitors, the quality of the recreational experience can decline (e.g. too many helicopters diminishes the natural quiet of the canyon).

**Considerations:**
- The specific management objective of the Hualapai Tribe with regard to recreation is to maximize the amount of economic benefit to the tribe while providing a quality experience for the visitors and while protecting the natural and cultural resources of the Hualapai Reservation in lower Grand Canyon.

**Solution:** The Hualapai Tribe and GCRC need to begin to understand the tradeoffs between economic development, visitor experience and natural and cultural resource condition by implementing a survey questionnaire program to assess the quality of the visitor experience, to determine whether visitors would be willing to pay more for a higher quality experience (e.g. fewer visitors and helicopters) and to determine whether the number of visitors (people and helicopters) could actually increase. In addition, it is imperative to monitor the condition of natural and cultural resources (e.g. sand beaches, water quality, litter) at attraction sites to better understand the effects of recreational visitation on these resources.

**Issue 2:** While considerable numbers of visitors are brought to the ramadas adjacent to the river below Quartermaster Canyon and to the landing areas on the mesa above Quartermaster Canyon, no sanitation facilities are present to serve the visitors and helicopter pilots.

**Situation:** Significant amounts of human waste and toilet paper are being deposited at the ramada and boat tour area that not only poses a potential health problem, but also litters the lands of the Hualapai Tribe. In addition, when the level of Lake Mead
rises, the waste material may be washed into Lake Mead causing substantial impairment of this water body.

**Considerations:**
- The recreational experience of visitors to these facilities is negatively affected by
  1) they have no restroom facility to relieve themselves and
  2) the presence of waste and toilet paper detract from the enjoyment of their experience.

**Solution:** Composting toilets, much like the one currently in use at Spencer Beach, should be constructed at the ramadas and on the mesa above Quartermaster. These restroom facilities should be maintained on a monthly basis.

**4.6 Socioeconomic Management Recommendations**

1. Determination of use levels for the lower Colorado River corridor and implementation of permitting system that matches the number of available beaches and to avoid overcrowding of attraction sites.

2. Implementation of a visitor education program for people visiting the Hualapai Reservation. This may include printed material, presentation by Hualapai Tribal members and guiding activities

3. Develop use levels for the number of people who are brought into the lower Colorado River corridor during the recreation season.

**5.0 BIOLOGICAL RESOURCES**
5.1 Wildlife

5.1.1 Birds

Over 30 bird species nest in Lower Grand Canyon on the Hualapai Reservation (Christensen 1997a) including the endangered Southwestern Willow Flycatcher. In 1997, the highest densities of birds were documented since studies commenced in 1993. Unfortunately, funding to continue these studies was not available from 1998 to present. The most common species are Lucy’s Warbler, Bell’s Vireo, Yellow-breasted Chat, Song Sparrow, Bewick’s Wren, Canyon Wren, House Finch and Yellow Warbler. Threatened and endangered birds will be discussed below.

While considerable numbers of birds live in the riparian vegetation in Lower Grand Canyon, loss of riparian vegetation from inundation by Lake Mead (Christensen et al. 1996) and from beaver damage are threatening bird populations. Fewer and fewer birds will likely be supported in the future. Management actions that reduce the loss of vegetation in the canyon must be implemented to reverse this trend. We advocate a beaver trapping program, as discussed below, to reduce beaver populations to more manageable numbers. In addition, we propose riparian restoration activities that restore populations of Goodding’s and coyote willow. The Hualapai Native Tree Nursery will hopefully provide trees for planting at appropriate locations on the river. We will seek funding for these activities from appropriate federal, state and tribal agencies.

5.1.2 Mammals

Several small mammal species inhabit the banks and adjacent uplands in Lower Grand Canyon. Cactus mice (Peromyscus eremicus), rock pocket mice
(Perognathus intermedius) and desert woodrat (Neotoma lepida) are the most common species. Striped skunk (Mephitis mephitis), spotted skunks (Spilogale putorius) and ringtail cats (Bassariscus astutus) are the most common medium sized mammals and bighorn sheep (Ovis canadensis), mule deer (Odocoileus hemionus), coyote (Canis latrans) and mountain lions (Felis concolor) are the common large mammals.

In small mammal studies from 1994 and 1995, rock pocket mice were the most abundant small mammal captured followed by cactus mice and desert woodrats (Christensen 1995). Desert woodrats were more likely to be captured along upland transects compared to transitional or riparian habitats. The abundance of small mammals was also greater at upland transects compared to the other habitats.

Little is known about medium and large mammals except for desert bighorn sheep. Discussions of this species are given below.

Management actions for small mammals include maintenance of riparian and upland vegetation to the extent possible. Other requirements for sustained populations of these animals include maintenance of good water quality in the streams and springs and limiting encroachment by humans.

5.1.3 Herpetofauna

Tree lizards (Urosaurus ornatus), side-blotched lizards (Uta stansburiana) and desert whiptail lizards (Cnemidophorus tigris) are the most common lizards in Lower Grand Canyon (Christensen 1995). Western diamondback (Crotalus viridis) and Grand Canyon pink rattlesnakes (Crotalus viridis abyssus) are common snakes in the canyon. Red-spotted toads (Bufo punctatus) are the most common amphibian.

Management actions for the herpetofauna in Lower Grand Canyon include
maintaining water quality and quantity in tributaries and the Colorado River and in limiting encroachment by humans. In addition, maintenance of riparian vegetation is critical to the support of reptile populations.

5.1.4 Native Fish

Alteration of the native riverine ecosystem of the Colorado River on the Hualapai Reservation by construction of Glen Canyon and Hoover Dams and introduction of non-native fishes has dramatically affected native fish populations (Minckley 1991). Razorback sucker (*Xyrauchen texanus*), humpback chub (*Gila cypha*), Colorado pikeminnow (*Ptychocheilus lucius*) and bonytail (*Gila elegans*) are native fish that once flourished in the Colorado River on the Hualapai Reservation, but are now federally listed as endangered (U.S. Fish and Wildlife Service 1997). In addition, the flannelmouth sucker (*Catostomus latipinnis*), bluehead sucker (*Pantosteus discobolus*) and speckled dace (*Rhinichthys osculus*) are considered threatened by the state of Arizona and the U.S. Fish and Wildlife Service.

The major effects of the presence of the dams was to decrease sediment loads, decrease water temperature and temperature variability, stabilize discharge patterns, affect channel morphology and facilitate habitation by non-native predatory fish. The reduced water temperatures negatively affect the ability of native fishes to successfully reproduce in the mainstem of the river such that successful reproduction by native fishes typically only occurs in tributaries of the Colorado River.

In 2000, the Glen Canyon Dam Adaptive Management Program (GCDAMP) initiated experimental low, steady-summer flows in an attempt to improve conditions for the survival of juvenile young of the year native fish; primarily humpback chub. Here, discharges from Glen Canyon Dam were reduced to a steady 8,000 cubic feet per second (cfs) for a three month period beginning in early May. This experiment is
designed to increase water temperatures and improve near-shore habitats to improve survival of young chubs entering the Colorado River from the Little Colorado River. This experiment could, however, also reduce survival of young, native-fish by encouraging upstream travel by non-native predators due to the warming of the water. At the time of writing this document, this experiment was still being conducted.

It is believed, however, that physical changes in the riverine environment following dam construction have fewer effects on native fish populations compared to interactions with non-native fishes (Minckley 1991, Valdez and Carothers 1998). Predation by channel catfish (*Ictalurus punctatus*), striped bass (*Morone saxatilis*), green sunfish (*Lepomis cyanellis*), largemouth bass (*Micropterus salmoides*), rainbow trout (*Onchorhynchus mykiss*), brown trout (*Salmo trutta*) and potentially other species have led to a dramatic decline in the survival of juvenile native fishes (Valdez and Carothers 1998).

The Hualapai Tribe’s management objectives for native fish are to 1) reduce predation and competition from non-native fishes by actively removing non-natives using trammel nets, seines, electrofishing and angling. We are currently seeking funding for these activities from various federal, state, local and tribal agencies, and 2) continue our participation in the GCDAMP to assist in their efforts to enhance and recover native fish populations.

5.1.5 Exotic Fish

Numerous species of exotic fish occur in the Lower Grand Canyon ecosystem including striped bass (*Morone saxalis*), channel catfish (*Ictalurus punctatus*), green sunfish (*Lepomis cyanellis*), carp (*Cyprinus carpio*), fathead minnow (*Pimephales promelas*), plains killifish (*Fundulus kansae*), red shiner (*Notropis venustus*) and largemouth bass (*Micropterus salmoides*). In general, these species are known to negatively affect reproduction and survival of native fish such as those described above. Several of
these species do, however, provide challenging sport fishing opportunities.

In an effort to reduce the impacts of non-native fish on native fishes in lower Grand Canyon, the Hualapai Tribe plans to initiate a non-native removal program that focuses on channel catfish, carp, striped bass, red shiner and fathead minnow. Given funding, the tribe will contract agents to remove individuals of the above named species using seines, trammel nets and through electrofishing throughout the Colorado River on the Hualapai Reservation. In addition, the Hualapai Tribe encourages the take of these species in lower Grand Canyon through angling according to limits set by the Hualapai Tribe.

5.1.6 Desert Bighorn Sheep

Desert bighorn sheep are sacred to the Hualapai people, and only a few individuals are harvested each year to help support the Hualapai people. Hunting of bighorn sheep occurs during two hunts, one in November and one in December. In general, hunters do not use the Colorado River corridor for access to trophy sheep. Occasionally, however, a hunter may desire access to a particular area by way of the river or it may be necessary to use the river to access an animal that has been shot from above. These activities are allowed given the appropriate permits are in possession.

Desert bighorn sheep are a common sight along the river corridor and provide excellent photo and wildlife viewing opportunities. Sheep are often seen coming to the river to drink in moderate numbers. The downstream reaches of Lower Grand Canyon seem to facilitate access to the river for sheep compared to the upstream reaches.

Management activities associated with desert bighorn sheep include vigorous prosecution of non-sanctioned hunting (poaching), limitations of human introgression into the canyon, removal of non-native ungulates such as burros and wild horses and maintenance of spring vegetation and water supplies throughout the canyon. The
sheep population is monitored annually through helicopter surveys of the entire Lower Grand Canyon on the Hualapai Reservation. It is the wishes of the tribe to increase the numbers of desert bighorn sheep to the carrying capacity while ensuring the availability of trophy animals. From 1994 to 2000, the average number of sheep counted on the Hualapai Reservation was 348 with an average of 18 trophy males counted each year.

5.1.7 Mule Deer

Mule deer (*Odocoileus hemionus*) occur throughout the Hualapai Reservation with fewer animals occupying areas along the steep canyon walls compared to the upper plateau. They are listed as common, however, throughout the Colorado River Corridor by Stevens (1983).

The Hualapai Tribe only allows tribal members to hunt mule deer and only during specified seasons. Each tribal member is allowed to take two antlered mule deer each year although in actuality; Tribal Members rarely take two in a year.

Management objectives for mule deer in Lower Grand Canyon include removal of exotic ungulates such as burros and wild horses, maintenance of spring vegetation and water supplies and limitation of predator populations such as coyotes and mountain lions. Bounties are usually in place for these two predators.

5.1.8 Insects

A great variety of insects occur in Lower Grand Canyon, many of which are undescribed in the Hualapai literature. In general, the Hualapai people regard insects as pests, but recognize their importance in the chain of life as food for higher organisms such as birds and small mammals. At this time, there are no management activities anticipated for insect populations in Lower Grand Canyon. In the future, however, if insect nuisance problems arise because of dam operations or for other reasons, the Hualapai Tribe will
develop management strategies for their control.

5.1.9 Crayfish

Crayfish (*Procambarus clarkii* and *Orconectes virilis*) inhabit the Lower Grand Canyon ecosystem as introduced exotic pests. These organisms feed on young native and non-native fish and their eggs. The Hualapai Tribe has an objective to limit the numbers of these animals wherever they occur on the Hualapai Reservation and encourage their harvest. If their numbers become a nuisance, the Hualapai Tribe will develop management strategies to limit their numbers.

5.1.10 Beavers

Historically, beavers (*Castor canadensis*) were relatively rare or even non-existent in the mainstem Colorado River in lower Grand Canyon due to the sparsity of riparian vegetation and because of the catastrophic floods that occurred in the canyon prior to completion of Glen Canyon Dam in 1963. Since completion of the dam, riparian vegetation has expanded dramatically and in 1995, lower Grand Canyon had some of the most extensive stands of riparian vegetation in the southwestern U.S. (Christensen et al.1996).

Beavers now have no natural enemies and at this time do not appear to be limited by the amount of food resources available. Because of this, their numbers have expanded dramatically and they are now having a significant impact on the riparian vegetation in lower Grand Canyon (K. Christensen, personal observation). We estimate that 150-250 beavers reside in lower Grand Canyon and that they have felled over 10,000 trees (mostly Goodding’s willow) since 1996.
The management objective for beavers in lower Grand Canyon is to reduce the number of beavers and thereby reduce the amount of riparian vegetation that is being impacted. To achieve this objective, we propose that a beaver management plan be prepared that outlines steps and methods for beaver control. In addition, we propose restoration of riparian vegetation that has been affected by beaver herbivory.

5.1.11 Feral Animals

Wild burros (*Equinus assus*), horses (*Equus equus*) and sometimes cattle (*Bovis bovis*) occupy side canyons of Lower Grand Canyon. The Hualapai Tribe regards these animals as pests as they compete with native ungulates such as desert bighorn sheep and mule deer for forage, water and cover. In 1998 and 1999, the Hualapai Department of Natural Resources received funding to remove feral burros and horses from both Spencer and Mohawk Canyons. Fifty burros and three horses were removed from Spencer Canyon and 37 wild horses were removed from Mohawk Canyon. While a few individuals of both species still occur in those canyons, the majority have been removed. Countless other individuals still roam other side canyons of the Colorado River in Lower Grand Canyon.

The Hualapai Tribe has constructed numerous fence lines in side canyons of the river in an attempt to prevent their access to the river, and for the most part, have been very successful in their elimination. The tribe will continue to seek funding to remove feral animals from side canyons of the river whenever they become a nuisance. In addition, the Hualapai Tribe continues to seek funding to fence springs and riparian areas to protect their valuable resources from the effects of over grazing by feral animals.

5.2 Threatened and Endangered Species

5.2.1 Southwestern Willow Flycatcher
In 1997, nesting Southwestern Willow Flycatchers (*Empidonax traillii extimus*) were first documented in lower Grand Canyon on the Hualapai Reservation (Christensen 1997b). Since then, successful nests have been located every year (Christensen 1998-2000). In addition to nesting pairs, individual males without mates have been located each year. The birds have been found primarily in Goodding’s willow (*Salix gooddingii*) habitat and a few in tamarisk (*Tamarix chinensis*).

As a management activity, the Hualapai Tribe will soon initiate a tamarisk eradication program at one site along the river on the Hualapai Reservation. Tamarisk will be chainsawed, piled and burned followed by an application of Garlon-4 to the stumps. Native trees grown at the Hualapai Native Plant Nursery will then be planted to replace the tamarisk. This pilot project will be evaluated for application to other stands along the river on the Hualapai Reservation.

Another management activity that the Hualapai Tribe hopes to engage in is beaver management. Beavers have no natural enemies in lower Grand Canyon, and their numbers have grown so that they are now significantly impacting riparian vegetation. We are currently seeking funding to remove beavers for the lower canyon and to revegetate stands that have been negatively affected by beaver herbivory.

The Hualapai Tribe also reserves the right to restrict access to certain beaches and areas in lower Grand Canyon when human disturbance of nesting flycatchers becomes a problem. All federal laws that apply to migratory song birds also apply on the Hualapai Reservation.

5.2.2 Bald Eagle

Bald Eagles (*Haliaeetus leucocephalus*) occasionally utilize the lower Grand Canyon corridor for travel and foraging. All federal laws that apply to Bald Eagles also apply on
the Hualapai Reservation. Currently, no management activities have been identified for Bald Eagles on the Hualapai Reservation.

5.2.3 Peregrine Falcon

Peregrine Falcons (*Falco peregrinus*) commonly utilize the lower Grand Canyon corridor for travel and foraging. All federal laws that apply to Peregrine Falcons also apply on the Hualapai Reservation. Currently, no management activities have been identified for Peregrine Falcons on the Hualapai Reservation.

5.2.4 Humpback chub, razorback sucker, bonytail chub, flannelmouth sucker, bluehead sucker and speckled dace

Of these fishes, the humpback chub, razorback sucker and bonytail chub are federally listed endangered species while the flannelmouth sucker, bluehead sucker and speckled dace are considered threatened by the Hualapai Tribe and others. Humpback chubs are only occasionally found in the Hualapai stretch of river while the razorback sucker and bonytail chub are considered extirpated from lower Grand Canyon (Rich Valdez, personal communication). Flannelmouth sucker and bluehead sucker can be found in certain areas in moderate abundance. Speckled dace are most abundant in tributaries of the Colorado River including Spencer Creek. Razorback suckers may be reintroduced into a Hualapai tributary in 2001 depending on their rate of growth in the tribe’s Native Fish Rearing Facility.

The management objectives for these fishes is to improve their abundance and reproduction on the Hualapai Reservation. We propose to achieve this objective through removal of non-native fishes in the system as described above and through protection of their habitats. The latter especially refers to tributaries such as Spencer Creek. This management plan provides provisions for the protection of these habitats.
(e.g. no swimming beyond 100 yards in Spencer Creek from the Colorado River confluence).

5.3 Vegetation

5.3.1 General Overview

In 1995 and 1996, the Hualapai Department of Natural Resources conducted a study to inventory riparian vegetation from Spencer Creek to Pearce Ferry in lower Grand Canyon (Christensen et al. 1996). We documented the presence of over 2,660 hectares of riparian vegetation consisting of wet marsh, dry marsh, Goodding’s willow, coyote willow, arroweed, tamarisk, seep willow and grassland (Appendix 9). This study included both sides of the river.

Since that time, the elevation of Lake Mead steadily increased thereby inundating and submerging much of this vegetation. The majority of the willows in the stretch from river mile 269.0 to Pearce Ferry were killed by this inundation (K. Christensen, personal observation). As mentioned above, many of the willows above river mile 269.0 have been killed by beavers.

In the spring of 2000, the elevation of Lake Mead began to drop and at the time of the writing of this document the lake is at an elevation of 1,195 feet. Due to this drop in lake elevation, many new beaches have been exposed, and they are currently being colonized by a variety of plant species. At this time, it appears that the new beaches adjacent to stands dominated by tamarisk are being colonized by tamarisk while the new beaches adjacent to stands dominated by willow are being colonized by willow. We have established permanent vegetation plots on four of these new beaches (21 plots total), and we will continue to monitor plant succession at these sites over time.
It is the management objective of the Hualapai Tribe to reduce the amount of exotic vegetation (primarily tamarisk) in lower Grand Canyon and replace it with native Goodding’s willow. The tribe is currently performing a demonstration project at river mile 241.5L where we will remove tamarisk from the beach and replant with native willows and mesquite. Results of this demonstration project will dictate future eradication activities. As described above, another management objective is to protect the riparian vegetation through the removal of beavers from the system.

5.3.2 Camelthorn

Camelthorn (Alhagi camelorum) is a noxious weed that occurs in many areas along the river, but is especially a problem at Granite Park. The management objective for camelthorn is to eradicate it from wherever it occurs on the Hualapai Reservation. Unfortunately, an effective method of eradication has not been developed (A. Phillips, personal communication).

5.3.3 Marshes

Marshes that occur in the lower Grand Canyon river corridor on the Hualapai Reservation benefit from full protection under the Hualapai Wetlands Ordinance (Appendix 3). The main marshes in the river corridor on the Hualapai Reservation include Spencer Creek, Lost Creek and Quartermaster Canyon. The management objective for marshes is to preserve and enhance these wetlands in any manner possible. A complete description of marshes located in the Colorado River Corridor on the Hualapai Reservation is available from the Hualapai Department of Natural Resources (P.O. Box 300, Peach Springs, AZ 86434).

5.3.4 Ethnobotanical Resources
5.4 Major Biological Management Issues and Concerns

Issue 1: How will the biological resources along the lower Colorado River corridor be managed to ensure that the values are protected for the benefit and enjoyment of the Hualapai Tribe and the public?

Situation: The Hualapai Tribe manages the lower 108 miles of the of the Grand Canyon as the lower Colorado River corridor. Eight species of native fish, fifteen species of non-native fish, twenty-six mammal species, twenty-seven species of amphibians and reptiles, and over 250 bird species have utilized and been observed along the Colorado River corridor. These species depend upon physical habitats, food, and a sustainable ecosystem if they are to survive. Protection of the ecological integrity of the lower Colorado River corridor is dependent upon sustaining the physical and biological processes.

Considerations:
- Interactions between people, wildlife and their habitats needs to be managed.
- The Endangered Species Act and Hualapai Tribal Ordinances protect threatened and endangered species, general wildlife and their habitats.

Solution: Several management actions have been identified to protect and enhance biological resources in the lower Grand Canyon river corridor. First, removal of exotic fishes from the lower canyon is important to the preservation and expansion of native fish populations. Second, reduction of the beaver population is necessary to preserve and enhance riparian vegetation in the lower canyon. In addition, removal of tamarisk and planting of native willows will further the enhancement of riparian vegetation. Third,
maintenance and improvement of water quality through protection of springs and reduction of fecal coliform contamination from human waste are necessary to protect all wildlife. Fourth, removal of feral animals will improve and protect wetlands and their associated water qualities and enhance forage for native wildlife species. Finally, management of recreational visitors will help preserve the natural environment for the betterment of the Hualapai Tribe and the general public.

6.0 PHYSICAL RESOURCES

6.1 Water Quality of the Lower Colorado River Corridor

The Hualapai Tribe has been working with the Environmental Protection Agency, Region IX and the U.S. Bureau of Indian Affairs for the last eight years to identify and implement water quality management and control activities within the reservation. Watershed Attainability studies, wetland management, and Water Quality Assessment Reports (305(b)) have been completed. The results of these studies have identified the importance of watershed management on the Hualapai Reservation.

Within the Hualapai Reservation, most of the observed and potential contamination of water is natural in origin. Secondary ore deposits scattered throughout the reservation along with community development and livestock activity account for localized point and non-point sources of pollution. Current Glen Canyon dam operation and fluctuating Lake Mead elevations contribute to the modification of the riparian corridor along the lower Colorado River corridor to the detriment of the natural and cultural resources on the reservation.

Total dissolved solids in the lower Colorado River corridor are generally above the U.S. Environmental Protection Agency secondary maximum contaminant level of 500 mg/l for drinking water along the Colorado River and are typically much higher than the level
at scattered areas across the remainder of the reservation. Concentrations of arsenic, mercury, lead, sulfate, chloride, and radon have exceeded drinking water standards or proposed regulations at selected areas across the reservation.

Water samples taken from the Colorado River at Spencer Beach have tested positive for fecal coliform contamination since 1998. These samples have tested negative, however, for *E. coli*. Sources of this contamination include livestock, feral burros and horses and human waste. A composting restroom was constructed in 1999 at Spencer Beach to alleviate the deposition of human waste at the beach. The restroom is currently receiving moderate use and is functioning properly.

### 6.1.1 Mainstem

Discharge rates and water quality of the mainstem water of the Colorado River in lower Grand Canyon are largely determined by releases from Glen Canyon Dam. As mentioned above, the Hualapai Tribe has been monitoring fecal coliform levels in the mainstem at Spencer Beach since 1998 and have found continuous contamination since that time. In addition, the Arizona Department of Environmental Quality identifies sediment as a significant impairment to the mainstem river. The management objective of the Hualapai Tribe is to decrease levels of fecal coliform contamination through the installation of restroom facilities at major attraction sites and removal of feral burros and horses from side canyons. To reduce sediment inputs into the river the Hualapai Tribe is also installing silt traps at Milkweed Canyon and elsewhere on the reservation.

### 6.1.2 Tributaries

Diamond Creek, Spencer Creek and Quartermaster Creek are the primary perennial tributaries of the Colorado River on the Hualapai Reservation. These tributaries support a great diversity of wildlife and fish and have significant cultural importance to the tribe. The management objective for these tributaries is to maintain good water quality, marsh
and riparian habitats and reduce the level of invasion by exotic plants and animals. As mentioned above, the tribe is currently evaluating the efficacy of the removal of exotic tamarisk, and we also hope to remove non-native carp and catfish from these tributaries.

6.1.3 Springs

Numerous springs issue from various locations on the Hualapai Reservation and drain into the Colorado River. These springs support a variety of wetland vegetation and wildlife and are of significant cultural importance to the Hualapai people. A complete description of the springs and their associated water quality parameters is available from the Hualapai Department of Natural Resources (P.O. Box 300, Peach Springs, AZ 86434).

6.1.4 Stream Gauges

Stream gauges are located at Diamond Creek, Truxton Wash and Spencer Creek on the Hualapai Reservation. These gauges are continuously monitored by the U.S Geological Survey. Those data are available on the Survey’s web site at www.usgs.gov. The gauge data is currently being used in modeling groundwater recharge.

6.2 Major Water Quality Management Issues and Concerns

Issue 1: Degrading water quality in the Colorado River in the lower Grand Canyon corridor concerns the Hualapai Tribe. What management decisions and actions can be
taken to protect the water quality conditions along the lower Colorado River corridor?

**Situation:** The lower Colorado River corridor water quality is defined by upstream water delivery, inflow from the watershed, and in-river recreation use. Degrading water quality results from both point and non-point pollution sources along the Colorado River corridor.

**Considerations:**

- Federally approved Hualapai water quality criteria should be used as the parameters by which to measure the condition of the water resources
- Allowing any diminishing of the lower Colorado River water quality would impair the biological productivity of the fisheries habitat
- Decreased water quality would have negative impacts on the natural scenic and recreation experience in the lower Colorado River corridor.

See the Hualapai Water Resources Ordinance for additional considerations (Appendix 2).

**Solution:**

- First, to eliminate fecal coliform contamination, composting toilets should be constructed at the helipads above Quartermaster Canyon and the ramadas below Quartermaster Canyon.
- Second, removal of feral horses and burros from side canyons of the Colorado River will reduce non-point source pollution. Third, use of four-stroke motors on motorized rafts will reduce the level of hydrocarbon pollution, and
- finally, installation of silt traps and check dams at major side canyons will reduce the level of sediment input to the Colorado River.

6.2.1 Water Quality Management Recommendations
Opportunities for management for the protection of the water quality of the lower Colorado River corridor include:

- Development of a watershed based approach to management of the sources of water to the lower Colorado River corridor.
- Identification of critical water sources for the lower Colorado River corridor
- Increased monitoring of water quality conditions in the lower Colorado River corridor including mainstem sampling
- Development of increased toilet facilities at selected areas along the lower Colorado River corridor
- Implementation of health standards for river recreationists along the lower Colorado River.

### 6.3 Sediment

Sediment is defined as unconsolidated material derived from the weathering of rock and transported and deposited by water or wind. Glen Canyon dam has caused three major changes related to sediment resources downstream in Glen and Grand Canyon. The first is the loss of sediment supply due to the reservoir trapping of approximately 95% of the inflowing sediment to the Colorado River. The second major impact is the reduced capacity for the river to transport sediment downstream. The pre-dam high flow levels that used to transport sediment downstream are now reduced to levels that only transport the fine silts and clays. The third major impact is the reduced level of the high water deposition zone due to restricted annual high flows. The end result has been a reduction in the depositional area of the sand deposits.

Sediments and beaches have been identified as critical resources to the lower Grand Canyon corridor (Kearsley and Warren 1993). The following sediment resources are impacted in the lower Colorado River corridor due to the operations and management of Glen Canyon dam:
Sediment in the lower Colorado River corridor is a dynamic resource, which defines and supports the aquatic, terrestrial and cultural resources. Most of the sediment that now supports the lower Colorado River is derived from tributaries that enter the Grand Canyon below Glen Canyon dam. Through complex processes, sediment from the river is transported, deposited and eroded along the river.

The most abundant sediment size class in the lower Colorado River is sand. This sand is utilized as campsites by recreational and commercial boaters, supports important cultural areas, and provides substrate for riparian and aquatic habitats. The Colorado River is predominantly a cobble and gravel-bed stream through which sand is transported. The sand that does occur in the canyon corridor is stored in patches on the riverbed and in the eddies (Graf et al., 1993).

The reduction in the annual peak flows has reduced the Colorado River's ability to transport sand. Prior to closure of Glen Canyon dam the average annual suspended sand, silt and clay mixture at Phantom Ranch was 85.9 million tons (1941-1957). Since closure of the dam in 1963 the annual average has been reduced to an estimated 11 million tons. Of this 11 million tons, approximately 70% of it comes from the Little Colorado and Paria Rivers.

The beaches along the lower Colorado River corridor are primarily composed of sand.
sized materials. Limited sand today enters the lower Colorado River corridor and therefore the remaining sand is of limited supply. The amount of sand that is capable of being stored in the river channel and along the river corridor is dependent on the supply provided from upstream sources from tributaries and from that stored along the channel bottom. Sand on the riverbed is the primary source of beach building materials and can only be mobilized for redistribution during high flow events.

The major points of sediment delivery to the Colorado River below Glen Canyon dam are:

- Paria River
- Little Colorado River
- Bright Angel Creek
- Kanab Creek
- Diamond Creek
- Spencer Creek

In addition to the perennial tributaries, approximately 525 ungaged tributaries periodically add additional sediment to the river. The frequency of occurrence of these ephemeral streams adding sediment to the river is approximately 1 to 4 times every 100 years.

6.3.1 Lower Colorado River Corridor Sediment Zones.

The hydraulic characteristics of the lower Colorado River corridor determine its ability to transport and store sediment. In the lower river corridor and along the Hualapai reservation the canyon can be separated into three main sections:

- River mile 160-213.8 – wide width (310 feet average) with an average depth of 19 feet, a slope of 6.9 feet per mile with 32 percent of the bed composed of bedrock and boulders.
• River mile 213.8-236 – narrow canyon (240 foot average) with an average depth of 30 feet, a slope of 8.4 feet per mile with 58 percent of the bed composed of bedrock and boulders.
• River mile 236-278 – widening canyon with reservoir deltaic deposits that vary in thickness with reservoir elevation.

6.3.2 Sandbars and Sediment Deposits Along the Lower River Corridor.

Sandbars found along the lower Colorado River corridor are dynamic. They vary in size and durability based on the flow regimes from Glen Canyon dam and resuspension of sediment from the riverbed. Rates of deposition and erosion vary with Glen Canyon dam releases, tributary sediment supply, the amount of sediment stored in the river channel and eddies, and the local channel hydraulics.

In the lower Colorado River corridor along the Hualapai tribe’s area of influence, the size and number of beaches has decreased since the closure of Glen Canyon dam (Kearsley and Warren, 1993). The experimental high flow release of 1996 temporarily increased the size and volume of lower canyon beaches due to redeposition of sands from the river bed. Following the return to a more normal flow regime release pattern at Glen Canyon dam, however, the beaches quickly reverted back to their pre-high release form and volume.

High elevation terraces along the lower Grand Canyon corridor support native vegetation and contain buried or partially buried archeological and culturally significant sights and remains. Cultural sites covered by the sediments are susceptible to exposure and loss by erosion. Hereford (1993) addressed the relationship between sediment and high terrace stability. The high terraces are deposited by large floodflows (100,000 cfs and greater) prior to the closure of Glen Canyon Dam. The highest terraces are more than 1,000 years old while the youngest terrace is about 30 years old.
Predam annual floodflows maintained the lower high terraces and rejuvenated them with additional sediment. Some arroyos along the river corridor were checked in their erosion by the deposition of sediment and increase in the base level of the river. Erosion of high terraces will continue through rilling and arroyo cutting regardless of dam operations and exacerbated by radical dam operations.

At the lower end of the Grand Canyon the Colorado River enters the influence of Lake Mead. Depending on the elevation of the reservoir this influence can occur as early as 236 mile or all the way to Pierce Ferry area. All sediment transported into Lake Mead by the Colorado River and tributaries is trapped in submerged canyons and valleys as deltas and lakebed deposits. The maximum-recorded lake level, approximately 1220 feet above sea level corresponds approximately to the elevation of the riverbed at River Mile 235. Presently the Lake Mead delta extends from approximately 236 mile to 290 mile.

Downstream from River Mile 235, river flow and sediment deposition and erosion are affected by the level of Lake Mead. Rapids historically located in this area have been buried by sediment. The shape of the Colorado River delta profile is affected mainly by lake level. The delta surface at the lower Granite Gorge and upper Lake Mead is relatively flat and mostly composed of sand. Fine silts and clays are carried further downstream and have been noted as far as Hoover Dam (River Mile 355).

### 6.4 Major Sediment Management Issues and Concerns

**Issue 1:** Protection, sustainment and reestablishment of sediment resources along the lower Colorado River corridor is important. How should the Hualapai Tribe manage the remaining sediment resources and work to reestablish lost deposits?

**Situation:** Current management of the flow releases from Glen Canyon dam directly
and indirectly impacts that sustainability of the sediment resources in the lower Colorado River corridor. Additionally, use of the corridor sediment resources by recreationists and scientists directly and indirectly impacts their long-term sustainability and stability.

**Considerations:**

- Conclusions reached in the 1996 Glen Canyon dam Environmental Impact Statement identify that long-term stability of the sediment resources throughout the Grand Canyon are directly impacted by the upstream management of Glen Canyon dam.
- Sediment supply to Grand Canyon and the Colorado River is restricted due to the upstream effects of Glen Canyon dam.
- Stability of the sediment resources along the lower Colorado River corridor and the Hualapai reservation requires management of flow releases from Glen Canyon dam and use levels of recreationists.

**Solution:**

The physical resources along the lower Colorado River corridor are dependent on the management of sediment and water. Water is primarily controlled by the upstream releases determined by the Bureau of Reclamation at Glen Canyon dam.

Sediment issues that should be considered include:

1. Identification of critical sediment resources and beaches in the lower Colorado River corridor and development monitoring programs to evaluate and track their existence and changes in size.
2. Determine critical flow levels to maintain the sediment resources in the lower Colorado River corridor.

3. If critical areas of sediment are being threatened by Bureau of Reclamation activities, explore ways to stabilize the sites naturally or with other measures as appropriate to protect their integrity.

4. Identify critical elevations of Lake Mead in relation to critical vegetation and habitat management. Identify the season of year that the habitat is most critical and determine the requirements necessary to protect those sediment and vegetation resources.

5. Work directly through the Glen Canyon Dam Adaptive Management Work Group and the Department of the Interior to identify and implement sediment protection protocols along the lower Colorado River Corridor.

6.5 Operation of Glen Canyon Dam

The Bureau of Reclamation manages and operates Glen Canyon dam to meet three primary objectives:

- Conservation of water for the upper basin states
- Production of hydroelectricity
- Meeting the requirements of the Glen Canyon Dam 1996 Record of Decision

The flows of the Colorado River are determined each year based on the available water in storage, treaty and compact requirements, and the anticipated inflow from snowpack and upstream water management. The dam's daily operating rules are defined in terms of maximum and minimum releases and rates of change.
The annual release target for Glen Canyon dam has always been 8.23 million acre-feet. This amount satisfies the legal requirements of the Colorado River Compact and the upper Basin's portion for meeting the Mexican Water Treaty volume. During wet years (years greater than 11 million acre-feet inflow to Lake Powell), the monthly flow targets are increased, usually in the spring and summer. This strategy is implemented to reduce the probability of having to bypass or spill excess water. Monthly release volumes to the lower Colorado River corridor average between 0.5 and 1.0 million acre-feet. The largest flow releases are during the summer and winter periods when the demand for cooling and heating requirements are at their highest.

Annually the Department of the Interior, through the Bureau of Reclamation, the seven Colorado River basin states and the interested public, develop an Annual Operating Plan to guide the management and operations of the Colorado River system. This plan takes into consideration:

- Legal requirements to meet the laws of the Colorado River system
- Minimize spill and floods
- Protect environmental resources
- Provide for hydroelectricity production

The current management of Glen Canyon dam by the Bureau of Reclamation utilizes the following annual targets to meet the demands set forth in the annual operating plan:

- January 1st minimum storage available in Lake Powell at 2.4 million acre-feet
- Fill Lake Powell by July to within 26,500,000 acre-feet of volume
- Minimize bypass and spill by increasing spring and summer releases
Adhering to these targets and criteria, the Bureau of Reclamation estimates that the probability of spilling water and flooding downstream resources is **1 in 20 years** (NRC, 1996). It is estimated that the 8.23 million acre-foot release target will be met unless a sustained drought period occurs.

Daily operations of Glen Canyon dam are managed under criteria outlined in the 1996 Record of Decision for the Environmental Impact Statement on the Operations of Glen Canyon dam. Daily operations of Glen Canyon dam are set to meet the following criteria:

- cumulatively meet the monthly target release volume as called for in the Annual Operating Plan
- Meet instantaneous hydroelectric requirements as determined by Western Area Power Administration
- Meet minimum flow release levels for downstream resources
- Be available for emergency power requirements

In 1996, a Record of Decision (ROD) was rendered by the U.S. Secretary of the Interior for the Environmental Impact Statement (EIS) regarding the operation of Glen Canyon Dam. This ROD identified the preferred alternative of modified, low fluctuating flows as operation criteria for Glen Canyon Dam. Under this alternative, flows normally would not exceed 20,000 cubic feet per second (cfs), nor would they fall below 5,000 cfs. The up ramp rate would not exceed 2,500 cfs/hr and the down ramp rate would not exceed 1,500 cfs/hr. In addition, the discharge rate would not vary by more than 8,000 cfs in a 24 hour period.

The preferred alternative also provided for beach building experimental flows to 45,000 cfs and for habitat maintenance flows of 33,200 cfs. In 1996, an experimental flood of 45,000 cfs was implemented to build beaches, scour near-shore vegetation and rejuvenate backwaters important to native fish reproduction. In the long term, this
experiment did little to accomplish the proposed objectives. Effects of this flood, however, were documented to river mile 254.0 by the Hualapai Department of Natural Resources (Christensen 1997c).

Another experiment provided for in the ROD was a Low, Steady Summer Flow (LSSF) regime where releases from Glen Canyon Dam would be 8,000 cfs from May to September. This experiment was primarily designed to enhance reproductive success of humpback chub. This experiment was implemented in 2000. Results of this experiment are still being evaluated at the time of writing this document.

The ROD also called for establishment of an Adaptive Management Program and the Grand Canyon Monitoring and Research Center. The Hualapai Tribe is a member of the Adaptive Management Workgroup (AMWG) and the Technical Workgroup (TWG). Working with the GCMRC, the AMWG works to direct monitoring and research activities in Grand Canyon to protect and improve the natural and cultural resources of the canyon. In addition, the tribe is also a signatory to the Programmatic Agreement (PA) whose objective is to protect and monitor cultural resources of Grand Canyon.

Operation of Glen Canyon Dam has obvious impacts to the natural and cultural resources of the Hualapai Reservation. The tribe’s involvement in the AMWG, TWG and PA will hopefully ensure that the tribe’s trust resources are protected and enhanced to the greatest extent possible.

6.6 Air Quality

In general, the air quality in lower Grand Canyon is good except for regional haze resulting from emissions from the Mohave Electric Generating plant in Laughlin, Nevada and from airborne dust. The generating plant will soon be retrofitted with scrubbers to reduce their emissions so that air quality should be improved.
The management objective for air quality in lower Grand Canyon is to maintain good air quality for the health of the community and tribal members and to enhance the recreational experience to visitors. To accomplish this, we closely scrutinize proposed actions that may influence air quality in the lower canyon. For example, we are intimately involved in the environmental review process for the Griffith and Big Sandy energy projects, both gas-fired electricity producers south of the Hualapai Reservation. These projects both have the potential to affect air quality in the lower canyon.

The tribe currently has a Section 105 Clean Air Act Program with the U.S. Environmental Protection Agency. The tribe is also considering Class I designation.

In addition, we currently monitor air quality and meteorological data at Grand Canyon West and in Peach Springs. This monitoring consists of PM10 and PM2.5 monitoring and periodic photographic documentation of the visual condition of the canyon. In addition, a nephelometer measures visibility at Grand Canyon West. The Hualapai Air Quality Ordinance is contained in Appendix 4.

6.7 Noise

6.7.1 Overflights

The Federal Aviation Administration (FAA) proposed new regulations regarding Grand Canyon overflights in 1997. These regulations direct air traffic over the northern portion of the Hualapai Reservation. The tribe believes that these air routes will disturb desert bighorn sheep, elk and deer to the detriment of the tribe. Instead, the Hualapai Tribe has developed their own overflight policies that direct the routes of all non-Hualapai authorized flights away from the Hualapai Reservation. These policies state that non-authorized flights are not allowed to violate Hualapai air space and especially keep the
flights away from the river corridor. Violations of Hualapai air space incur a minimum fine of $5000.00 per day. The fine may be increased at the discretion of the Hualapai Tribal Council.

6.7.2 Helicopter Flights

Helicopter flights in the lower Grand Canyon river corridor are limited to Quartermaster Canyon downstream to the reservation boundary and to the Whitmore helipad site (Figure 1). The majority of the helicopter flights focus at Quartermaster Canyon and the ramadas just downstream. To minimize noise impacts, and for safety considerations, the Hualapai Tribe proposes that helicopters minimize their exposure along the river corridor and only arrive and depart from specified access points. A helicopter management plan is currently under preparation by GCRC that will address access points, flight paths and other helicopter related activities in lower Grand Canyon. Helicopter flights above Quartermaster Canyon (and especially in Spencer Canyon) are prohibited.

6.7.3 Outboard motors/motorboats

The Hualapai Tribe advocates the use of four-stroke motors on all motorized rafts in lower Grand Canyon. In addition, a limit of 50 horsepower is initiated for motors from National Canyon to Quartermaster Canyon and a limit of 150 horsepower from Quartermaster Canyon downstream to the reservation boundary. A minimum fine of $150 will be imposed for violations of these limits.

7.0 CULTURAL RESOURCES
The Hualapai Tribal Council on February 18, 1998 passed Resolution No. 13-98 enacting the Cultural Heritage Resources Ordinance (Appendix 6). The Hualapai Cultural Resources Department operates within the direction of the ordinance and is responsible for identification, protection, preservation and management of cultural resources within Hualapai tribal lands and Hualapai traditional use lands.

The Hualapai Tribe is working with the Grand Canyon Monitoring and Research Center, The National Park Service, The Bureau of Reclamation, the State of Arizona Historic Preservation Office, the Advisory Council on Historic Preservation and other Tribes in the protection of cultural resources in the lower Colorado River corridor. Tribal ordinances and federal laws direct these protection activities and include the National Historic Preservation Act (NHPA), the Archaeological Resources Protection Act (ARPA), the Native American Graves Protection and Repatriation Act (NAGPRA), and the National Park Service Organic Act. These activities are coordinated and described in the Programmatic Agreement (PA) that defines and specifies the responsibilities of all agencies to maintain compliance relative to NHPA for Grand Canyon. The Department has defined the cultural resource responsibilities into two distinct areas:

1. Spatially from National Canyon (River Mile 166) to Lake Mead (River Mile 278).

2. Administratively as defined by NAGPRA, ordinances and other requirements defined by the Hualapai Tribe.

7.1 The Cultural Resources Department and the Glen Canyon Dam Adaptive Management Program

The National Research Council (NRC) in their 1999 report on the Adaptive Management Program in the Grand Canyon concluded:
1. Coordinating cultural and socioeconomic programs is a worthwhile venture that should be tested and given sufficient resources. Further coordination of existing Cultural Resources subprograms are needed.

2. The Cultural Resources Program should look forward to including a wider range of social groups and should recognize that archeological evidence and ethnographic perspectives offer valuable insights on adaptive management in the Grand Canyon.

3. Resources must be secured for full tribal participation in all aspects of monitoring, research and communication in the Adaptive Management Program, without reducing other components of the Cultural Resources Program.

The Hualapai Tribe is a key member of the Programmatic Agreement that has developed between the Bureau of Reclamation, the National Park Service, the Advisory Council on Historic Preservation and eight other tribes which have cultural affinity to the Grand Canyon and Colorado River region. Implementation of a useful Hualapai Tribe cultural resource program in the lower Colorado River corridor requires that the Hualapai Tribe be directly involved in the development and implementation of the Programmatic Agreement.

7.2 Culturally Sensitive Locations along Lower Grand Canyon

The area from the Little Colorado River confluence (River Mile 61) to Lake Mead (River Mile 278) is considered to be the historic use area of the Hualapai tribe. The Hualapai Tribe Cultural Resources Department has identified sensitive sites along the Colorado
River corridor that will remain confidential to the Hualapai Tribe.

It is recommended that a basic monitoring program be developed and evaluated through a Protocol Evaluation Panel (PEP) to review the scientific relevance of the proposed effort. Monitoring protocols should be developed and followed should anything happen to a site. Monitoring should initially occur at five specific sites: National Canyon, Granite Park, Diamond Creek, Bridge Canyon, and Spencer Canyon.

7.3 Major Cultural Management Issues and Concerns

**Issue 1:** The Hualapai Tribe Cultural Resource Department has documented a number of culturally and socially important areas to the Hualapai Tribe along the lower Colorado River corridor. Continued use and resulting impacts to these sites are leading to their loss both directly and indirectly. The question exists as to how the Hualapai Tribe should manage these important resources for future generations?

**Situation:**
Present and past river corridor use by recreationists, concessionaires and management of upstream water releases from Glen Canyon dam has led to the loss of important Hualapai cultural resources. Protection and restoration of these important sites requires additional management, monitoring and studying of the lower Colorado River corridor.

**Considerations:**
- The Glen Canyon dam EIS (1996) dictates a long-term management approach to the protection of cultural resources along the entire Colorado River corridor through the Grand Canyon.
- The Hualapai cultural resources are directly and indirectly impacted along the entire Colorado River corridor in the Grand Canyon.
Solution: There are several needs that are required prior to implementing adequate management of the cultural sites:

1. Funding to support the existing cultural resources staff must be provided.
2. Additional funding and staff to handle monitoring and coordination with GCNP and LMNRA cultural staffs is required.
3. Completion, acceptance and implementation of the Historic Preservation Plan should occur.
4. Programmatic Agreement issues with the Federal agencies should be resolved.
5. Develop a more appropriate and useable way to manage and store the information from the cultural resource monitoring program.
6. The process and integration of the cultural resource monitoring and management program need to be resolved. Specifically the roles of the PEP, the input to the Grand Canyon Technical Work Group, refinement of direction, approval by the Adaptive Management Work Group and finally implementation.
7. Elders need to be brought into the program on an as needed basis.

7.4 Evolving Research and Science Issues with Hualapai Tribe

1. Traditional use of native plants is important. Increased knowledge has led to increased use. This effort should be expanded and supported by the Hualapai Tribe
2. Flight restriction zones should be established on the reservation to protect traditional cultural areas (side canyons)
3. Additional animal studies on traditionally used mammals including bighorn sheep and beavers should be conducted.
4. Long-term documentation of the culturally significant sites with photography
should be implemented.

5. The Hualapai Tribe Herbarium needs to be supported and maintained.
6. Spatial information from vegetation studies should be integrated into the GIS program.
7. Cultural resource artifacts should be stored in a museum located in Peach Springs. The museum could be used for education of tribal members and the public.
8. The Hualapai Tribe should develop and implement their own Programmatic Agreement using dedicated funds from the Federal government.
9. The National Historic Preservation Act needs to be implemented and utilized.
10. A need exists to identify where specific people’s involvement begins and ends.
11. The tribal resources must be protected.
12. Ordinances should be developed for process and action.
13. NAGPRA should be used to assess inventories for potential repatriation.
14. Repatriation issues have not been litigated yet.

FAA and NPS must work cooperatively with the Hualapai Tribe on the over flight issues.

7.5 Ethnobotanical Resources

The Hualapai Tribe has identified certain plant species that are of particular use or interest to the tribe. Those species were identified in a report to the Glen Canyon Environmental Studies and is attached to this document as Appendix 7.

7.5.1 Granite Park Gooding’s willow

The large Gooding’s willow at the edge of the river at Granite Park has special importance to the Hualapai people. The tree has been there since at least 1900 and has survived numerous flood events. The tribe periodically performs stabilization
activities to protect the tree for future generations. Anyone caught harming the tree in any manner is subject to a minimum fine of $1000.00.

8.0 SCENIC QUALITY

The Hualapai Tribe takes great pride in the beauty of the Hualapai Reservation and especially the river corridor. To protect the scenic beauty of the canyon, the tribe has adopted many of the same regulations as has Grand Canyon National Park. Limitations on campfires, sanitation and wildlife/vegetation protection all help maintain the pristine condition in the lower canyon. Even though we maintain the scenic beauty of lower Grand Canyon, the tribe also allows the general public to enjoy this beauty in the form of helicopter, raft and boat tours in the canyon.

The management objective of the Hualapai Tribe with regard to scenic quality of lower Grand Canyon is to maintain the scenic quality that currently exists while allowing access to these areas by tribal members and the general public. To accomplish this, the tribe strictly enforces its ordinances and codes relating to the natural beauty of the canyon while encouraging visitation from the outside.

8.1 Major Scenery Management Issues and Concerns

Issue 1: How will the scenic quality of the lower Colorado River corridor be protected?

Situation:
The lower Colorado River corridor flows through the lower Grand Canyon and represents one of the most unique and scenic areas in the world. The Hualapai Tribe is the only tribe that has direct management responsibility of the Grand Canyon. The unique environment provides an opportunity for recreation and resource protection.
Considerations:

- River recreationists and publics from around the world expect the natural scenic character of the lower Colorado River through the Grand Canyon will remain.
- The public generally supports facilities and access that protect the safety and health of the public.
- Facilities that impact the scenic quality of the lower Colorado River corridor are likely not to be supported by the National Park Service or the public.

Solution:

- Establish with the Hualapai Tribal Council parameters that define the important visitor attributes of the Hualapai Reservation along the lower Colorado River corridor.
- Implement within permits, leases and concession licenses appropriate requirements to protect the scenic and cultural qualities of the Hualapai Tribe and reservation.
- Identify important viewshed and resource attributes that will have priority in regards to management and resource protection

9.0 ADMINISTRATIVE ISSUES

9.1 Roads and Access

Diamond Creek Road is the main access to the Colorado River in lower Grand Canyon. It leads to river mile 225.0. Approximately 10,000 visitors per year end their river trip at Diamond Creek. Over 1,000 private river trips begin their voyage at Diamond Creek. In addition, there is a road that approaches the river at Whitmore Wash on the opposite side of the river from the Hualapai Reservation. Over 50% of rafters in Grand Canyon initiate or terminate their trips at Whitmore Wash.
9.2 Law Enforcement

Primary law enforcement on the Hualapai Reservation is provided by the U.S. Bureau of Indian Affairs, Truxton Canon Agency. In addition, the Hualapai Department of Wildlife Conservation provides law enforcement services regarding the taking of wildlife and fish and in the permitting of activities. Finally, staff of the Wildlife, Fisheries and Parks Program provide secondary law enforcement activities including the issuance of citations for violation of the Wildlife Conservation Ordinance 24-70.

9.3 Emergency Services

Currently, an emergency response plan has been prepared in cooperation with Grand Canyon National Park and Lake Mead National Recreation Area that specifies the details regarding emergency response in lower Grand Canyon. That document is attached as Appendix 8.

9.4 Agency Coordination

- Grand Canyon National Park
- Lake Mead National Recreation Area
- Grand Canyon-Parashant National Monument
- U.S. Fish and Wildlife Service
- U.S. Bureau of Reclamation
- U.S. Bureau of Indian Affairs
- Grand Canyon Monitoring and Research Center
- Lower Colorado River Multispecies Conservation Plan
- Arizona Game and Fish Department
- Colorado River Guides
- Grand Canyon Resort Corporation
9.5 Tribal Coordination

- Havasupai Tribe
- Hopi Tribe
- Kaibab Paiute Tribe
- Navajo Nation
- Zuni Tribe
- Colorado River Indian Tribe
- Fort Mohave Indian Tribe
- Chemehuevi Tribe
- Cocopah Tribe
- Pai Pai Tribe

9.6 Management Plan Next Steps

Completion of a lower Colorado River Corridor Management Plan will require meeting with many people and incorporating their concerns and ideas into the plan. The Hualapai Tribe intends to complete the following steps with this document:

1. Meet with the Hualapai Interdisciplinary Team and present the overall findings of the report.
   - Gain approval to present to the Tribal Council
   - Make revisions as necessary

2. Meet with the Hualapai Tribal Council to report on the draft management plan
   - Respond to questions
   - Make revisions as necessary
• Gain approval to meet with individual tribal groups

3. Meet with Hualapai Tribal groups and Tribal departments to discuss report and recommendations
  • Make revisions as necessary
  • Gain approval to produce final draft

4. Schedule meetings with Federal and State Agencies and Public Interest Groups
  • Meet with Grand Canyon National Park and Lake Mead National Recreation Area personnel
  • Meet with other Federal and State Agencies and Tribal Groups
  • Discuss recommendations and alternatives to implementation

5. Produce Final Draft Report with Final Recommendations
  • Present to Tribal Council and appropriate Tribal groups
  • Incorporate Tribal Council recommendations

6. Produce Final Report

7. Initiate Development of Vehicles to Implement the Management Plan Recommendations
  • Meet with Federal and State Agencies to develop memorandums of action

8. Implement Lower Colorado River Corridor Management Plan

9. Schedule biennial reviews of the document to ensure maintaining its integrity and appropriateness.

10.0 LITERATURE CITED

Christensen, K.M. 1995. Effects of the operation of Glen Canyon dam on small
mammals and reptiles in lower Grand Canyon. Final Report to Glen Canyon Environmental Studies, U.S. Bureau of Reclamation, Upper Colorado Region, Salt Lake City, Utah.


**MANAGEMENT RECOMMENDATIONS**

Opportunities for management for the protection of the water quality of the lower Colorado River corridor include:

- Development of a watershed based approach to management of the sources of water to the lower Colorado River corridor
- Identification of critical water sources for the lower Colorado River corridor
- Increased monitoring of water quality conditions in the lower Colorado River corridor including main stem sampling
- Implementation of health standards for river recreationists

Grand Canyon National Park has joint jurisdiction over these same lands. Lake Mead National Recreation Area has jurisdiction over the waters from Separation Canyon (approximately river mile 239.6) to river mile 276.7 and beyond. The Arizona Game and Fish Department has jurisdiction over the fish and wildlife in Lower Grand Canyon along with the Hualapai Tribe, Grand Canyon National Park and Lake Mead National Recreation Area. The U.S. Fish and Wildlife Service has jurisdiction over endangered species in Lower Grand Canyon.
The lower Colorado River corridor is managed cooperatively with Grand Canyon National Park, National Park Service. This relationship allows for the two entities to cooperative determine management objectives and goals.

**Major Management Issues and Concerns**

Disturbance to habitats for native birds and fish may disrupt their breeding and spawning cycles.

Recreation use at tributary mouths and side canyons affects soil, vegetation and water quality.

Maintaining the biological productivity of the lower Colorado River corridor requires developing specific management guidelines that are based on scientific and ecological thresholds for the various species.
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