HUALAPAI TRIBE

Department of Cultural Resources

EVALUATING HUALAPAI CULTURAL RESOURCES ALONG THE COLORADO RIVER FY 2015 REPORT

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DEPARTMENT OF CULTURAL RESOURCES:

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INTRODUCTION

The Hualapai Tribe has a special interest in the Grand Canyon and the Colorado River because Hualapai traditional lands begin at the Little Colorado River and continue downstream through the entire Grand Canyon and beyond, to the confluence with the Bill Williams River (Figure 1). For the Hualapai people the cultural link to the Grand Canyon and the Colorado River corridor is both ancestral and contemporary, as the river is integral to Hualapai creation and migration traditions, as well as defining the extents of ancestral territory and the modern reservation boundary. The current Hualapai Reservation includes 108 miles of the Colorado River in the western Grand Canyon from River Mile (RM) 165 to RM 273. The annual Hualapai monitoring program takes into consideration the length of the Colorado River corridor from Lee's Ferry (RM 0) to Pearce Ferry (RM 280.5) at Lake Mead National Recreation Area. In this report we present our findings from the 2015 season regarding monitoring archaeological sites, traditional cultural places (TCPs), ethnobotanical resources, and other ecological aspects along the river corridor and adjacent tributaries. Active participation in the stewardship of the natural and cultural resources of the ancestral homeland of the Hualapai Tribe in this area is very important to tribal members (Suagee and Bungart 2013).

Monitoring TCPs located within the traditional Hualapai lands of the Colorado River corridor (Table 1) plays a particularly significant role in the tribe's cultural ties to the Grand Canyon area. According to the National Register Bulletin 38, a TCP is associated with "cultural practices or beliefs of a living community that are rooted in that community's history, and are important in maintaining the continued cultural identity of the community" (Parker and King 1990). Examples of Hualapai TCPs include plant and paint gathering areas, sacred sites, historic and prehistoric archeological sites, historic travel routes, and areas where rock images are present.

Not all sites that are part of the ancestral Hualapai cultural landscape are listed in Table 1, and as Hualapai complete annual monitoring trips, places not previously given specific TCP designation may be included in the monitoring program. For Hualapai, the Colorado River corridor includes springs and other water sources, rock formations, plant and animal life, and all material culture encompassed in the Grand Canyon, from the river to associated side canyons and tributaries to the rim and surrounding area. All of these are believed by the Hualapai people to be inherently linked, and they regard their traditional lands in the Colorado River corridor with the highest esteem and most profound respect (HDCR et. al 1993).

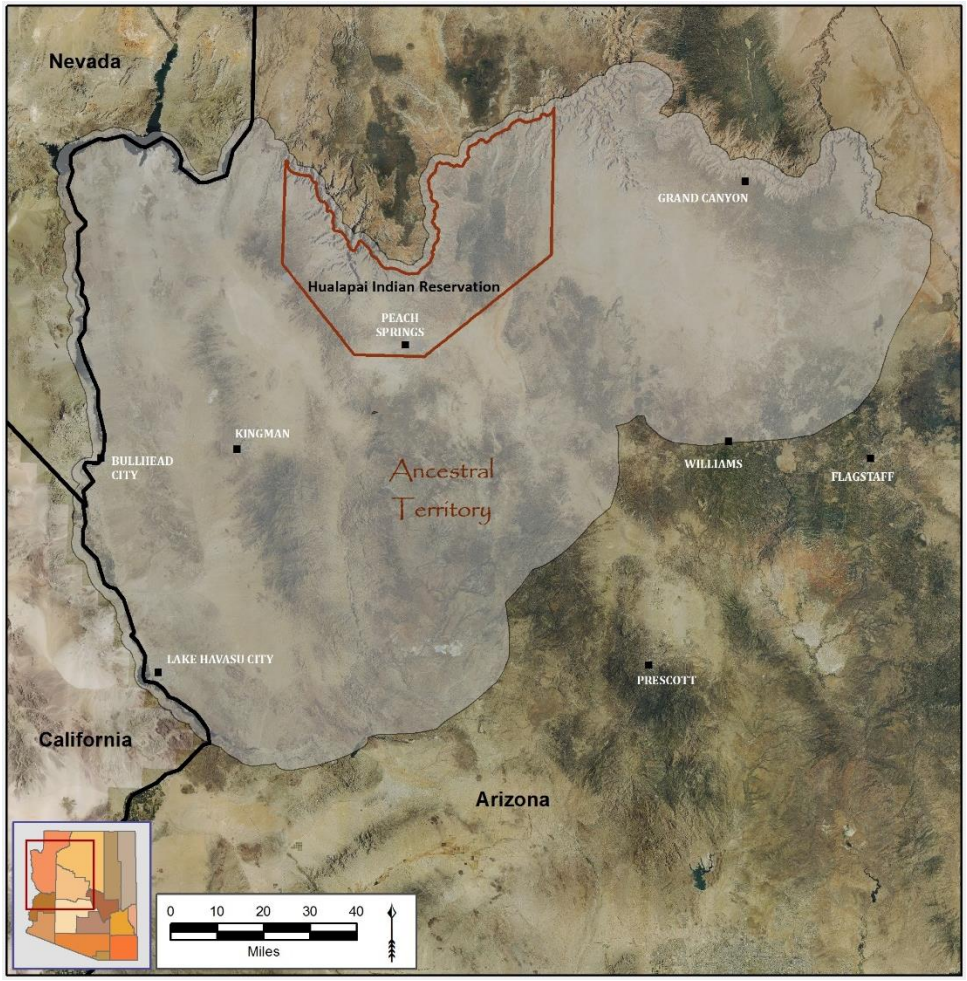

Figure 1. Approximate area of Hualapai ancestral territory (after Dobyns and Euler 1970:17).

Table 1. Partial List of Hualapai Traditional Cultural Places along the Colorado River corridor

TCP 001	National Canyon	166.5 L	TCP 020	Spencer Canyon & Lava Cliff	246 L
TCP 002	Mohawk Canyon	171.5 L	TCP 021	Travertine Canyon	229 L
TCP 003	Vulcan's Anvil	178	TCP 022	Travertine Falls	230.5 L
TCP 004	Medicine Springs	180 L	TCP 023	Burnt Springs	259 R
TCP 005	Artesian Springs	194 L	TCP 024	Shinumo Canyon	108.7 R
TCP 006	Roasting Complex	197.3 L	TCP 025	Whitmore Helipad	186 L
TCP 007	Whitmore Canyon	188 L	TCP 026	Separation Canyon	240 R
TCP 008	Hematite Mine	200.0 R	TCP 027	Columbine Falls	274.3 L
TCP 009	205 Mile Canyon	205 L	TCP 028	Hotauta Canyon	107.5 L
TCP 010	Granite Park	209 L	TCP 029	AZ:A:16:004	189.7 L
TCP 011	Pumpkin Springs	212 L	TCP 030	Vassey's Paradise	31.7 R
TCP 012	Three Springs Canyon	216 L	TCP 031	Buck Farm Canyon	41.0 R
TCP 013	AZ:G:3:80	223 L	TCP 032	Salt Mine	64.0 L
TCP 014	Little Colorado River	61.8 L	TCP 033	Elves Chasm	116.5 L
TCP 015	Cardenas	71 L	TCP 034	Stone Creek	132.4 R
TCP 016	Deer Creek Canyon	137 R	TCP 035	Forester Canyon	122.7 L
TCP 017	Havasu Creek Canyon	156.9 L	TCP 036	Olo Canyon	145.6 L
TCP 018	Diamond Creek	225.5 L	TCP 037	Tapeats Creek	134.5 R
TCP 019	Bridge Canyon	235 L	TCP 038	Quarter Master Springs	260.0 L

Relatively new to Hualapai monitoring efforts are the matching of historic photos to understand changes in riverine ecology, monitoring effects of high-flow experiments (HFEs) that were implemented in 2012, and additional emphasis on bighorn sheep sightings along the river. Some of this work draws from and complements studies already underway by the National Park Service (NPS), the U.S. Geological Survey (USGS), or the Grand Canyon Research and Monitoring Center (GCMRC, a branch of the USGS).

Photo matching provides an expedient and visual method to identify the loss of or changes in the distribution of culturally significant plants and other aspects of the environment, and benefits from previous work conducted over the past 40+ years by the USGS (Turner and Karpiscack 1980; Webb 1996; Webb, Melis and Valdez 2002). With photographs from the late 19th and early 20th Centuries as a baseline, profound changes in the river corridor cultural landscape are evident. In

certain cases, changes at specific places of significance, and even specific plant species, can be identified, such as the historic willow at Granite Park.

The HFE protocols implemented in 2012 (USBOR 2012) allow for a series of high-flow experimental releases from Glen Canyon Dam through 2020, which are designed to conserve sand in the upper reaches of the Colorado River corridor. Any given HFE release is dependent on sediment input triggers from the Paria River tributary just downstream from Lees Ferry. As sediment is "banked" on the river bottom of the main channel, the creation of an extended artificial flood transports substantial amounts downstream to be deposited in backwaters and along the river bank, creating sandbars and building up beaches. The potential benefits of this approach are many, creating wildlife and riparian plant habitat, stemming erosion in the vicinity of some archaeological sites, and preserving and even restoring what remains of the pre-dam character of the river. Because HFEs have the potential to affect cultural resources, including archaeological sites, plant communities, and wildlife habitat, it is important to include the effects of HFEs into our monitoring program. At this point, this is limited to photographing HFE deposits (focusing on the western canyon, which is more solidly within the Hualapai traditional landscape and is not as intensively studied by GCMRC), documenting their locations, and noting culturally significant plants when practical to do so.

As one of the most important wildlife species to the Hualapai (and other tribes in the area), the health and status of bighorn sheep is of concern. Sightings of bighorn while boating through the canyon are always noted with much interest by trip participants. NPS currently has a long-term sheep monitoring study underway, and relies on observations by "citizen scientists" to augment its research. In 2014, we used a matrix type form created by NPS wildlife biologist Brandon Holton to document sightings on that trip, and conducted a TEK interview with one of our participants who is knowledgeable about bighorn on a number of levels, including hunting, uses, and lore.

The biological and cultural resources of the Canyon have always been integral to the culture of the Hualapai (Kroeber 1935; Mapatis 1982). Formal studies undertaken in the mid-1990s focused on the ethnobotanical resources of the Canyon. During ethnobotanical river trips conducted in the lower Grand Canyon from 1993-95, 46 species of plants were recognized as having cultural significance to the Hualapai people (e.g., Hogan 1995), although this should not be considered an exhaustive list. Archaeological resources have been a major focus of the Hualapai monitoring program since the early 1990s (Balsom and Fairley 1992; Fairley et al. 1994; Hualapai Tribe 1994). Studies were also undertaken to identify, document and establish management plans to maintain the integrity of Hualapai TCPs (HDCR 1998). Since the beginning of these efforts, the Hualapai Department of Cultural Resources (HDCR) has continued to identify and document Hualapai TCPs along traditional lands in the Colorado River corridor.

HUALAPAI CULTURAL BELIEFS AND TRADITIONAL ECOLOGICAL KNOWLEDGE

The Hualapai people regard the Colorado River and the entire river corridor as a living entity infused with conscious spirit. This belief is inter-related with Traditional Ecological Knowledge (TEK), which pertains to "all types of knowledge about the environment derived from the experience and traditions of a particular group of people" (Usher 2000:185). A commonly cited definition of TEK is provided by Berkes (1993:3):

> TEK is a cumulative body of knowledge and beliefs, handed down through generations by cultural transmission, about the relationship of living beings (including humans) with one another and with their environment. Further, TEK is an attribute of societies with historical continuity in resource use practices; by and large, these are non-industrial or less technologically advanced societies, many of them Indigenous and tribal.

Loretta Jackson-Kelly, Principal Investigator, notes that TEK "is based on careful empirical observations that are accumulated over a sequence of generations which allows a long term view that is often missing from the data sets collected through experimentation and systematic deliberate accumulation of facts," (Jackson-Kelly 2007:10). These observations have the potential to contribute to a more holistic and systemic approach to management decisions, and in their own way are a form of structured decision-making that plays a prominent role in contemporary adaptive management strategies (e.g., Failing et al. 2007; Berkes et al. .2000).

All of the physical elements in and around the river corridor are accorded powers of observation and awareness. These elements include the water, air, rocks, plants, insects, fish and wildlife. All elements are believed to be inherently linked to one another, through conscious awareness and in unique and specific ways. For Hualapai people, these components form a cohesive "cultural landscape" that is felt as sacred in a way that supersedes any form of explicit religious dogma or formal ceremonialism, although ceremony, language, song and story are informed by it. TEK embodies nature, land, family, community, reciprocity, balance, thought, and spirit. Life experiences are conceptualized and reciprocated through social traditions placing the past into the context of the present and future. Oral histories and ceremonialism shape and 'move' time and space into values and ethical lessons for social and political cohesion.

Hualapai Elders frame elements of TEK into their conversations regarding cultural landscapes, TCPs, and archaeological sites, and feel that (Jackson and Stevens, 1996:7-8)

> "…all archaeological sites are sacred places – places to be treated with respect. It has always been essential to protect ancestral sacred sites and to maintain the integrity of these sites. It is felt that physical contact with Hualapai ancestral cultural materials requires prayers and offerings to offset or reduce the prospect of dangerous consequences for intruding into the places of strong spirits…Ancestral and sacred sites in Hualapai traditional lifeways have tangible and intangible qualities that make management and protection appear to be in conflict…"

The conflict mainly centers on 1) interpretation of diverse types of data; 2) how interpretations fit or do not fit into existing scientific paradigms, and 3) how the needs of tribes and agencies are met in the context of management. Interpretations and needs also remain dependent upon how heritage and resources are perceived by Indigenous and non-Indigenous communities. For the Hualapai Department of Cultural Resources, addressing these issues can in part be met by incorporating TEK into the annual Programmatic Agreement (PA) Bureau of Reclamation (BOR) monitoring river trips. The HDCR monitoring program strives to meet three important goals:

1) Integrate Hualapai TEK into the monitoring methodology,

2) Contribute relevant information on the effects of Glen Canyon Dam operations on cultural as well as biological resources to the Glen Canyon Dam Adaptive Management Program (GCDAMP),

3) Balance tribal use of shared natural resources with agency multiple use approaches in regards to public access (Usher 2000; Becker and Ghimire 2003; Moller et al. 2004).

During the May-June 2015 river trip, field interviews were conducted with Hualapai trip participants. Topics ranged from their knowledge of the landscape and its cultural and natural resources; Hualapai history in the canyon and its surroundings, including at the family level; thoughts and opinions on Colorado River management practices and dam operations; and transference of knowledge from elders and to tribal youth and future generations. These interviews provided ethnographic background on Hualapai knowledge of plants, animals, and landscapes. In addition to documenting traditional knowledge, an important goal was to foster a vested and active interest in the current dynamics of Colorado River management.

It has long been evident that the riparian environment along the Colorado River offered Hualapai people successful living in the region, which is a rich resource base for plant gathering, hunting, gardening, and mineral collecting. Important native plants found along the river include agave, yucca, various cacti, Gooddings willow, coyote willow, desert tobacco, reeds, bear grass, and edible grass seeds such as dropseed (*Sporobolus* spp) and rice grass. In the past, seasonal migrations for hunting and gathering of sustenance resulted in acquiring a variety of foods that extended through different elevations and biological life zones. Spiritual and life skills were conveyed partially during these migration events with Hualapai teaching their children traditional knowledge through hunting and gathering, song and oration, and environmental stewardship. With migration traditions each successive Hualapai generation passed on cultural truths and lessons, which today connect them to their elders, their community, their lands, and their past, present, and future.

Through emergence, survival, subsistence and struggle, the Hualapai have sought to maintain and protect their ancestral homelands since time immemorial. Traditional Hualapai beliefs address the ecology and knowledge about Hualapai cultural landscapes. These belief systems address the following, but are not limited to:

- The health and welfare of the Hualapai People,
- Economic values through traditional trade and trade routes,
- Spiritual and religious beliefs tied to the land and water,
- Oral traditions regarding non-humans and supernatural phenomena,
- Events of creation, such as fire, animals, plants, and humans.

Elements in and around the canyon are filled with significant symbolism, seen through powers of observation and awareness. The springs, seeps, tributaries and the river itself comprise a vital life force believed to be absolutely and unequivocally essential to the well-being of the Hualapai people. The entire system is a sentient being. As such, it feels and is expressive of calmness and anger; it also offers happiness, sadness, strength, life, sustenance, and the threat of death (during an interview on the 2015 river trip, one of the participants believed the river seemed sad because it could not run free). According to Hualapai cultural beliefs, these elements of consciousness can be observed through the nature of the river's ebb and flow at different points in time and at various locations. Thus, the Hualapai people regard the river with the highest esteem and most profound respect. In the Hualapai language the Colorado River is considered *Ha'yi' đađa* – the "Backbone of the River." Without the backbone the Hualapai people believe they cannot survive.

METHODS, SITES, AND ANALYSIS

In 2001 HDCR, in consultation with BOR, expanded the evaluation and monitoring protocols of Hualapai archaeology, ethnobotany and TCPs in the Colorado River corridor (Jackson, Kennedy, and Phillips 2001). As a result, the Hualapai Colorado River corridor TCP Evaluation Database was developed in order to further incorporate Hualapai TCP analysis in evaluation and monitoring procedures. The original 2001 database was based upon in-field evaluation forms used by HDCR during the evaluation and monitoring of river corridor TCPs already in place. The form was designed for the evaluation and monitoring of natural and human impacts (effects) at each designated Hualapai location. A synopsis of the types of impacts for which monitoring data is collected is presented in Table 2.

HDCR monitoring staff continue to conduct interviews with trip participants, and promote cultural education among tribal youth on the trip. Hualapai perspectives on traditional knowledge about the tribe's history in the Grand Canyon is of course a main focus of discussion, as well as the cultural significance of plants, animals, and other aspects of the natural world that are part of their cultural landscape. These discussions are often framed with concepts of spirituality and deep connections to the canyon and the river. As such, the annual monitoring river trips provide a catalyst for reinforcing the significance of the pattern of past events that helped shape the identity of the Hualapai people. As the area is eligible for the National Register of Historic Places (NRHP) under criterion A (in part), maintaining this significance may thus be viewed as a mitigative strategy. Dissemination of particular information obtained during the annual trips to a wider non-Hualapai public, however, is at the discretion of the Hualapai Tribe.

Table 2. Monitoring Impact Attributes

Impact Attributes							
Archaeology	*Natural*	Erosion	Deposition	Flooding	Slumping	Arroyo Cutting	Turbation
	Human	Trailing [1]	Camping[2]	Collection Piles	GC Dam[3]	Vandalism	
Ethnobotany	*Natural*	Erosion	Deposition	Flooding	Drought	Competition	Turbation
	Human	Trailing	Camping	Picking	GC Dam	Veg Clearing	
TCPs	*Natural*	Erosion	Deposition	Flooding	Drought	Competition	Turbation
	Human	Trailing	Camping	Vandalism	GC Dam	Visual	Noise
[1] *Camping*	*This impact relates to camping off site.*						
[2] *Trailing*	*Trailing refers to new trails off main trails.*						
[3] *GC Dam*	*Impacts from inundation or lack thereof*						

FIELD SUMMARY AND RECOMMENDATIONS

HDCR conducted the 2014 river trip, during which 23 locations were monitored (Table 3). Note that three locations are not on the list of TCPs in Table 1: Beecher Springs, site AZ C:5:1 (South Canyon), and Granite Camp – Monument Creek, but are considered of interest as discussed below in the site specific results sections.

Table 3. Monitored TCPs during the 2014 Hualapai Monitoring River Trip

TCP 001 National Canyon, RM 167L
TCP 002 Mohawk Canyon. RM 172L
TCP 003 Vulcan's Anvil, RM 178
TCP 004 Medicine Springs, RM 180L
Beecher Springs, RM 183L
TCP 007 Whitmore Canyon, RM 188R
TCP 008 Hematite Mine, RM 200.2R
TCP 010 Granite Park, RM 209L
TCP 011 Pumpkin Springs, RM 213 L
TCP 012 Three Springs, RM 216L
TCP 013 AZ G:3:80, RM 222.2L
TCP 014 Little Colorado River, RM 61.8L
TCP 015 Cardenas, RM 71.5L
TCP 016 Deer Creek, RM 137R
TCP 017 Havasu Creek, RM 156.9L
TCP 018 Diamond Creek, RM 225.5L
AZ C:5:1 (South Canyon), RM 31.7R
TCP 024 Shinumo Canyon, RM 109.3R
TCP 030 Vasey's Paradise, RM 31.8R
TCP 031 Buck Farm Canyon, RM 41R
TCP 032 Salt Mine, RM63 L
TCP 033 Elves Chasm, RM 116.5L
Granite Camp – Monument Ck, RM 93.8L

For the 2015 HDCR PA BOR river trip, participants joined the HDCR staff with one boat crew from the Grand Canyon Monitoring and Research Center (GCMRC) (Table 4). We thank participants and the boat crew for their dedication and hard work. In this report, we present our findings of natural and human impacts to TCPs and ethnobotanical resources located along the Colorado River corridor.

Table 4. HDCR May-June 2015 River Trip Participants

Participant	***Position***	***Representing***
Peter Bungart	Co-Principal Investigator	HDCR
Carrie Cannon, M.A.	Cultural Specialist-Ethnobotanist	HDCR
Bennett Jackson	Cultural Resource Technician	HDCR
Simone Ka-Voka Jackson	Water Quality Hydrologist	HDCR
Eva Sullivan	Hualapai Adult	HDCR
Seran Sullivan	Hualapai Youth	HDCR
Patricia Cesspooch	Hualapai Adult	HDCR
Alicia Cesspooch	Hualapai Adult	HDCR
Rosie Wescogame	Hualapai Adult	HDCR
Angelique Jackson	Hualapai Youth	HDCR
Tryston Jackson	Hualapai Youth	HDCR
Wendy Hodgson	Botanist	DBG
Melissa McMaster	Restoration Ecologist	Mariposa
Jaimie Townsend	Head Boatman	GCMRC
Tiffany Cooper	Boat Crew	GCMRC

For the 2015 season, HDCR monitors noted that several TCPs were affected by human and natural impacts, not all of which are necessarily negative. A summary of observations at the 23 locations is presented in Table 5, with a synopsis of recommendations in Table 6. Site specific discussions follow.

Table 5. Synopsis of 2015 River Trip evaluations

TCP 001 National Canyon, RM 167L	Lower camp/beach area recovering from flash floods & HFE effects
TCP 002 Mohawk Canyon. RM 172L	Previous HFE sediments noted in 2014 swept away; archaeological site unchanged
TCP 003 Vulcan's Anvil RM 178	No apparent recent impacts
TCP 004 Medicine Springs, RM 180L	No apparent recent impacts at spring at river's edge; monitored source against cliffs
Beecher Springs, RM 183L	Submerged at higher water levels
TCP 007 Whitmore Canyon, RM 188R	Recent trail rerouting & stabilization appears to be holding
TCP 008 Hematite Mine, RM 200.2R	Erosion, trailing, & gullying noted
TCP 010 Granite Park, RM 209L	Erosion & gullying from trailing, Goodding's willow in failing health; conducted limited trail closing
TCP 011 Pumpkin Springs, RM 213 L	Increased algae, native grasses thriving along with red brome and dicoria

TCP 012 Three Springs, RM 216L	No new impacts noted
TCP 013 AZ G:3:80, RM 222.2L	Pronounced trailing/trampling near rockshelter
TCP 014 Little Colorado River, RM 61.8L	No new impacts noted
TCP 015 Cardenas, RM 71.5L	Distressed tamarisk, beaver predation on Gooddings willows
TCP 016 Deer Creek, RM 137R	No new impacts noted
TCP 017 Havasu Creek, RM 156.9L	No new impacts noted
TCP 018 Diamond Creek, RM 225.5L	Heavy use, potential loss of sediment
AZ C:5:1 (South Canyon), RM 31.7R	Possible erosion in structure
TCP 024 Shinumo Canyon, RM 109.3R	Flash flooding
TCP 030 Vasey's Paradise, RM 31.8R	Gooddings willow attacked by beaver
TCP 031 Buck Farm Canyon, RM 41R	Trailing & erosion
TCP 032 Salt Mine, RM63 L	Bank cutting, question of salt regeneration
TCP 033 Elves Chasm, RM 116.5L	No new impacts noted
Granite Camp – Monument Ck, RM 93.8L	Tended plant restoration project, education site

Table 6. HDCR recommendations for treatment of Hualapai TCPs in the Colorado River corridor

TCP	***Name***	***Recommended Treatment***
001	National	Annual monitoring, including HFE effects; cover upper trail as required
002	Mohawk	Monitor archaeology site every two years; monitor HFE effects
003	Vulcan's	Annual monitoring; public outreach & education
004	Medicine Spr.	Monitor occasionally at base of cliffs; monitor spring at river bank for flow changes
	Beecher Spr.	Monitoring annually when above river level
007	Whitmore	Annual monitoring, focusing on erosion, trails, and graffiti
008	Hematite Mine	Annual monitoring, possible trail obliteration
010	Granite Park	Annual monitoring; trail work; willow restoration, graffiti removal
011	Pumpkin Spr.	Annual monitoring, including HFE effects; public outreach & education
012	3 Springs	Annual monitoring; species list
013	AZ:G:3:80	Annual monitoring, focusing on trailing & erosion
014	LCR	Annual monitoring, focusing on trail impacts; ethnobotany survey
015	Cardenas	Annual monitoring; focusing on willow, tamarisk leaf beetle, trailing
016	Deer Ck	Annual monitoring, focusing on trail erosion
017	Havasu Ck	Annual monitoring, focusing on trail erosion
018	Diamond Ck	Annual monitoring, focusing on erosion, loss of beach sediments, trash, visitor impacts
024	Shinumo Ck	Annual monitoring; check for "artifact seeding"
	AZ C:5:1	Annual monitoring, focusing on trails, erosion, stability of archaeological features
030	Vasey's	Annual monitoring, ethnobotany survey
031	Buck Farm	Annual monitoring, focusing on trail erosion, riparian plant impacts
032	Salt Mine	Annual monitoring, focusing on regeneration of salt, bank erosion
033	Elves Chasm	Annual monitoring, ethnobotany survey
	Granite Camp	Annual monitoring, tending to restoration project

TCP EVALUATIONS AND RECOMMENDATIONS

TCP 001 – NATIONAL CANYON, RM 167 L

Hualapai site monitors visited National Canyon on June 5, 2015, where they camped that evening. In part, this place is significant because it represents the easternmost major landmark along the river that is within the Hualapai Reservation (a rock cairn located on a talus slope across from Tuckup Canyon (RM 165.2 L) marks the northeast boundary line of Hualapai Reservation lands). However, it is also very significant as an ancestral settlement area, with trails connecting the river to the upland country to the south. An archaeological site (AZ B:9:317) situated at the mouth of the canyon is routinely monitored by HDCR. The site consists of a roasting pit with an associated lithic scatter and a few miscellaneous stone tools at the base of a semi-sheltered cliff face. Hualapai monitors also evaluated three plant transects in the general area.

The trail leading up to the site is subject to increased definition through use, including by monitors, and to subsequent erosion. HDCR staff try to minimize this by brushing away tracks and walking on rocks, rather than soil, whenever possible. Monitors noted very little change at the site, compared to recent years. A single set of footprints was noted passing through the site. Slight gullying (<10 cm deep) was noted, similar to the previous monitoring session of May 2014.

National Canyon has experienced significant flash flooding twice in recent years, and along with the effects of HFEs is a case study in active, and perhaps unpredictable, geomorphic processes. It seems as though the pattern, if there is one, is that flash floods scour away sediments from the delta, and HFEs deposit new sediments that have a chance of being reworked by upstream winds (Figure 2). The availability of relatively stable sediments ultimately influences the growth and recruitment of various plants, such as dicoria and perennial grasses.

Ethnobotany

Three plant transects were completed with results discussed in the Ethnobotanical Results (page 42) section below.

Recommendation :

HDCR recommends annual monitoring and photo matching, including possible HFE effects and aeolian sediment transport across the debris fan at the mouth of the canyon. Brush away tracks leading up to the archaeological site as necessary to minimize definition of a trail.

Figure 2. Top: lower National Canyon delta after summer 2014 side canyon flood, which resulted in loss of beach sediments and shallow wide channels (photo taken September 4, 2014). Bottom: although not a precise match (both photos were taken from a raft), it appears that aeolian and alluvial sediments are somewhat becoming replenished, creating low dune areas (photo taken June 5, 2015).

TCP 002 – MOHAWK CANYON, RM 172 L

Archaeological remains at the mouth of Mohawk Canyon (site AZ B:13:2) include a multi-component roasting feature complex with four or five roasting features, middens, and artifacts, surrounding a shallow rockshelter (Figures 3 and 4). Associated ethnobotanical resources include creosotebush, wolfberry, Nevada Indian-tea, mesquite, globemallow, and California barrel cactus. HDCR visited Mohawk Canyon on June 6, 2015. There was no evidence of recent human impacts to this site, although there may have been some small rodent activity in the sediments in front of the rockshelter. Access to the site requires some "bushwacking" through dense vegetation, and so would not be very attractive to river parties during the main boating season. Plant transects were not recorded during this visit.

In May of 2014 a significant deposition of HFE sediments was noted on the upstream side of the mouth of the canyon, both above the normal high water line and as a sandbar out from the river bank (Figure 5). This deposition was completely eroded away by the time of the 2015 monitoring trip, however, and unfortunately a photo match was not possible since the shallow water that was present in 2014 was no longer there, precluding the possibility of standing in the same location. It would be interesting to observe, in any case, whether future HFEs or other conditions will lead to reestablishment of sand deposits.

Ethnobotany

TCP 002 contains typical lower canyon desert and riparian plants and most of the site is located above the influence of fluctuations in Glen Canyon dam releases. One new plant transect was established during the 2013 monitoring trip, as the previous transect from 2012 was flooded away.

Figure 3. Rockshelter site AZ B:13:2 near the mouth of Mohawk Canyon. Photo left taken May 2014; photo right taken June 2015. Note slight trail, most apparent in photo right.

Figure 4. Remains of roasting pit at AZ B:13:2. Note incipient drainage in left foreground and overall dearth of vegetation below base of cliff, which may lead to accelerated erosion in the future, although little to no change was apparent between the 2014 and 2015 monitoring trips. Top photo taken in May 2014; lower photo taken June 2015.

Figure 5. Panoramic composite photo showing accumulation of HFE sediment deposits at the upstream side of the mouth of Mohawk Canyon (photo taken May 18, 2014). This HFE sediment deposit would likely not be affected by side canyon flash floods, and may be a suitable location for a native vegetation restoration project. Photo taken while standing out from the river bank several meters, attesting to additional sandbar sediments in shallow waters.

Recommendations

HDCR recommends monitoring the archaeological site at Mohawk Canyon every two years. Potential HFE effects should be monitored each year for possible sediment accumulation or loss. Observations of prevailing wind direction and evidence of aeolian transport of sediments may be warranted.

TCP 003 – VULCAN'S ANVIL, RM 178

Vulcan's Anvil is a large, flat-topped volcanic remnant located near the middle of the Colorado River at RM 178 (Figure 6). *Wi-Nya-Ta-Lupa* (Flat Black Rock) is the Hualapai name. This place is also said to have been called *Wi-Geth-Yea'a,* or the 'Medicine Rock.' Vulcan's Anvil was visited by the HDCR monitoring trip in the early morning of June 7, 2015, when prayers were given prior to running Lava Falls Rapid downstream. In the past, river runners have been known to leave offerings on the Anvil, some of which were offensive or disrespectful. Through public outreach and education, however, this practice has dramatically decreased. HDCR monitors noted little or no evidence of improper offerings during the 2015 trip.

It is maintained in Hualapai belief that medicine people receive their special power from the area around this rock, and from the rock itself. Hualapai oral traditions also recount that the creation of fire is associated with Vulcan's Anvil. For Hualapai, the entire Lava Falls area is regarded with reverence, due to the profound respect for the sacred powers residing in the environment of the canyons and the waters.

Recommendations

HDCR recommends continuing public outreach and education to discourage tourist "offerings" and to provide insight into the Hualapai concept of sacred sites. HDCR recommends an annual evaluation of this TCP.

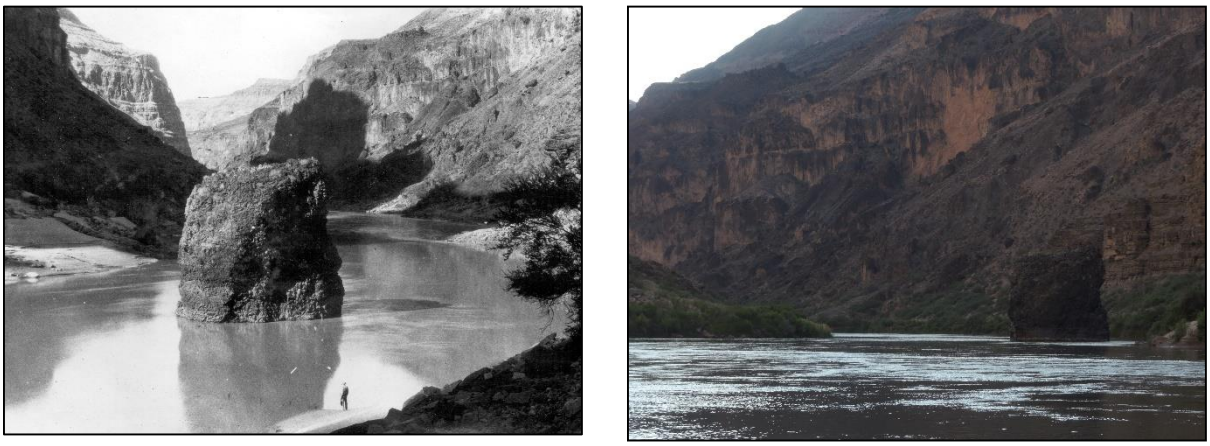

Figure 6. Vulcan's Anvil. Photo left by E.C. LaRue in 1923; Photo right taken June 2015.

TCP 004 – Medicine Springs, RM 180 L

Medicine Springs erupts at the river's edge at the bottom of Lava Falls Rapid, on the downstream end of Prospect Valley, but it also has a source located at the base of the cliff to the southeast (Figure 7). A small pictograph site, recorded as AZ A:16:179, is located nearby. As this is a warm mineral spring, it is considered to have special healing properties. HDCR stopped at the spring along the river's edge on June 7, 2015 to fill containers to take back to elders at Peach Springs, as well as monitor the pictograph site and measure water quality at the source of the spring below the cliffs.

Recommendations

HDCR recommends occasional monitoring or visitation (every three years or so) at the source of the spring and pictograph panel, although it is difficult to reach because of dense vegetation. More frequent monitoring may result in trails being established, which would not be desirable. Collection of spring water at the river's edge will likely continue, although changes in the flow of the spring should be monitored.

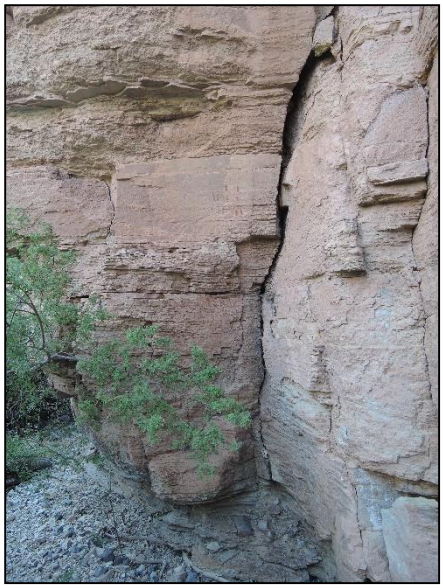

Figure 7. Area of Medicine Springs at base of cliffs below Lava Falls Rapid. Photo right shows nearby pictographs.

Beecher Springs, RM 183 L

Beecher Springs (Figure 8) was inundated by higher water levels at the time the 2015 monitoring trip passed by. As with other springs in the canyon, it is considered sacred. It seems likely that it was a good source of fresh water for the inhabitants of nearby archaeological sites.

Recommendations

HDCR recommends monitoring of the spring annually, as long as it is visible above the current water level. It would be desirable to determine at what discharge the spring becomes inundated. An ethnobotanical assessment is also recommended.

Figure 8. Beecher Springs, exposed just above river level in May 2014 (inundated June 2015).

TCP 007 – WHITMORE WASH, RM 188 R

The most notable features of the heavily visited Whitmore Wash location include an archaeological site (AZ A:16:1) comprising a rock shelter, artifacts and pictographs (including elements that have been interpreted as a map of trails to the Colorado River to and from Prospect, Mohawk and National Canyons). A relatively short trail leads down from a lava flow on the north side of the river, and this location is used as an "interchange" point for certain river companies. This site has been a challenging management issue for NPS due to heavy visitation and associated trailing and erosion, which led to recent stabilization efforts by the Park in partnership with the Pueblo of Zuni. On our visit on June 7, 2015, our group noted the stabilization and trail re-routing work conducted by Zuni and NPS, and discussed the importance of Hualapai and other tribal participation in taking a more active stewardship role in taking care of places along the river corridor. Overall, it appears that the recent work has been effective in curbing additional impacts to the site.

Ethnobotany

Ethnobotanical resources at Whitmore Wash include creosotebush, mesquite, arrowweed, California barrel cactus, and four-wing saltbush. The Hualapai Tribe does not carry out formal ethnobotanical evaluation at this site; however, it is a regular plant monitoring site for the Southern Paiute Consortium.

Recommendations

HDCR will continue annual evaluations of the Whitmore Wash site, as other tribal monitoring trips will be likely to do. Given the frequent inspections over the course of the main river running season, it should be easy to identify impacts shortly after they occur.

TCP 008 – HEMATITE MINE CANYON, RM 200.7 R

The place along the river commonly known as the Hematite Mine is a traditional Hualapai paint gathering and processing area. The mine was recorded as an archaeological site (AZ:A:15:25), which aslo includes associated artifacts. Hualapai monitors visited the site on June 7, 2015. Only male tribal members accessed the hematite deposits, for the purpose of collecting a modest amount.

Traditional knowledge regarding the mineral hematite (*gwađ* in Hualapai), as recorded in 1996, states that it *"is highly valued as a sacred mineral, not only by the Hualapai, but by all other neighboring tribes surrounding the Hualapai Ancestral Territories. … Religious beliefs…require that the Hualapai Tribe fulfill its sacred stewardship of the site, in continued maintenance of traditional cultural practice at this TCP…It is said that great caution, stamina, and humility are required of those who might extract a measure of the mineral substance from the mine" (*Jackson and Stevens, 1994:13*).*

Multiple trails have been noted accessing the site, which may lead to erosion of sediments along the talus slope. In years past, digging implements had been noted in the mine, as well, but were promptly removed. None were seen on the present visit.

Ethnobotany

This TCP is quite rich in ethnobotanical resources, mostly in a small basin or cove below the cave and along the dry wash that leads to the river. Important culturally significant plants include creosotebush, prickly pear, snakeweed, mesquite, globemallow, and brittlebush. A plant species list was compiled in March 1998, and updated in 2009. It will continue to be updated as needed.

Recommendations

HDCR will continue annual monitoring of the Hematite Mine. Potential erosion along the talus slope and the wash below the site should be assessed. If necessary, this could be addressed in conjunction with NPS. It is suggested that HDCR work with NPS to discuss options regarding the multiple trails at the mine. One main trail may be preferred.

TCP 010 - GRANITE PARK, RM 209 L

Granite Park is an extensive ancestral Hualapai settlement area, as evidenced by several recorded archaeological sites spread across a wide terrace area overlooking the river. Most of these are open artifact scatters, some with roasting features, although one of the sites (AZ G:3:3), consists of a rockshelter, roasting features, and associated artifacts. Travel routes from the east and south connected with a cross-canyon route via 209-Mile Canyon across the river. A full evaluation of the rockshelter and roasting features was conducted by HDCR in March 2003 and June 2004, and the site is routinely monitored on annual river trips. On August 10, 2012, Hualapai monitors discovered graffiti scratched into the rockshelter, some of which was etched through sooted rock surfaces (Figure 9 photo sequence). At a subsequent meeting with the Hualapai Tribal Council and NPS, the possibility of a collaborative effort to remove the graffiti was discussed. As of late 2015, this work has yet to come to fruition.

Aside from the graffiti, trails leading to the rockshelter are quite pronounced and have been causing significant erosion, including to archaeological roasting features (Figure 10 photo sequence). Social trails across the general terrace area have caused erosion in otherwise vegetation-stabilized sand dune deposits, some of which contain additional roasting features, artifacts, and other cultural materials. As a preliminary effort to curb access to the rockshelter and associated features, HDCR conducted some trail restoration work where four of the trails ascend from the wash toward the shelter, and installed signs at the wash at two of these (Figure 11), notifying visitors of the closures (we initially had three wooden signs provided by GRCA, but one was broken on the raft by the time we reached Granite Park). This work was done with the assistance of Melissa McMaster, former GRCA ecologist, who provided training to Hualapai tribal members conducting the restoration work.

Another aspect of Granite Park significant to the Hualapai is a historic Gooddings willow tree growing along the river's edge (Figure 12). This tree was one of many that formerly grew at Granite Park and at various places along the river corridor, but that have largely been extirpated since the construction of Glen Canyon Dam. The one remaining Gooddings willow at Granite Park appears in historic photos at least as early as 1923 during the Birdseye expedition, when it was already a mature tree. Gooddings willow *(Iyo'* in Hualapai) is an ethnobotanically significant plant, used in making cradleboards, basketry, gourd rattle handles, and for stone tool handles. The tree's health has fluctuated over the decades since it was first monitored (Jackson, Mayo, and Phillips 1997), although it appears to be in a general state of decline, perhaps nearing the end of its natural life. Three cuttings have been collected from the tree (two in 2014 and one in 2015), for the purpose of propagating new trees that can ultimately be replanted at Granite Park, thereby keeping the 'spirit' of the tree alive. These were small cuttings approximately one centimeter in diameter at their base and up to a meter in length, kept moist after collection and replanted in containers immediately after our return to Peach Springs. As of late 2015, the two young trees propagated from the 2014 cuttings are approximately seven tall, and the one from 2015 is nearly five feet tall.

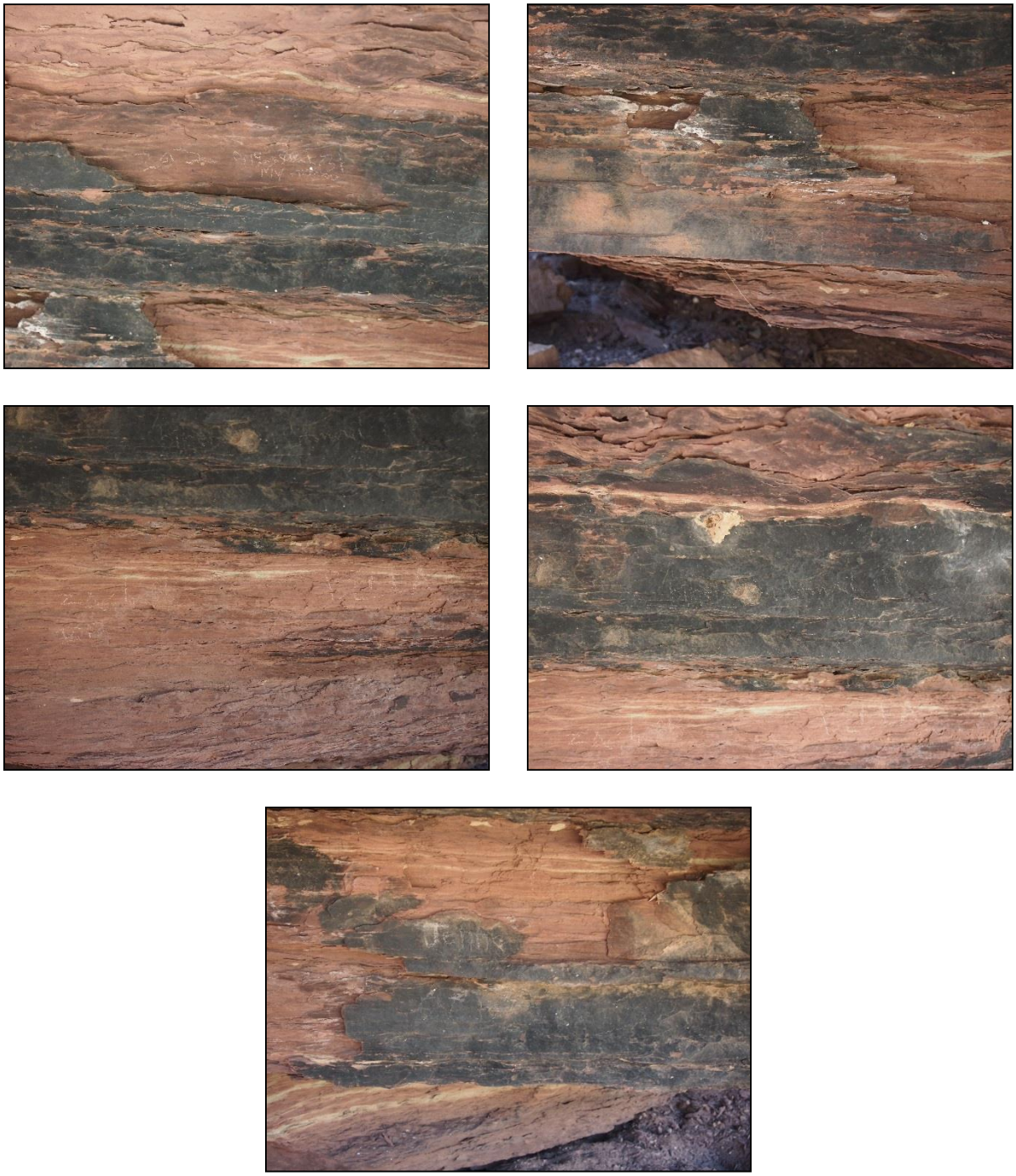

Figure 9. Photos showing graffiti scratched into rock surfaces at AZ G:3:3 (taken May 2014).

Figure 10. Sequence of photos showing pronounced trail leading to rockshelter. Lower left photo clearly shows impacts to archaeological roasting feature (taken May 2014).

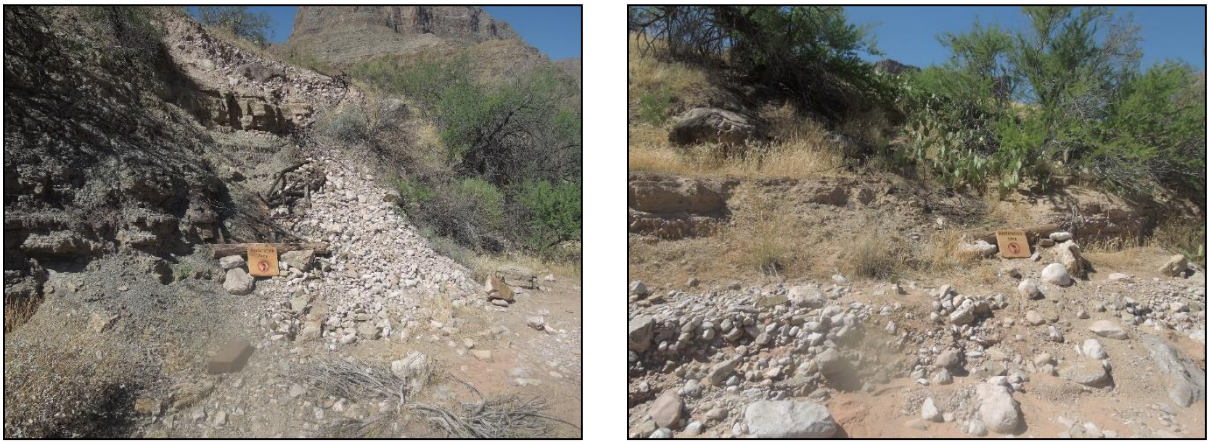

Figure 11. Preliminary trail restoration work, with signs provided by GRCA, at two locations on Granite Park Wash.

Figure 12. Old Gooddings willow at Granite Park. Left photo taken May 2014. Right photo taken June 2015. Approximately ½ of greenery at left side of tree is Baccharis.

Ethnobotany

Three plant transects were established at Granite Park in 1996, and are read annually to monitor and evaluate the condition of ethnobotanical resources. Details are presented further in the Ethnobotanical section of this report.

Recommendations

The persistent and ever-deepening trailing, as indicated in the above photo sequence, as well as the recent graffiti reported in 2012, begs for remedial action. Aside from the trail work conducted during the 2015 monitoring trip, we recommend that, in partnership with NPS, the rockshelter site and trail be closed to public access, and that trail revegetation and graffiti removal be undertaken as soon as can be arranged between HDCR and GRCA.

Regarding the historic Gooddings willow (*Salix gooddingii)*, it may be that the tree is nearing the end of its natural life, although this is likely being exacerbated by beaver predation, changes in flow regimes since the presence of Glen Canyon Dam, and impacts by river trips (such as tying boats to the tree and general trampling of the ground around the tree, which is an area of high activity when boating parties are camped or having lunch at the cove at Granite Park). We recommend continuing to collect cuttings for propagation, taking care not to 'over-harvest' and stress the already ailing tree. As the old willow is a female, it is also important to locate and collect cuttings from one or more nearby male Gooddings willow, which should also be replanted in the vicinity to promote natural recruitment over the long term.

TCP 011 – PUMPKIN SPRINGS, RM 213 L

Pumpkin Springs is a natural warm spring that is known to have been traditionally utilized by the Hualapai people (Figure 13). It is also known to be a popular stop for river commercial and private river trips going back many decades. As a warm medicinal mineral spring with healing properties, the Hualapai believe it should be treated respectfully, and behaviors that demonstrate irreverence are a cause of concern. Prior to the construction of Glen Canyon Dam, the large pool that characterizes the spring would periodically get flushed out by massive runoff from spring and early summer snowmelt. However, since regulated flows are now the rule, this occurs much less frequently and has led to extended periods where algae and other contaminants become concentrated. It was reported in HDCR's 2011 monitoring report that the equalization flows of that year of 25,000 – 27,000 cfs was sufficient to completely flush the spring out. In 2012-2013, the spring was showing signs of renewed algae growth, which was even more apparent when monitored on May 20, 2014, in spite of two HFE events in fall of 2012 and 2013 that exceeded 35,000 cfs. It may be that algae growth occurs quickly enough after the spring has been inundated that it is difficult to infer the effect it has had in rejuvenating the pool.

Just below Pumpkin Springs (Figure 14), at the boat pull-in, is an HFE deposit that appears to provide sediment for aeolian reworking that may be beneficial for creating habitat for native perennial dropseed grass (*Sporobolus* sp). Dropseed was an important food resource going back millennia, as evidenced by caches found in dry cave archaeological sites. Its presence along the river corridor may be considered evidence of the ecological health of certain locations, especially in contrast to non-native cheat grass, camelthorn, Russian thistle, and other invasive species. During the 2015 monitoring trip, red brome and dicoria was noted growing along with dropseed along the 'zone' created by aeolian sand deposition.

Figure 13. Pumpkin Springs. Photo left: taken May 20, 2014; right: June 8, 2015. Note algae build-up in 2015 photo.

Figure 14. HFE sediments deposited on the downstream side of Pumpkin Springs. Photo left shows aeolian redeposition as well as erosion of sediments at river's edge. Photo right shows growth of dropseed, red brome, and dicoria further up the bank in aeolian sand area.

Ethnobotany

TCP 011 RM 213L Pumpkin Springs TCP Plant List

Tamarisk	Fish Hook Cactus
Jimmy weed	Brome Grass
Desert Dicoria	Desert Broom
Mesquite	Acacia
Creosote	Brittle Bush
Arroweed	Tumbleweed
Bermuda Grass	Snake Weed
Ocotillo	Engelmann's Prickly Pear
Barrel Cactus	Clover
Sporobolus sp.	Spiny Aster

Recommendations

HDCR will continue annual monitoring at Pumpkin Spring, focusing on the condition of the spring itself and on the HFE sediments and associated plants. Public outreach and education about the significance of Hualapai sacred sites should continue.

TCP 012 – THREE SPRINGS, RM 216 L

Three Springs Canyon (Figure 15) is a tributary of the Colorado River that descends from the Ponderosa pine high country to the east. Two archaeological sites have been recorded near the mouth of the canyon: a small pictograph site with associated bedrock grinding slicks (AZ G:3:77) within the canyon, and an artifact scatter (AZ G:3:78) situated on the bench above to the south. The riparian area in the canyon, which includes a small free-flowing stream that is spring fed, includes a number of culturally significant plants, such as Gooddings willow, cottonwood, and cattail. In general, Three Springs was in good condition when visited on June 8, 2015. A well-defined trail mostly leads across shallow soils overlying bedrock. Multiple trailing appears minimal, and mainly occurs where one descends into the stream bottom from the bench above. The pictographs have not been disturbed. A rattlesnake was observed in the dense riparian vegetation along the stream below the lower spring.

Figure 15. Left: Three Springs Canyon overview; right: pictographs at site AZ G:3:77 (both photos May 20, 2014).

Ethnobotany

A complete ethnobotanical survey is not yet completed for Three Springs, but it is clear that a diversity of plants inhabits this area, including a number of riparian species such as cattail, Gooddings willow, and cottonwood.

Recommendations

HDCR will continue annual monitoring at Three Springs, focusing on the condition of the pictographs and the riparian vegetation. A plant and associated animal species inventory for the riparian area is recommended.

TCP 013 – AZ G:3:80, RM 222.2 L

The main features at this site (recorded by NPS in 1991 as AZ:G:3:80) include a shallow rockshelter with several pictographs and an open area among sand dunes with roasting features and associated artifacts. In general, pictographs and petroglyphs tend to attract visitors who are curious about their design and meaning, and a well-defined trail leads to the shelter area containing the pictographs from the upstream side of the site, rather than from a camping area on the downstream side. This area is regarded as highly significant for Hualapai due to the rock writing. Hualapai Elders stated "…that the writings indicate travel routes, and represent events occurring in the canyon. These writings are also written with the hematite of Hualapai cultural and geographical affiliation" (Jackson and Stevens, 1994:15). When visited on June 8, 2015, a small artifact collection was present on a rock below the shelter, comprising a few pieces of pottery and some chipped stone flakes. These may have come from the dune area downstream from the site, since for the most part there are relatively few artifacts within the rockshelter area. The collection pile was dispersed to hopefully dissuade visitors from adding more items, as is often the case.

Ethnobotany
Associated ethnobotanical resources at TCP 013 include Fremont wolfberry, mesquite, prickly-pear, and globemallow. A plant species list was originally compiled in 2001.

Recommendations
HDCR recommends monitoring of this site at least annually, perhaps more often if practical. Trail impacts to the rockshelter at Locus A and to the camping area at Locus B should be closely monitored due to frequent visitation.

TCP 014 – LITTLE COLORADO RIVER, RM 61.8 L

The Little Colorado River comprises "a large significant traditional cultural area for the Hualapai, Havasupai, and Hopi Tribes, and … for the Navajo Nation…This area is the conceptual boundary line between the Pai Tribes and the Hopi. Everything west of the Little Colorado to the Mohave Valley is called *Ko Ho Nin'* a Hopi term referring to 'the People that live to the West' (the Hualapai and Havasupai). The main routes in this vicinity have been used by Pai Bands for trading wares, minerals and food resources with Hopi" (Jackson and Stevens 1994:7-8).

The mouth of the Little Colorado River includes an archaeological site, which consists of structures, roasting features, midden deposits, rock art, artifacts, and a historic travel route. NPS routinely monitors the site. The general area is heavily visited by river parties who come to swim in the Little Colorado River, which is a beautiful turquoise blue when running clear. Hualapai monitors visited the site on May 13, 2014. Although distinct trails are present, the area is kept very clean by visitors (Figure 16). One issue that tribal monitoring trips encounter is that, when tribal members wish to conduct prayers or other ceremonies here, it can be difficult to find the privacy they need for these activities.


Figure 16. Photo left shows a typical scene at the mouth of the Little Colorado River on a warm spring day. Photo right is looking up the Little Colorado River. Both photos taken June 1, 2015.

Ethnobotany

HDCR monitors have not completed an ethnobotany survey for TCP 014.

Recommendations

HDCR will continue monitoring annually at the Little Colorado River. An ethnobotany survey should be completed when feasible.

TCP 015 – CARDENAS, RM 71.5 L

Cardenas is a multi-faceted site with archaeological features, remnants of marsh habitat, and probably the largest remaining stand of Gooddings willow between Glen Canyon Dam and Lake Mead. Cardenas is also a popular camping area for river parties. It can be accessed by hiking trail between the Tanner and Hance Trails, as well, although this does not appear to occur very often. The archaeological remains are mostly buried by dune deposits behind a dense frontage of tamarisk that line the river, although erosion of the dunes has exposed some of these remains in the past. These are routinely monitored by NPS. A nice stand of dropseed grass (*Sporobolus contractus*), an important subsistence seed in the past, grow among the dune areas. Above the camp area to the southwest is a large masonry structure on a hill (sometimes known as "Hilltop Fort"). Its actual purpose is unclear, but it affords commanding views up and down river to a number of other ancient settlement areas.

In recent years the profusion and migration of the tamarisk leaf beetle has taken a major toll on the tamarisk at Cardenas (Figure 17). This may be considered to present both opportunities and challenges. On one hand, as tamarisk decline, they could be replaced by Gooddings willow and other native species. On the other, if the tamarisk dies and just the dead trees remain, the area could be devastated by wildfire, which could impact not only the plant and animal life but the archaeological sites as well. Further complicating the situation is the fact that beavers are actively feeding on the existing Gooddings willow (Figure 18), and have felled perhaps two-thirds of the trees. Any future management actions would have to address this problem to succeed.

Ethnobotany

An ethnobotanical survey at Cardenas has not yet been completed. TEK derived from such a study would be very beneficial for future management actions, including potential restoration.

Recommendations

Annual monitoring is recommended at Cardenas. The health and status of the stand of Gooddings willow should be monitored, as well as the effects of the tamarisk leaf beetle. As Cardenas is a frequently used camp that is near an archaeological site, visitor impacts should be evaluated, including the trail that leads to the "Hilltop Fort."

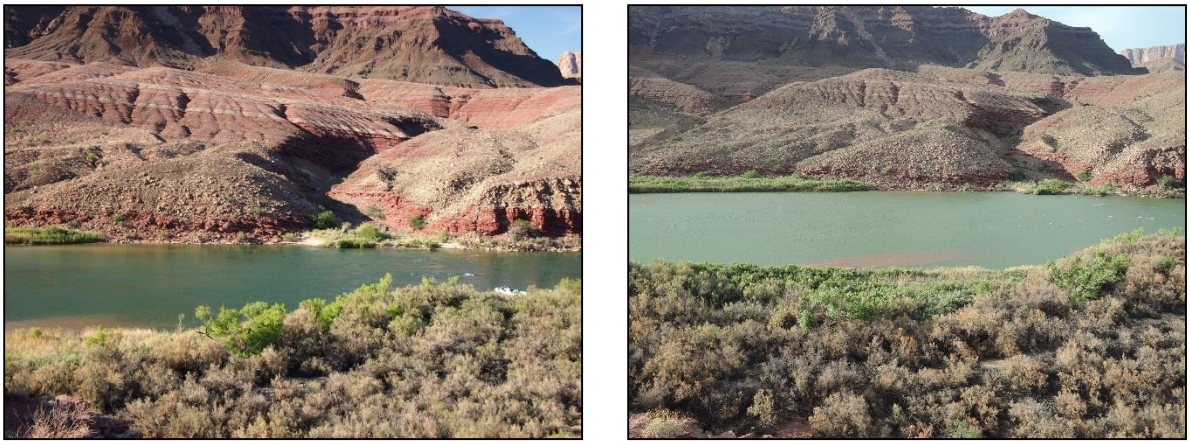

Figure 17. Overview of the Cardenas area from above. Bright green trees in foreground are primarily Gooddings willow, while brown shrubs are tamarisk being stressed by the tamarisk leaf beetle (photo left taken May 13, 2014; photo right taken June 1, 2015).

Figure 18. Photo left shows large Gooddings willow being devoured by beaver at Cardenas. Photo right shows large Gooddings willow felled by beaver, with meager new growth around base of trunk.

TCP 016 – DEER CREEK, RM 137R

Deer Creek is a heavily visited scenic tributary canyon and includes archaeological sites, remnants of irrigation features, roasting pits, pictograph panels, and a historic travel route. Deer Creek is also a popular backpacking destination. HDCR monitors visited Deer Creek on June 4, 2015. Visitors continue to be the largest cause of impacts. Many visitors go further up beyond the pictograph panel area and the shady area known as the patio, and hike up to Deer Spring. The spring is a sacred area for Hualapai and, when possible, HDCR monitors collect water to take back to the Elder participants on any given river trip. In general, the heavy use of the area has presented challenges to NPS in maintaining trails, removing graffiti, and monitoring archaeological sites. Of

special interest to Hualapai trip participants as well as botanists is a population of *Agave philllipsii* that grows up the canyon near the established campsite area (Figure 19). This species of agave is considered to have been introduced into certain favorable canyon locations through ancient human means, perhaps through trade by agriculturalists. Agaves in general are among the most important food resources for the Hualapai, and peculiarities such as this species is naturally of interest.

Figure 19. *Agave phillipsii* in Deer Creek. Trip participants Eva Sullivan (left) and Patricia Cesspooch (right) discussing the agave with botanist Wendy Hodgson in photo right.

Ethnobotany

Ethnobotanical resources present in Deer Creek include cottonwood, giant reed, Deer Creek agave, coyote willow, Indian tobacco, Gooddings willow, and four-wing saltbush, among many others. A plant species list was compiled in 1993 and updated in 2010. It has been entered into the Hualapai Colorado River corridor TCP Evaluation database, and will be updated as needed.

Recommendations

HDCR recommends continuing an annual evaluation of Deer Creek.

TCP 017 – HAVASU CREEK, RM 156.5 L

Havasu Creek is a side canyon that is traditionally visited by the Hualapai people, who are closely related to the Havasupai that live further up canyon. Prayers for the creek are offered here. Havasu Creek is a historic travel route, with access to the rim through Supai Village. HDCR monitors visited this site on June 5, 2015. Well-defined trails lead from the boat pull-in areas at the mouth of the canyon to swimming areas that are very popular with river parties during the main river running season.

Ethnobotany

The area is rich in ethnobotanical resources. A well-developed side canyon riparian flora is found along the banks of Havasu Creek, which supports canyon grape, velvet ash, cattails, prickly-pear, and many other plants important to the Hualapai people. No ethnobotanical monitoring program has been established at Havasu Creek by HDCR.

Recommendations

HDCR recommends continued annual monitoring at Havasu Creek.

TCP 018 – DIAMOND CREEK, RM 225.5 L

The mouth of Diamond Creek includes an artifact scatter (AZ:G:3:1) and a historic travel route. It also includes important ethnobotanical resources and a side canyon creek. Diamond Creek is an important historical and current ethnobotanical gathering area, with relatively easy road access from Peach Springs. Further up Diamond Creek were gardens and settlement areas, and the remoteness in the 19th Century allowed it to become a place of refuge during conflict with the U.S. Army. It is therefore an important traditional site for the Hualapai people. Over the years, the mouth of Diamond Creek has been impacted from camping, side-canyon flash-flooding, and intensive use as a boat launch and take-out.

Ethnobotany

The main ethnobotanical resources at TCP 018 are along Diamond Creek, a perennial stream that rises at a large spring about seven miles from the Colorado River. Usually this creek has a steady, small flow of clear, cold water; however, it is subject to severe flash flooding from the creek's drainage and from the larger but normally dry tributary Peach Springs Wash. These floods can periodically have a devastating effect on plants along the canyon floor. Floods may deposit a debris fan of gravels and cobbles into the Colorado River. A plant species list of was compiled in August 2002, and is updated as needed. An ethnobotanical TCP evaluation program was established at Diamond Creek by HDCR in 1996.

Recommendations

HDCR continues monitoring every year to check the beach area for erosion, trash, campfires and other visitor impacts.

TCP 024 - SHINUMO CREEK, RM 109.3 R

Shinumo Creek (Figure 20) is a popular stopping place for river rafting parties, mainly due to a profuse water fall a short hike up from its mouth. The canyon is occasionally subject to flash flooding, however, such as a flood that occurred in the summer of 2014. Shinumo

Creek was visited by HDCR on June 3, 2015.

Figure 20. The mouth of Shinumo Creek from approximately mid-channel, with commercial raft trip.

Ethnobotany

Ethnobotanical resources include reeds, willow, and brittlebush.

Recommendations

HDCR recommends continued monitoring on a yearly basis.

AZ C:5:1 – South Canyon, RM 31.7 R

This is a well-known archaeological site located near the mouth of South Canyon on high limestone ledges above the river. The site is accessible both to river parties and to hikers using the South Canyon Trail. Stanton's Cave and Vasey's Paradise are just downstream and clearly visible

from the site, which comprises a series of small masonry features and a large petroglyph boulder. When visited on May 30, 2015, it appeared that erosion may be worsening within the occupation structure next to the petroglyph boulder, and possibly some displacement of masonry elements as well (Figures 21 and 22). Artifact piles were noted on rocks adjacent the entry to this structure, as is all too common at this site; these were photographed and dispersed. Charcoal-stained soil below the structure was notably trampled by visitors, and may lead to future exposure of cultural remains.

Figure 21. Masonry structure at AZ C:05:001. Photo left taken in May 2014; photo right taken May 30, 2015. Note additional rock placed near entry in photo right.

Figure 22. Masonry structure at AZ C:05:001. Photo left taken in May 2014; photo right taken May 30, 2015. Note incipient gullying near center of photo (just to left of patch of prickly pear), which appears to be slightly worsening.

Recommendations

HDCR recommends continued photo matching and monitoring of AZ C:05:001 annually.

TCP 030 – VASEY'S PARADISE, RM 32.2 R

For Hualapai, all springs, seeps, and side creeks leading into the Colorado River are considered to be TCPs. HDCR monitors visited this site on May 30, 2015 (Figure 23). Near this location is reported to be a burial. Culturally significant plants are located here and water is collected for ceremonial purposes. No particular impacts were evident on the 2015 monitoring trip, although a Gooddings willow growing just above a large tamarisk is being attacked by beaver.

Ethnobotany

When feasible, complete an ethnobotanical survey.

Figure 23. Vasey's Paradise, showing volume of water issuing from limestone cliff face. Left photo taken May 11, 2014; right photo taken May 30, 2015.

Recommendations

HDCR recommends monitoring of Vasey's Paradise every year.

TCP 031 – BUCK FARM CANYON, RM 41.0 R

Buck Farm Canyon is a popular beach camping and hiking area, with a spring and relatively diverse ecological habitat (Figure 24). HDCR monitors visited Buck Farm and camped here on May 30-31, 2015. Near the mouth of the canyon, above the main sleeping areas, there are multiple trails heading up to where Buck Farm becomes restricted. At that point, there are two main routes leading up canyon: one that mostly follows the wash bottom, requiring some boulder hopping in places, and the other which mainly traverses the slope on the south side of the canyon.

Abundant redbud grows up Buck Farm Canyon, as well as fragrant ash (*Fraxinus cuspidata*), thistle, *Veronica* sp., columbine, and wild tobacco. Fragrant ash is on the list of GRCA's sensitive plant species, but is not threatened or endangered.


Figure 24. Left, small spring up Buck Farm Canyon. Right, small frog enjoying the diverse ecological habitat.

Camping impacts on the beach area appear to be minimal, considering its popularity, although camelthorn is an increasingly abundant invasive species. Aside from sleeping areas being defined by rocks and the before-mentioned trailing, the area has been well-kept. Hualapai Elders who have visited Buck Farm and similar areas in the past spoke about the sacredness of the canyons that supported animal and plant life, which the people hunted and gathered as gifts of creation. Hualapai Elders have also been concerned with the "little people" who take care of the canyon. This is an intangible concept, but is a cultural belief connected to making offerings to the canyon and the river. There are spirits, including the little people, who protect the canyon, and these beliefs are tied to Hualapai traditional practices. If the canyon is not treated with reverence and respect, and if the proper offerings and prayers are not followed, the little people may cause mischief and interfere with sleep or cause uneasy feelings, as told by an Elder during a 1997 monitoring trip.

Ethnobotany

TCP 031, RM 41.0 R, Buck Farm Canyon TCP Plant List

Plant Zone 1: Beach	*Plant Zone 2: Canyon/Wash*	*Zone 3: Spring*
Arroweed	Arroweed	Thistle
Tamarisk	Four-Wing Saltbush	Cattail
Coyote Willow	Indian Tea	Maiden Hair Fern
Emory's Baccharis	Beaver Tail Prickly Pear	Bermuda Grass
Indian Plantago	Spiny Aster	Birch Leaf Buckthorn
Clover	Brittlebush (*Encelia frutescens*)	Columbine
Desert Dicoria	Tumbleweed	Long Leaf Brickellia
Tumbleweed	Mesquite	*Baccharis Sergiloides*
Spiny Aster	Brittlebush (*Encelia ferinosa*)	Red Bud
Engelmann's Prickly Pear	Mescal Agave	Tamarisk
Snakeweed	Hedgehog Cactus	
Longleaf Brickellia	Globemallow	

Tiquillia	Datura
Indian Tea	Longleaf Brickellia
Beaver Tail Prickly Pear	Prince's Plume Wire Lettuce
	Barrel Cactus
	Wolf Berry
	Verbena
	Red Bud
	Snap Dragon
	Birchleaf Buckthorn
	Maiden Hair Fern
	Wild tobacco

Recommendations

HDCR recommends continued monitoring of Buck Farm Canyon every year. An assessment of invasive plants in the beach area may be desirable, especially of tamarisk, which may be in decline due to the tamarisk leaf beetle. Buck Farm could be suitable for a future restoration project if dramatic changes are occurring to the river bank ecology, and an opportunity exists for improved desired future conditions.

TCP 032 – SALT MINE, RM 64.0 L

Natural salt sources are a highly significant type of resource to Native American tribes, and have been for countless generations. This is especially true in landscapes where they rarely occur, and may involve extensive travels and risks to obtain. The salt source at RM 64 is a traditional cultural place for Hualapai and for other tribes as well. HDCR monitors visited this site on June 1, 2015. Dam operations and the associated changes in vegetation along the river bank surrounding the salt mines have affected the overall setting and feeling, and it may be that the bank may be cutting back due to erosion. The rate of regeneration of salt is difficult to assess, as more or less collection occurs each year by various tribal monitoring trips (the site is officially off limits to non-Indians, but it is hard to verify the adherence to this policy). In addition, the amount of salt reaching the surface is likely determined by ground water, climate, and aquifer dynamics that potentially originate many miles away.

Recommendations

HDCR recommends continued monitoring of the salt mine every year. Perhaps methods should be developed that assess the rate of salt depletion and regeneration, as well as changes in river bank vegetation and bank erosion.

TCP 033 – ELVES CHASM, RM 116.5 L

HDCR monitors visited this site on June 3, 2015. Because of the abundant spring associated with this site, Hualapai consider Elves Chasm to be a significant place. For Hualapai "the springs are sacred. The use of the water is sacred" (HDCR 1992a:72). Stewardship and protection of the waters has always been paramount, "for its culture, religion, physical survival, and economic viability…the Pine Springs Band, Milkweed Band, Grass Springs Band, Cerbat Band and Clay Springs Band…are responsible to protect and care for the water resources of the Hualapai Tribe" (ibid p. 73). This is also a very popular place for visitors. Monitors noted that the trail to the falls is minimally impacted as it is mostly rock, although rock surfaces in some places have become visibly polished from being used as hand holds.

Ethnobotany

The riparian vegetation at Elves Chasm is quite verdant. When feasible, completion of an ethnobotanical survey would be desirable.

Recommendations

HDCR recommends continued monitoring of Elves Chasm every year.

GRANITE CAMP – MONUMENT CREEK, RM 93.8 L

Granite Camp/Monument Creek is the site of an NPS vegetation restoration project, where a large stand of tamarisk was mostly removed and a number of native species reintroduced in the hopes of reestablishing a native vegetation community. Some of the native species being restored include plants culturally significant to the Hualapai, such as Gooddings willow, cottonwood, mesquite, and prickly pear, among others. This location is used as a lunch spot and camp by river runners, and can be accessed via a relatively popular backcountry hiking trail as well. A nearby archaeological site (AZ B:16:260), comprising a lithic scatter, is located just up from the mouth of Monument Creek. A small rockshelter above the river was found to have a wild tobacco plant (which is considered both sacred and medicinal) growing inside, even though rain rarely, if ever, reaches the plant.

To ensure the success of the vegetation restoration project, which encompasses about one acre, NPS has employed significant volunteer labor and also depends on boating parties to assist in watering the young plants while they become established (Figure 25). A small ammo can with a log book inside serves as a register for how often and to what extent watering has occurred. To prevent predation by beavers, many of the plants (especially the trees) have been 'caged' with wire mesh enclosures to prevent the young trunks and stems from being eaten.

Figure 25. Left: young Gooddings willow at the Granite Camp – Monument Creek restoration site (note wire mesh 'cage.' Right: Hualapai youth trip participant Angelique Jackson watering a young mesquite tree.

Recommendations

Active participation in stewardship of Colorado River resources reinforces Hualapai connections to the river, and the Grand Canyon in general, as a TCP. This in some ways enhances the river corridor's National Register status under Criterion A. Continued participation in this and other

restoration, research, and monitoring activities is recommended as often as is feasible, given restraints in funding and availability of HDCR staff and other tribal representatives.

BOTANICAL TRANSECTS BACKGROUND AND METHODS

In 1996 five ethnobotanical study sites were established on Colorado River beaches within the Hualapai Reservation portion of the Grand Canyon as a means of evaluating the effects of an experimental flood carried out by the Bureau of Reclamation. These sites were evaluated prior to the flood in March, 1996, after the flood in April, and annually for the next four years to document recovery (Phillips and Jackson 1996, 1999; Jackson, Phillips and Christensen 2001).

Prior to the 1996 experimental flood, three line-intercept transects were installed at each of five study sites, National Canyon (River Mile [RM] 166 L[eft]), Granite Park (RM 209 L), Diamond Creek (RM 225.5 L), Bridge Canyon (RM 235 L), and Spencer Canyon (RM 246 L). Line intercept transects can be installed rapidly and efficiently by two researchers, providing a maximum amount of data in a minimum amount of time. They are appropriate for rapid assessment of changes in Grand Canyon beach and riparian zone vegetation.

Transects started at a point at or above the maximum flood level anticipated for the experimental flow, and were set using a 50-meter tape extended across the beach and riparian zone to the water's edge at the pre-flood time of installation. Sites were selected to include individuals of as many cultural plant species as possible at each study area. Transects were marked at the upper end at a re-locatable point above the high water line.

The three transects at each site were placed so as to sample different sections of the beach or delta, representing different depositional and erosion regimes present at the site. The line-intercept method is a standard method for quickly and efficiently collecting quantitative vegetation analysis data (Mueller-Dombois and Ellenberg, 1974; Bonham, 1989). A meter tape is laid from the upper endpoint to the water's edge, with the 0 point away from the river. The tape is placed as close to the ground as rocks and vegetation will allow, passing under plants as much as possible. The tape is stretched taut and straight between the two endpoints, and a vertical, two-dimensional plane extending from ground level to the top of the vegetation canopy is defined by the tape. Starting from the 0 end of the tape, each individual plant which hangs over the tape, or "breaks the plane," is measured by reading the interval along the tape through which the plant intercepts the plane. The beginning and endpoint of each such intercept is recorded for each individual biennial and perennial plant.

The individual intervals recorded for each species are added, giving a total intercept for each species along the transect. The ratio of the intercept for a particular species and the length of the transect gives a value known as percent cover for each species present on the transect. This is calculated as follows:

$$\text{Percent cover} = \frac{\text{Sum of intercepts for each species}}{\text{Length of transect}}$$

Total cover for a transect can be calculated by adding the individual values for each species.

The key to accurately comparing vegetation changes between readings is the placement of the tape in exactly the same position each time. This is made possible by keeping the tape straight, , and relocating fixed points. Photography was used to facilitate relocation; photos taken at the initial reading document the end points, additional fixed points, and the placement of the transect with respect to key individual plants and clumps of vegetation along the line. Matching photos and supplemental reference photos taken at each subsequent reading document changes in plants and sediment between readings (Phillips and Jackson 1999).

Since 1996 the three transects, each at National and Granite Park continue to be read to evaluate changes in vegetation over time. Additionally, a new transect has been established at Mohawk Canyon to evaluate the effects of the tamarisk beetle on a stand of tamarisk along the down-river side of Mohawk Canyon wash.

RESULTS

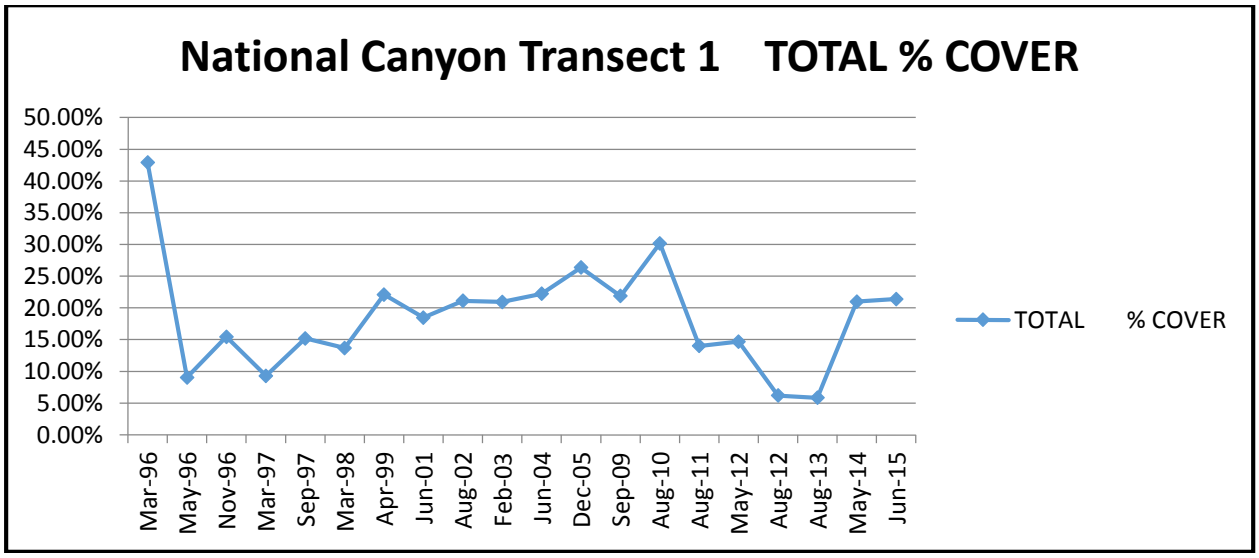

Figure 26. National Transect 1. Total Percent Cover Graph.

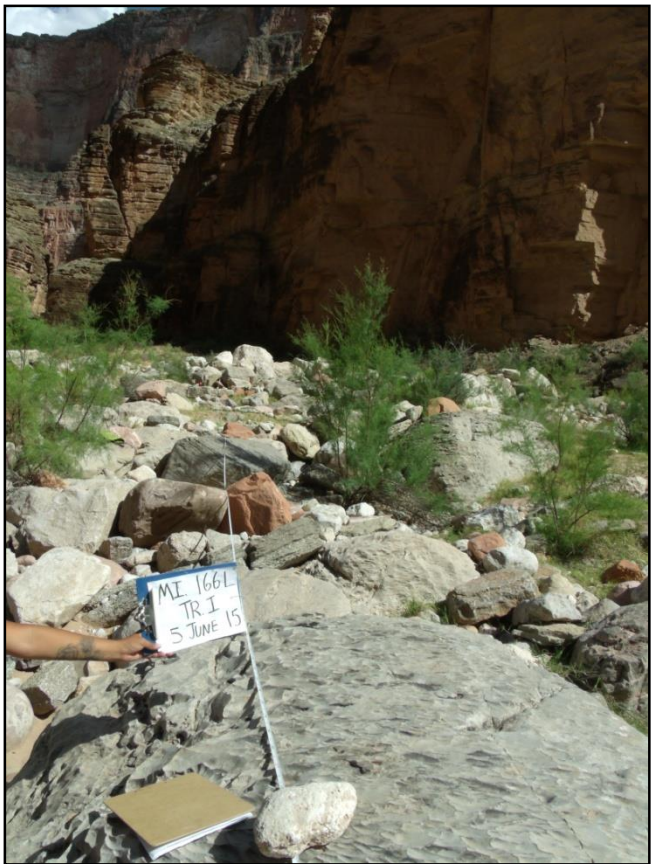

Figure 27. Photograph of National Transect 1.

A summer monsoon storm event in the upper drainages of National Canyon caused flooding which washed over the majority of the delta moving sand, rock, boulders, and scouring nearly all existing vegetation in July of 2012. In an August 2012 visitation little vegetation recovery had occurred. Since all vegetation had been wiped out from the flood event, any subsequent recording of new vegetation for these two transects provides an ample opportunity to document the re-vegetation and plant succession that follows a major side canyon flood.

The two transects along the upper beach were dramatically affected by the flood event. Transect 1 was relocated exactly using a boulder feature that had not moved during the flood. Boulders located within Transect 2 had moved, and the transect was re-established as accurately as possible utilizing boulders and landscape features from past photos.

Cover along transect 1 has changed little since our reading in August 2012 following the drastic flood event that had wiped out the majority of vegetation that had been recorded in prior years. From August 2012 to August 2013 there was a slight, 2% increase in Bermuda grass cover, and the percent cover of seep willow decreased slightly by 2%. Tamarisk that was recorded in 2012 was not present in 2013. In 2014 transect results indicated a modest increase in Bacharis *salicifolia* within the transect, and a large increase of *Cynodon dactylon*, from approximately 5% in 2013 to

20% in 2014. In addition, *Polypogon monspeliensis* showed up in the transect which only occurred in 1996 and 2001, but otherwise has been absent from the transect. Results from our 2015 transect reading show little change from the prior year, with *Cynodon dactylon* amounts (which has the largest presence within the transect) virtually the same. Two new species showed up within the transect not previously recorded*: Polypogon interiptus, and Polypogon semiverticulatus.* With the exception of Bermuda Grass (*Cynodon dactylon*) the transect line reads relatively bare. However, tamarisk and bacharis saplings area beginning to populate the beach within this area and will likely begin to show up within the transect in the future.

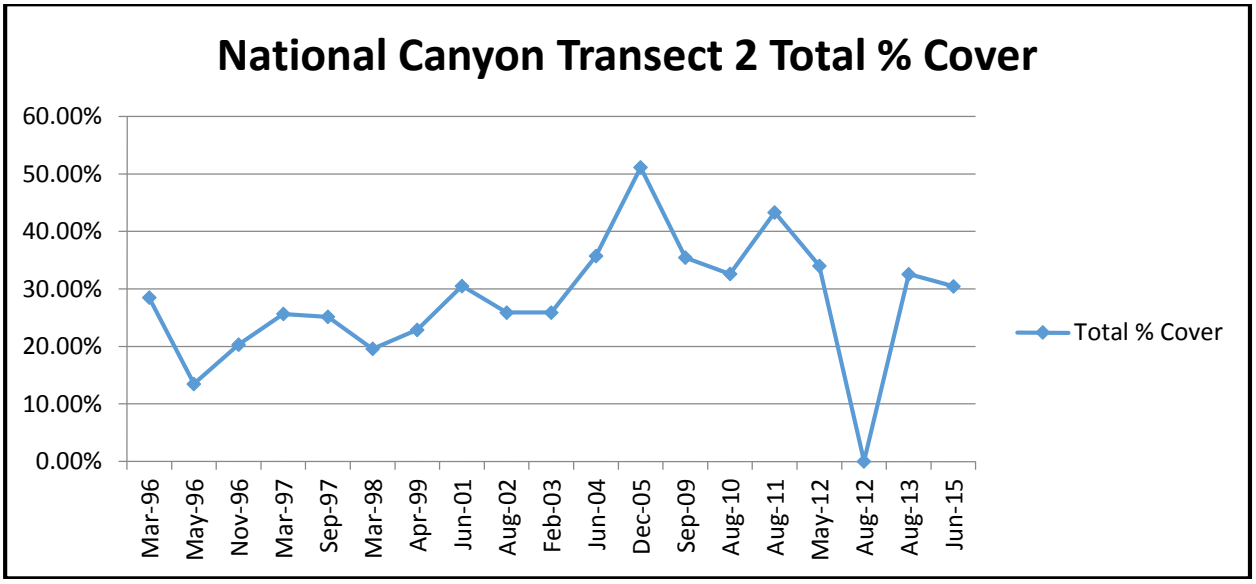

Figure 28. National Transect 2 Total Percent Cover Graph.

Figure 29. Photograph of National Transect 2.

Vegetation cover along transect 2 had decreased to 0 following the 2012 July flash flood and there were no remaining plants on the August 2012 trip. Using photographs from the May 2012 trip, we were able to re-establish the transect. Because there were no existing landmarks within the original transect we had to rely on using features in the background, and establish an approximate original position for transect 2. Since this transect had zero plants in the aftermath of the flood event, re-establishment of an approximate original position should be sufficient to continue to carry out ongoing studies at this site. All information recorded is starting from a clean slate with no existing vegetation.

Three plant species that were newly established, including *Dicoria canescens*, *Cynodon dactylon*, and *Salix exigua* were recorded in the 2013 survey. This transect has never had a record of *Dicoria cansescens* in its history, so this constitutes a new species that is beginning to colonize the delta for this transect. As would be expected, *Cynodon dactylon* also established a presence near the shoreline end of the transect. *Cynodon dactylon* has shown a dramatic increase in 2014 as compared to 2013. Due to shifting sands that have moved into the beach in transect 2 more *Dicoria canescens* has been able to colonize the beach. Although our transect happened to show a decrease in this species from 2013, this is due likely to the fact that individual plants happened to not cross under the transect, however, visual observations through photographic comparisons indicate a steady overall increase of this plant colonizing the beach.

Three new species were recorded in 2015 which had not been previously recorded since the establishment of the new transect including: *Oenethera spp.*, *Pseudoghaphalium staminim*, *Sonchus Asper*, and *Tamarax spp.* Before the transect had flash flooded in 2012 Tamarisk had existed within the transect. A number of tamarisk saplings are scattered throughout the beach so it is no surprise that we are now beginning to pick up this presence within the transect line.

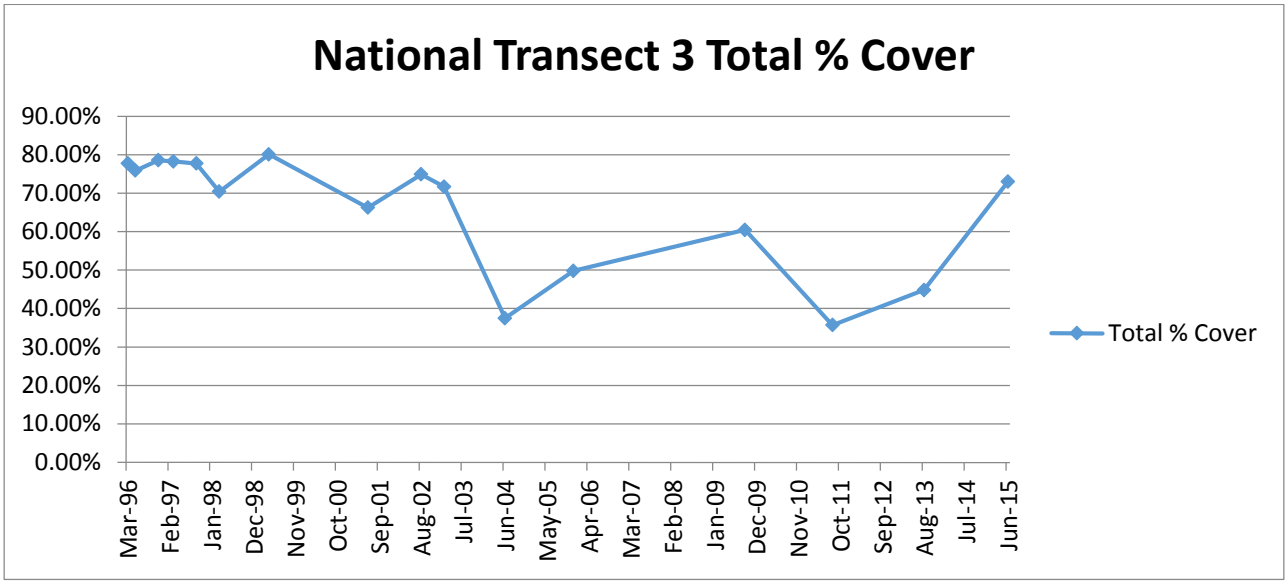

Figure 30. National Canyon Transect 3, Graph.

Figure 31. National Canyon Transect 3, Photograph.

Transect 3 is located on a talus slope above the lower beach. Plant growth within this transect is governed by rainfall alone in contrast to the other two transects that are affected by fluctuating river levels or flash flooding. The total cover in 2005 was 50%, and in 2009 it was 60.5%. No clear trend explains the difference; there were variations in a number of species. Cover on Transect 3 decreased by about 25% from 2009 to 2011 (it was not read in 2010). This site is generally affected by seasonal fluctuations in rainfall; the reading taken in 2011 was prior to any significant storms. Thus early summer dormancy was reflected in the reading. The variation is within the range recorded during previous years. The August 2013 reading showed a 9% total percent cover increase from the 2011 reading. This transect is read on alternating years and the readings in 2015 show a 28.21% increase in total percent cover from the 2013 reading.

The *Acacia gregii* within the transect has grown larger extending past the end of the transect. An additional *Acourtia wrightii* has shown up towards the end of the transect and representing an increase in presence from 1% to 10% since the last reading in 2013.

Figure 32. Mohawk Canyon, Transect 1.

Beginning on our HDCR 2011 monitoring river trip we observed presence of the non-native tamarisk beetle from Lees Ferry to river mile 30, and again from river mile 128-180, noting that there was sparser beetle impact through the gorge from river mile 142-165. On our 2012 river trip, stretches of the river containing tamarisk defoliated by the beetle were too numerous to record. From these observations it is evident that the beetle is having an impact on the tamarisk, and may ultimately result in its elimination or greatly reduced dominance in the Canyon riparian ecosystem.

On our August 2012 monitoring trip we established a new transect, 25 meters long, running through the center of a tamarisk thicket growing on the downstream side of Mohawk wash. This new study has been created with the intent to provide an opportunity to monitor and record what species will take the place of the declining tamarisk over time, in an area that does not have an understory already competing with the tamarisk. It will provide a study that can determine from the beginning, which species will begin to colonize this new habitat. Because the site is above regular river flows, it is likely that its new species makeup will differ from tamarisk replacement communities along the river.

In the 2013 monitoring of this new transect, only minor changes were observed. A new *Bacharis sarathroides* was recorded within the transect. Also, a section within the declining thicket of tamarisk was noted to have a stretch of entirely dead tamarisk. In addition to Bac*haris sarathroides*, species recorded within the transect, in 2014 the following species were also recroded: *Gutierrezia sarothrae, Bebbia juncea, Sporobulus cryptandrus, Datura wrightii,* and *Vulpia octoflora.*

This year on our 2015 trip, an additional species, *Eigeron lobatus*, was recorded. Other species not recorded under the transect line, but within the immediate vicinity included camel thorn, datura, wild tobacco, and evening primrose. It should also be noted that the stand of tamarisk affected by the beetle is not entirely dead. In most cases it takes repeated exposure to tamarisk beetles to completely kill off a stand of tamarisk. This study provides a good observation of what kind of time frame of exposure is required for this to take place in full.

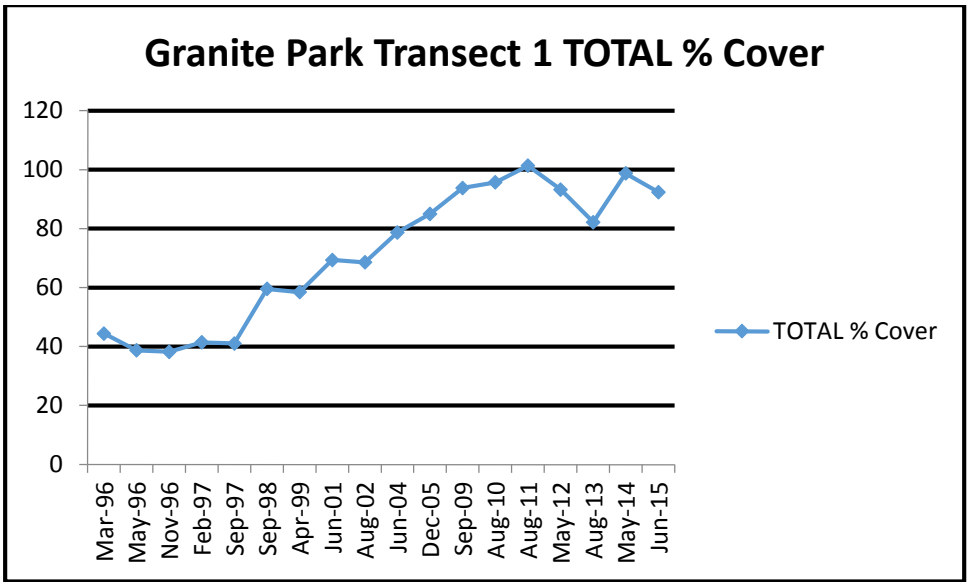

Figure 33. Granite Park Transect 1, Graph.

Figure 34. Photograph of Granite Park Transect 1.

Transect 1 has a series of 3 Mesquite trees that are continuous throughout the start of the transect past the acacia and tamarisk. After a gap, there is a fourth mesquite. The last two mesquites have

multiple phoradendron parasites taking their toll. Toward the end of the transect, species include tamarisk, arroweed, camelthorn, desert broom, and *bacharis emoryi*.

In the 2013 survey of Transect 1 some noteworthy changes had occurred. The infestation of mistletoe was showing a noticeable effect on the mesquites within the transect. One of the Mesquite trees was in poor shape and a second tree had a large infestation. This continued to be true during the 2015 survey. Drought conditions in 2013 also had affected plants within the transect as stands of *Pluchea sericea* and thickets of *Isocoma acradenia* were observed as totally dried out and dead. In 2015 we also noted dead Isocoma acradenia indicating this species has not recovered from drought conditions first noted in 2013.

Overall, Granite Park Transect 1 is reflective of two trends taking place in the lower Grand Canyon beach vegetation in the past several years. There is a steady increase in overall vegetative cover, and there are increases in mesquite *(Prosopis glandulosa*) a non-riparian cultural species that has significantly increased in the New High Water Zone along the Colorado River in recent years. The second trend is an increase in shoreline dry marsh vegetation. Consistently low river flows have resulted in a dramatic increase and stabilization of herbaceous wetland species along the shoreline, not only at Granite Park but consistently throughout Grand Canyon.

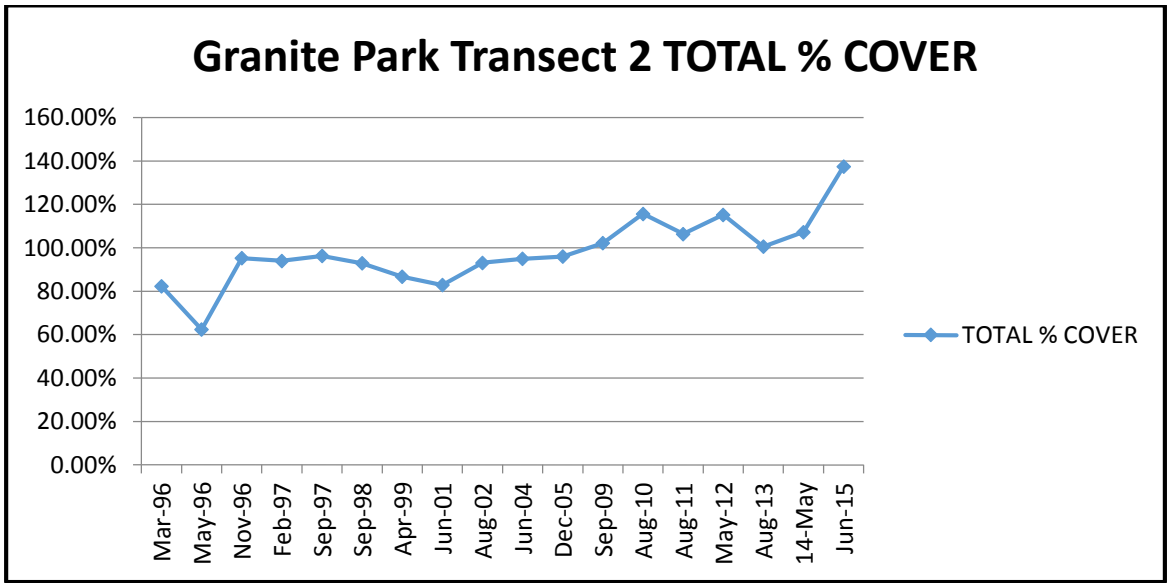

Figure 35. Granite Park Transect 2, Graph.

Figure 36. Photograph of Granite Park Transect 2.

The dominant species along Granite Park Transect 2 is *Pluchea sericea*. A consistent increase in vegetation cover along this transect is largely due to increases in both shrubby and herbaceous vegetation in the riparian zone. In 2013 this site, not unlike Transect 2, showed signs of drought stress. Large stands and thickets of *Pluchea sericea* were dried out and dead. 2014 transect results show that *Plucchea sericea* had recovered some from last year, and there was a 6% increase in total percent cover for this species from 2013. In 2015 the transect showed an overall 30% increase in total percent cover. The Bacharis emoryi and Bacharis salicifolia appear to be hybridizing making it difficult to class this species.

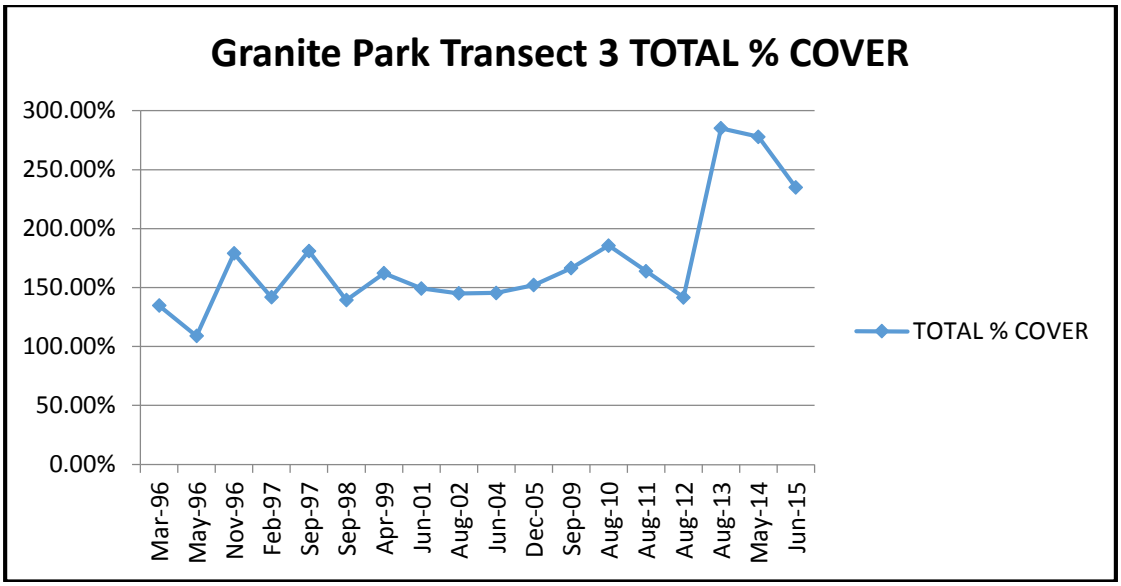

Figure 37. Granite Park Transect 3, Graph.

The high total percent cover values for transect 3 reflect the dense vegetation along the lower half of the transect. In 2013 a new large thicket of *Phragmites* was recorded within the transect along the shoreline. *Phragmites* can spread rapidly forming above ground lateral shoots which root to form new plants. Dense clusters can form multiple stems and seed germination tends to occur in exposed moist soils during times of low water. This new population within the transect formed a large thick stand within past two years. A 7% total cover increase of *Phragmites* has occurred from 2013 to 2014 indicative of the aforementioned species expansion. In 2015 Phragmites still remained however the transect showed decreases in total percent cover of this species. Transect 3 like Transect 2 also has *Bacharis salicifolia* and *emoryi* hybridizing making it challenging to class this species.

Figure 38. Photograph of Granite Park Transect 3.

Transect 3 begins in an upper beach area and runs through a large also rapidly-expanding mesquite, and arroweed thicket, and a large stand of horsetails. This transect is located just up river and parallel to the Granite Park creek wash. Increase in shrubby vegetation near the shoreline at Granite Park between the Gooding's willow and Granite Park Creek (a distance of about 200 m) has resulted in a decrease in visitor usage in the area around Transect 3. Total cover along the transect increased drastically since 2005 to 2015 from 152% to 234%, largely due to an increase in shrubby species such as seep willow *(Baccharis salicifolia)*, Emory seep willow *(Baccharis emoryi)*, and desert-broom *(Baccharis sarothroides)*. *Equitestum* has also increased as well as *Phragmites*. A new species was recorded within the transect in 2015: *Sporobulus cryptandrus*. Cover can exceed 100% when plants overlap, resulting in a double cover reading for such areas. This transect was nearly impenetrable making it very challenging to maneuver through. It is recommended that this transect be read alternating years for this reason.

SUMMARY

In this report, we presented the results of cultural resources monitoring at 23 Hualapai TCPs; associated features, and ethnobotanical resources located along the Colorado River corridor and adjacent tributaries for the 2015 season. Monitoring culturally significant sites and TCPs for Hualapai is an opportunity to evaluate the ever-changing conditions along the river. Table 7, (page 55) lists each TCP with noted impacts for the 2015 season along with treatment recommendations. This table is a compilation of Tables5 and 6, from pages 10-11 above. Many aspects of our monitoring work are continuations of interests and protocols established in the 1990s when our program was first developed. Other aspects have evolved since then, or are a response to more recent management actions and modifications to dam operations. For example, taking note of HFE effects may identify changes, both positive and potentially negative, to river bank ecology in the vicinity of Hualapai TCPs, both at specific locations and at the landscape level. Recent use of repeat historic photographs has also proven useful in identifying change along the river. As an important wildlife species to the Hualapai, systematically taking note of bighorn sheep sightings and behaviors will become part of monitoring as well, and can contribute to bighorn research and monitoring underway in the Park.

An overarching objective in much of the current program, however, is a greater integration of Traditional Ecological Knowledge (TEK) into the monitoring methodology and results. To better understand the effects of Glen Canyon Dam on cultural and ecological resources from a traditional cultural perspective (from a Hualapai point of view as well as those of other tribes that are part of the Adaptive Management Program) can lead to better and more inclusive management decisions and actions.

The outcome of these goals allows Hualapai to perform monitoring in a way that is meaningful to the Tribe beyond solely quantitative means. The process of integrating aspects of TEK into the HDCR monitoring program means that Hualapai Elders who are the keepers and scholars of TEK are able to pass on Hualapai cultural knowledge regarding the Colorado River corridor to the next generation, which is a major reason for trying to include both youth and elders into monitoring trips as much as possible.

Incorporating Hualapai TEK into Hualapai's monitoring methodologies and consequently contributing information towards understanding change within the Colorado River corridor is a process that requires time, continuity, and collaboration between the Hualapai monitoring program and agency stakeholders. Integrating applicable and appropriate TEK data into the Adaptive Management Program will ultimately lead to more inclusive and comprehensive management of the Colorado River and its resources.

Table 7. 2015 TCP Evaluations: Impacts and Recommendations

TCP	2015 EVALUATIONS: IMPACTS AND RECOMMENDATIONS
TCP 001 National Canyon, RM 167L	
Impacts:	Lower camp/beach area recovering from flash floods & HFE effects.
Recommendations:	Annual monitoring, including HFE effects; cover upper trail as required. Continue Photo matching.
TCP 002 Mohawk Canyon. RM 172L	
Impacts:	Previous HFE sediments noted in 2014 swept away; archaeological site unchanged.
Recommendations:	Monitor archaeology site every two years; monitor HFE effects.
TCP 003 Vulcan's Anvil RM 178	
Impacts:	No apparent recent impacts.
Recommendations:	Annual monitoring; public outreach & education.
TCP 004 Medicine Springs, RM 180L	
Impacts:	No apparent recent impacts at spring at river's edge; monitored source against cliffs.
Recommendations:	Monitor occasionally at base of cliffs; monitor spring at river bank for flow changes.
Beecher Springs, RM 183L	
Impacts:	Submerged at higher water levels.
Recommendations:	Monitoring annually when above river level.
TCP 007 Whitmore Canyon, RM 188R	
Impacts:	Recent trail rerouting & stabilization appears to be holding.
Recommendations:	Annual monitoring, focusing on erosion, trails, and graffiti.
TCP 008 Hematite Mine, RM 200.2R	
Impacts:	Erosion, trailing, & gullying noted.
Recommendations:	Annual monitoring, possible trail obliteration.
TCP 010 Granite Park, RM 209L	
Impacts:	Erosion & gullying from trailing, Goodding's willow in failing health; conducted limited trail closing.
Recommendations:	Annual monitoring; trail work; willow restoration, graffiti removal. Closure of rockshelter.
TCP 011 Pumpkin Springs, RM 213 L	
Impacts:	Increased algae, native grasses thriving along with red brome and dicoria.
Recommendations:	Annual monitoring, including HFE effects; public outreach & education.
TCP 012 Three Springs, RM 216L	
Impacts:	No new impacts noted.
Recommendations:	Annual monitoring; species list.
TCP 013 AZ G:3:80, RM 222.2L	
Impacts:	Pronounced trailing/trampling near rockshelter.
Recommendations:	Annual monitoring, focusing on trailing & erosion.
TCP 014 Little Colorado River, RM 61.8L	
Impacts:	No new impacts noted.
Recommendations:	Annual monitoring, focusing on trail impacts; ethnobotany survey.
TCP 015 Cardenas, RM 71.5L	
Impacts:	Distressed tamarisk, beaver predation on Gooddings willows.
Recommendations:	Annual monitoring; focusing on willow, tamarisk leaf beetle, trailing.

Table. 7 Continued

TCP	2015 EVALUATIONS: IMPACTS AND RECOMMENDATIONS
TCP 016 Deer Creek, RM 137R	
Impacts:	No new impacts noted.
Recommendations:	Annual monitoring, focusing on trail erosion.
TCP 017 Havasu Creek, RM 156.9L	
Impacts:	No new impacts noted.
Recommendations:	Annual monitoring, focusing on trail erosion.
TCP 018 Diamond Creek, RM 225.5L	
Impacts:	Heavy use, potential loss of sediment.
Recommendations:	Annual monitoring, focusing on erosion, loss of beach sediments, trash, visitor impacts.
AZ C:5:1 (South Canyon), RM 31.7R	
Impacts:	Possible erosion in structure.
Recommendations:	Annual monitoring, focusing on trails, erosion, stability of archaeological features.
TCP 024 Shinumo Canyon, RM 109.3R	
Impacts:	Flash flooding.
Recommendations:	Annual monitoring; check for “artifact seeding.”
TCP 030 Vasey’s Paradise, RM 31.8R	
Impacts:	Gooddings willow attacked by beaver.
Recommendations:	Annual monitoring, ethnobotany survey.
TCP 031 Buck Farm Canyon, RM 41R	
Impacts:	Trailing & erosion.
Recommendations:	Annual monitoring, focusing on trail erosion, riparian plant impacts
TCP 032 Salt Mine, RM63 L	
Impacts:	Bank cutting, question of salt regeneration.
Recommendations:	Annual monitoring, focusing on regeneration of salt, bank erosion.
TCP 033 Elves Chasm, RM 116.5L	
Impacts:	No new impacts noted.
Recommendations:	Annual monitoring, ethnobotany survey.
Granite Camp – Monument Ck, RM 93.8L	
Impacts:	Tended plant restoration project, education site.
Recommendations:	Annual monitoring, tending to restoration project

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