Adopt – A - Beach:

Long Term Monitoring of Camping Beaches in Grand Canyon

Summary Report of Observations for Fall 2010

By

Paul Lauck
Grand Canyon River Guides, Inc

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Summary of Monitoring Observations for Year 2010

By Paul Lauck[1]

Abstract

For the past fifteen years, the Adopt-A-Beach repeat photography program has been monitoring beaches along the Colorado River through Grand Canyon. Through comparative examination of photo series and on-the-spot observations contributed by the volunteer photographers, campsite conditions are evaluated. Factors considered which contribute to changes, both positive and negative, include: fluctuating river flows, aeolian action, vegetation increase/decrease, human introduced change, rain associated erosion or other actions, natural or anthropomorphic, that may have an effect on the camp. The resulting evaluations are also segregated and examined dependent upon which of the four primary river reaches in which the beach resides.

For the time spanning the 2010 summer boating season, early April to early November, 40 of the 44 study beaches in the program had photographs and photographer comment sheets spanning a sufficient period of time to be evaluated. Of these 40 beaches, 47.5% were classified as Unchanged for the time period, 10% had Improved through the summer and 42.5% were considered as Degraded by the end of the season. Of the Unchanged beaches, 12.5% are located in the Marble Canyon reach, 22.5% in the Upper Granite Gorge reach, another 12.5% are contained in the Muav Gorge reach and none are from the Lower Granite Gorge. Two and one-half percent of the Improved beaches, or one beach, are located in the Marble Canyon reach, another 2.5% in the Upper Granite Gorge and 5% are found in the Muav Gorge reach. Again, none are located in the Lower Granite Gorge. For the beaches classified as Degraded for this time period, 7.5% are from the Marble Canyon reach, 12.5% are found in the Upper Granite Gorge, 17.5% in the Muav Gorge reach and 5% are located in the Lower Granite Gorge reach. The primary factor sited as creating an Improved camp is an increase of sand on the beach front enlarging the beach and creating more favorable parking for boaters. This is attributed to deposition from river transported sediment or sand being moved downslope and forward to the beach front by multiple actions. While gully erosion from rain events late in the season are the most readily evident cause of Degradation, other primary factors sited include cutbanks associated with river fluctuation, vegetation encroachment and impacts from people.

A comparison between the late 2009 and early April 2010 beach conditions was conducted to evaluate possible changes over the winter. Of the 37 beaches considered in this portion of the analysis, 59.5% of the beaches remained unchanged through the

winter, 2.7% or one beach, had Improved and 37.8% were classified as Degraded. Of the Unchanged beaches, 16.2% are situated in Marble Canyon, 24.3% in the Upper Granite Gorge and 18.9% are located in the Muav Gorge. The single beach classified as Improved for this time period is the upstream most study beach in Marble Canyon reach and may have benefited from an increase in sediment inflow from the Paria tributary in late January or early February. Degraded beaches were dispersed, with 5.4% located in the Marble Canyon reach, 13.5% in the Upper Granite Gorge and another 18.9% located in the Muav Gorge. None of the beaches from the Lower Granite Gorge were considered in this part of the analysis due to a lack of photographs. Beach front erosion and recession, commonly associated with higher dam releases, were the predominant cause for a Degraded classification, with rain and human impacts sited as secondary factors.

Since 1996, a primary concern of researchers has been the longevity of conditions for those beaches which were considered as Improved by the High Flow Experiment (HFE) conducted in March 2008. Forty-three of the Adopt-A-Beach camps photographed in 2010 were available for comparison to the late season photographs acquired in 2007. Of these, 46.5% were considered to be about the Same condition now as in 2007, 32.6% were classified as remaining Improved since the HFE and 20.9% have Degraded beyond their pre-2008 condition. When divided into their respective reaches, 16.3% of the Unchanged beaches are located in Marble Canyon, 11.6% are in the Upper Granite Gorge and 18.6% are in the Muav Gorge reach. None of the Unchanged camps were located in the Lower Granite Gorge. Those beaches considered Degraded are distributed as 4.7% in Marble Canyon, 2.3% or one beach, are located in the Upper Granite Gorge and 14% are found in the Muav Gorge. Again, there are no Degraded beaches located in the Lower Granite Gorge. For beaches classified as having Improved since the HFE event, 4.7% are located in Marble Canyon, 20.9% in the Upper Granite Gorge, a single beach or 2.3%, is in the Muav Gorge and another 4.7% are located in the Lower Granite Gorge. For those beaches rated as Improved when compared to the 2007 images, most had a greater camping area available at the end of 2010, while the most common cause sited for increased Degradation was sand removal at the beach front by river erosion, followed by erosion from rain events. It is important to note that a few of the beaches 'reversed' in classification through the intervening three years. That is, some of the camps now considered as Improved when compared to the 2007 images were initially regarded as being less desirable following the 2008 HFE. This is predominantly a factor of those beach fronts found to be very steep or rocky immediately following the HFE having graded to a lower angle and extended forward in the subsequent years.

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Introduction and Background

In 1981, the Glen Canyon Environmental Studies (GCES), under the administration of the Bureau of Reclamation, began to study the effects of controlled flow releases from the dam on the downstream river ecosystem (U.S. Department of Interior 1987). Included in this study were effects on sediment supply and recreational resources. Studies of sediment dynamics showed that fluctuating flow releases from the dam have had a degrading effect on sand bar deposits (Hazel and others 1993, Schmidt and Graf 1990) since the closure of the dam. However, beaches can also be replenished by high flows adequate to entrain bedload sand and cause deposition to high elevation areas of beaches (Parnell and others 1997, Wiele and others 1999). Studies of campsite resources demonstrated that the impact to sand bars due to erosion decreases the carrying capacity and campable area available for river parties and backpackers (Kearsley and Warren 1993, Kearsley and Quartaroli 1997).

In 1992, the Grand Canyon Protection Act was passed by Congress to ensure that ecological and cultural resources downstream of the dam would be monitored for changing conditions imposed by operation of the dam. It states that the dam:

"….must be managed in such a way as to protect, mitigate adverse impacts to, and improve the values for which Grand Canyon National Park….were established, including, but not limited to, natural and cultural resources and visitor use" (U.S. Department of Interior 1996).

In 1996, following completion of the "Operation of Glen Canyon Dam: Final Environmental Impact Statement" (EIS), a Record of Decision was signed and implemented which included provision for the use of "beach/habitat-building flows." Now referred to as High Flow Experiments (HFE), the EIS defined these events as, *"…scheduled high releases of a short duration designed to rebuild high elevation sandbars, deposit nutrients, restore backwater channels and provide some of the dynamics of a natural system" (U.S. Department of the Interior, 1995).*

Further, an HFE is defined as a flow release exceeding 31,500 ft^3/s. Sand bars form when sediment carried by the river, either from bed load or suspended load, is deposited by the action of eddy currents in recirculation zones. This occurs primarily on the downstream end of debris fans, but also in areas along the river's channel margin (Schmidt 1990). The first HFE was conducted in late March, 1996, and consisted of a 7-day steady release of 45,000 ft^3/s that was preceded and followed by steady flows of 8000 ft^3/s for 4 days each (Melis, 2011).

Those who run the river are interested in observing the changes to camping beaches throughout the river corridor in the Grand Canyon. To help document and better understand the impacts that the HEF and possible future events would have on sandbars used by river runners as primary campsites along the Colorado River, members of Grand

Canyon River Guides (GCRG) began photographing selected beaches shortly before and after the original HFE occurred. The GCRG is a nonprofit, grassroots organization that represents the interests of the Grand Canyon river running community. To monitor subsequent changes in the beaches of interest, the Adopt-A-Beach (AAB) program was created and utilized volunteer photographers to conduct repeat photography of these camps. These volunteers include commercial, private and scientific persons who travel by boat on the Colorado River. Comment sheets, completed by the volunteers at the time the photographs are acquired, assist in the effort to document the beach conditions. The program assesses the visible photographs and first-hand, objective comments pertaining to changes to beaches, and reports on the conditions as influenced by regulated flow regimes, rainfall, wind, vegetation, human impacts or any other factors that may be present.

Camping beaches are an important resource for river parties conducting trips through Grand Canyon. Both commercial and private river trips, as well as backpackers, rely on wide sandy areas for camping and recreation. As a way to contribute to resource management, AAB now submits annual results to the Adaptive Management Program (AMP). The results and conclusions are synthesized through a representative that serves on the Technical Work Group (TWG). Professional river guides and other river runners make the program possible, contributing 100% of the manpower, the entire dataset of repeat photographs, and valuable input about the condition of beaches throughout each season and between years. Monitoring includes information on natural and human-induced impacts to beaches such as cutbank retreat, wind erosion and dune formation, rain gully formation and the effects of visitation and camping (Lauck, 2009).

The purpose of this report is to present the results of the monitoring effort for the period between late July 2009 and Dec 2010, and a comparison of the 2010 beach conditions with those found in late 2007, prior to the most recent HFE.

The AAB program has now completed its fifteenth year as a study that monitors camping beaches along the Colorado River in Grand Canyon. Results are submitted to various agencies such as the Cultural Resources Program of the Grand Canyon Monitoring and Research Center (GCMRC). Results are also presented to the AMP so that private and commercial recreational interests are represented as stakeholders in Colorado River management as reported to the Secretary of the Interior (Lauck, 2010).

Volunteer photographers for this program are unique in that many run the Colorado River more than once in one season, and are able to provide sets of repeat photographs and on-the-spot comments for each study beach. With the end of the 2010 season, river runners have produced nearly 3500 replicate photographs on more than 2600 dates with associated field sheets recording the sequential condition of beaches. The average number of photography dates per beach for the 40 beaches reporting during the season of 2010 is 5.7. Research results include reporting positive “Improved” conditions, negative “Degraded” conditions or “Same,” that no changes were found in beaches; results of the High Flow Experiment (HFE) events; longevity of these results; and attributes the primary and secondary processes that cause change in camping beach area and quality.

Specific research questions that are addressed by this report are:

- What changes, if any, are found at the beaches between late summer 2009 and early spring 2010

- What changes, if any, are found at the beaches during the boating season of 2010
- How do the beach conditions of late 2010 compare to those of late 2007, prior to the High Flow Experiment of early 2008?
- How are changes in the beaches, if any, distributed throughout the river corridor?
- Which processes resulting in a change of condition at a beach are most prevalent?

Methods

Study locations and beaches

Since 1996 the AAB program has studied an average of 38 beaches per year from within three of the five *critical reaches* of the river corridor (Figure 1). The practice of assessing camping beach resources within critical reaches was first developed by Kearsley and Warren (1993), and modified for the 1996 Adopt-a-Beach study by Thompson and others (1997). A critical reach is defined as a section of the river where camps are in high demand and few in number. The same reach system has been in use for all years of study, 1996-2010. They are as follows: 1) Marble Canyon, river miles 9-41; 2) Upper Granite Gorge, river miles 71-114; 3) Muav Gorge, river miles 131-165.

Two additional critical reaches were added during the 2003 monitoring season. The purpose was to increase the sample set of beaches in order to more widely represent the effects of beach erosion and building throughout the whole river corridor below Glen Canyon Dam. These new reaches included Glen Canyon, from the dam to Lees Ferry (river mile 0), and Lower Granite Gorge, from Diamond Creek (river mile 226) to Gneiss Canyon (river mile 236). Unfortunately, no data has been collected for the Glen Canyon reach for a few years, but the Lower Gorge reach, which was been extended to include the 250 Mile Camp in 2009, is still being monitored.

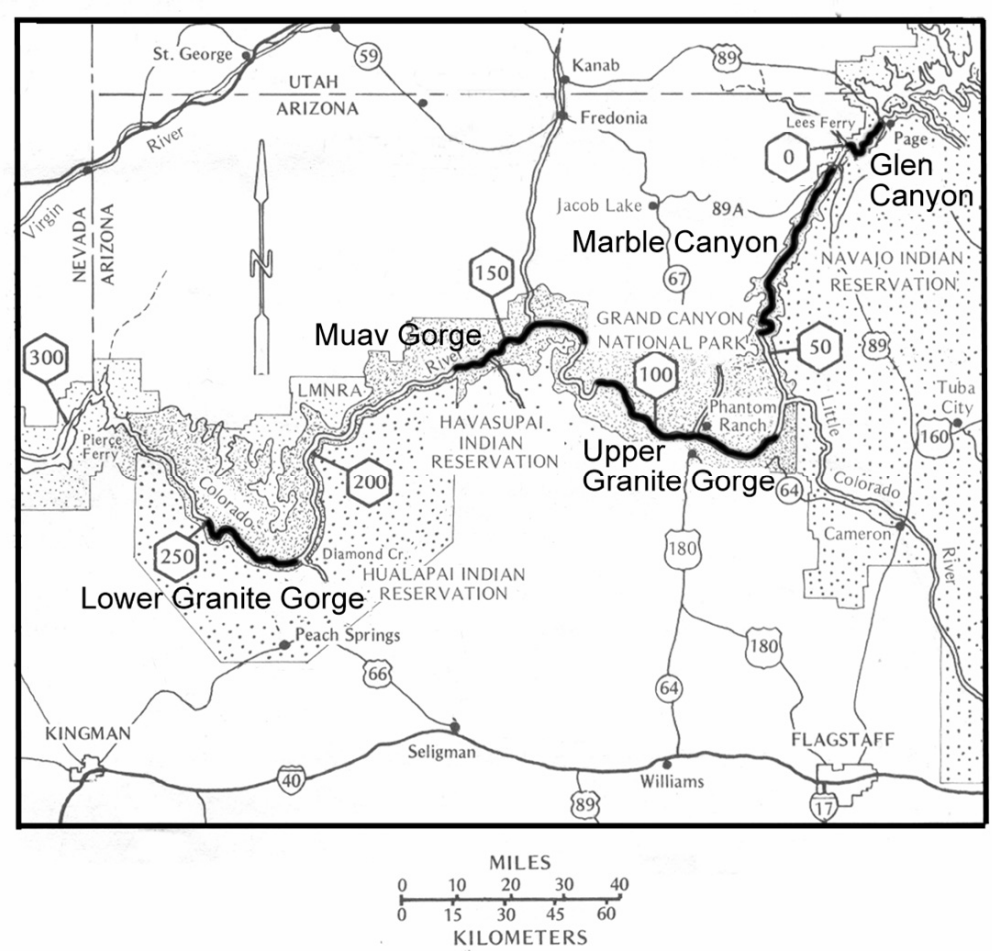

Figure 1. Locations of five critical reaches along the Colorado River in Grand Canyon National Park

Table 1 shows popular campsites (n = 44), many of which were originally inventoried in 1996, and includes beaches added in 2000, 2001 and 2009. Every beach in the inventory has an established photographic location that shows an optimum view of the beachfront and as much of the actual camping area as possible. However, the portion of the camp photographed at each beach, the relative photographic location between beaches and the number of images acquired per beach are not the same for all beaches. Most commonly, the photos are shot from the boat on the river, taken as a single image or series, to provide a full, upstream to downstream look at the beach. There is also another photo or photos taken from specifically designated locations on shore, looking across the front of the beach, usually from an elevated, oblique angle. Combined, these views provide a considerable amount of information for analysis.

A few beaches are photographed from the river only. Unfortunately, this often limits the visibility of the upper or rear part of the camp. Efforts are being made to expand these visits to include a shore based view, but this is completely up to the volunteer and their time available. Also, almost half of the beaches have photo locations toward the back of the camp, looking across the upper part of the beach or toward the river. While not always practical, these views are invaluable additions to the beach dataset.

Each year, GCRG motivates guides to adopt as many beaches as possible. To encourage a relatively complete data set from year to year, GCRG encourages adoption

of high-priority beaches (n = 27) first. These beaches have been adopted for most of the study years. Usually, they are camps that can be used year after year by the river community, and thus are continually in high demand. The remaining beaches are adopted once high-priority beaches have been claimed.

Figure 2 & 3. Matkat Hotel RM 148.9 L. Photo on left taken 4/11/2010, right taken 8/2/2010. Documented change in rain erosion gully for 2010 season.

The time-series photos taken within study locations allow assessment of relative change over the course of each season and between monitoring years. Assessment is standardized according to the highest average fluctuating flow of the season and to a zone of 20,000 ft^3/s when comparing 1996 photos (determined by Kaplinski and others 1994). The number of adopted beaches with useable season long data in 2010 totaled 40. Each record in the data base represents an individual visit to a beach where each beach usually has 1-5 photos associated with it. Adopters often take extra snapshots of various impacts such as flash flooding in Schist Camp (August 2002) and North Canyon (October 2010) and debris flows at Hot Na Na (July 2000). These documented events and data are available to any interested researchers through Grand Canyon River Guides or Grand Canyon Monitoring and Research Center and the images are currently available as part of the Adopt-A-Beach photo gallery, http://www.geanious.com/gallery/main.php. Part of the Adopt-A-Beach program is to provide photos of unusual natural events in Grand Canyon to interested parties

Glen Canyon		Marble Canyon		Upper Granite Gorge		Muav Gorge		Lower Granite Gorge	
Mile	Camp	Mile	Camp	Mile	Camp	Mile	Camp	Mile	Camp
-13.0	Dam Beach	11.3	Soap Creek	76.0	Nevill's	131.7	Below Bedrock	230.6	Travertine
-8.0	Lunch Beach	12.4	12.4 Mile (Salt Water Wash)	77.1	Hance	132.5	Stone Creek	236.1	Gneiss Canyon
				81.7	Grapevine	133.7	Talking Heads		
				84.6	Clear Creek	134.2	Race Track	250.0	250 Mile
		16.6	Hot Na Na	85.0	Zoroaster	134.5	Lower Tapeats		
		19.4	19.4 Mile	92.1	Trinity Creek	135.2	Owl Eyes		
		20.7	North Cyn	96.6	Schist	137.8	Back Eddy		
		22.7	23 Mile	97.3	Boucher	144.0	Kanab Creek		
		29.5	Shinumo Wash (Silver Grotto)	98.7	Crystal	146.1	Olo		
				100.2	Lwr Tuna	148.9	Matkat Hotel		
		35.0	Nautiloid (Middle&Lower)	108.3	Ross Wheeler	150.9	Upset Hotel		
				109.0	Lwr Bass	156.3	Last Chance		
		37.9	Tatahatso	110.0	110 Mile	165.2	Tuckup		
		38.6	Martha's (Bishop's)	114.9	Upper Garnet	167.0	Upper National		
				115.1	Lower Garnet	167.2	Lower National		
		41.2	Buck Farm						

Table 1. Sample set of camping beaches inventoried that lie within five critical reaches.

When comparing the photos for evaluation, numerous criteria are used to gather the empirical data used. This begins by estimating the river flow in each of the photos, usually confirmed by flow data available through the USGS Real-Time Water Data website, http://waterdata.usgs.gov/az/nwis/rt, and standardizing the beach configuration to the highest dam release summer flow. For the time period under consideration, this was just over 16,000 ft^3/s as dam release and a momentary spike to ~18,500 ft^3/s at the Grand Canyon flow gauge (Fig. 4 thru 7). Also considered is any evidence of flattening, mounding or scouring of sand in the photos, a change in area of sand cover between photo dates, vegetation cover, rocks covered/uncovered by the flow changes or wind action that would indicate a change in camping area, a change in the access at loading/unloading areas used by river parties who stop to lunch or camp at the beach, and comments made by the AAB photographer on the datasheet when the photo is taken. Due to the variety of river flow levels between the comparison photos, change in the 'parking' at a particular beach is often difficult to evaluate, and, at higher flows, is considered only when recorded by the AAB observer.

Figure 3 & 4. Shinumo Wash, RM 29.5 L, 04/02/10 (left) and 10/19/10 (right) display multiple factors of degradation including beach recession from river erosion, rain gullies and erosion from human use.

Knowledge of the study sites by this investigator was also considered, though this did not determine the final classification used for any particular beach. Using these criteria, the beaches are given classifications indicating desirability as camping beaches, stated as Improved, Degraded or Same. While the designations of Same, Improved and Degraded are inherently subjective, the results are reflective of the stated evaluation purpose of determining the beach as a useable camp for river trips. This should not be interpreted in any way that results were obtained using anything other than objective evaluation.

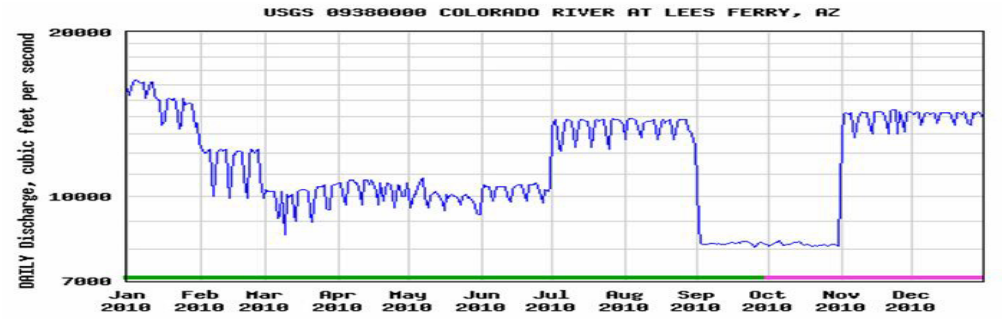

Figure 4. Flow graph for Colorado River at Lees Ferry, AZ. Through 2010

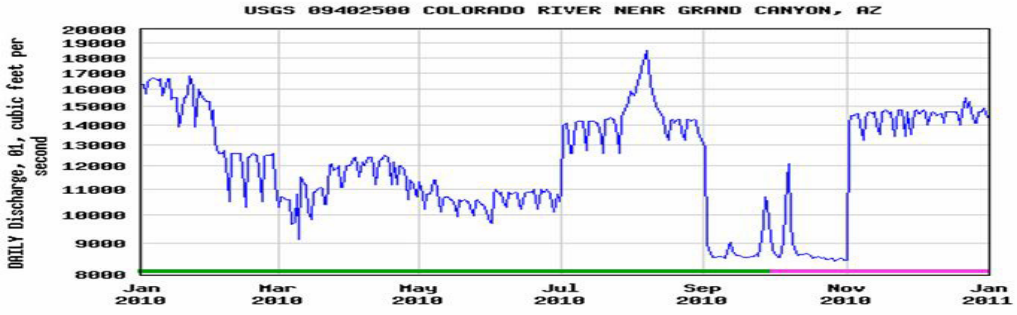

Figure 5. Flow graph for Colorado River near Grand Canyon, AZ. Through 2010

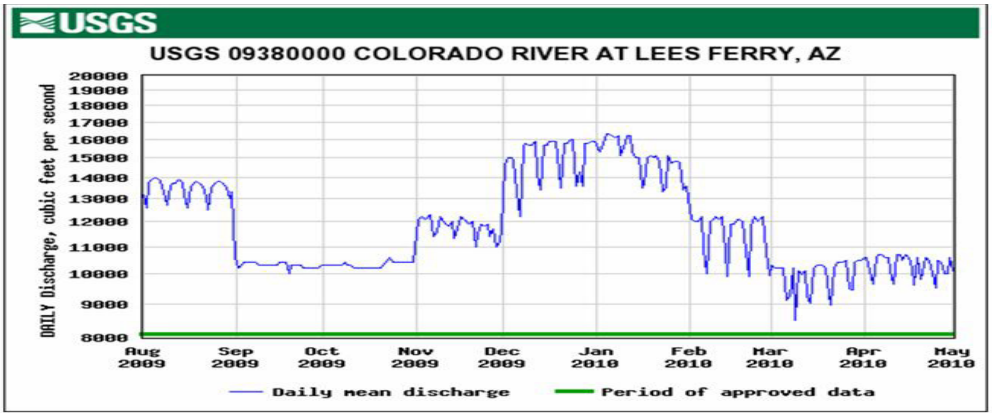

Figure 6. Flow graph for Colorado River at Lees Ferry, AZ., 8/2009-4/2010

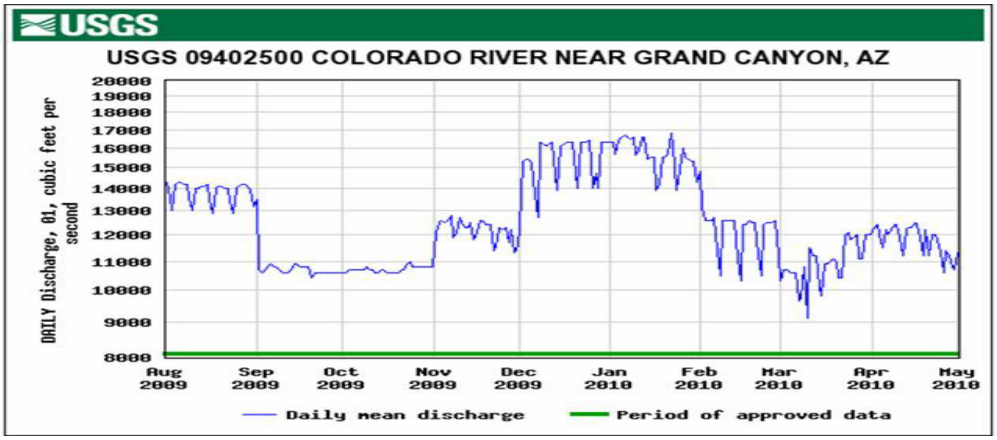

Figure 7. Flow graph for Colorado River near Grand Canyon, AZ., 8/2009-4/2010

The data are compared and analyzed according to the research questions that are most applicable for the time period being studied. For the season of 2010, evidence of change between April 1 and the latest photo acquired for the year was evaluated. For thirty of the beaches the end date was August 15 or later, with the earliest of the other 10 season ending images being acquired on July 8. The majority of the ending date photos were taken September into November. Another analysis conducted for this data set compared the early April photographs to the end of season 2009. Finally, the end of 2010 season images were compared to photos taken on the latest dates from 2007 to evaluate the long term results of the 2008 HFE.

Results

Through 2010 boating season

For the time spanning the 2010 summer boating season, early April to late October, 40 of the 44 study beaches in the program had photographs and photographer comment sheets spanning a sufficient period of time to be evaluated. Of these 40 beaches, 47.5% were classified as Unchanged for the time period, 10% had Improved through the summer and 42.5% were considered as Degraded by the end of the season. Of the Unchanged beaches, 12.5% are located in the Marble Canyon reach, 22.5% in the Upper

Granite Gorge reach, another 12.5% are contained in the Muav Gorge reach and none are from the Lower Granite Gorge. Two and one-half percent of the Improved beaches, or one beach, are located in the Marble Canyon reach, another 2.5% in the Upper Granite Gorge and 5% are found in the Muav Gorge reach. Again, none are located in the Lower Granite Gorge. For the beaches classified as Degraded for this time period, 7.5% are from the Marble Canyon reach, 12.5% are found in the Upper Granite Gorge, 17.5% in the Muav Gorge reach and 5% are located in the Lower Granite Gorge reach. The primary factor sited as creating an Improved camp is an increase of sand on the beach front enlarging the beach and creating more favorable parking for boaters. This is attributed to deposition from river transported sediment or sand being moved downslope and forward to the beach front by multiple actions. While gully erosion from rain events late in the season are the most readily evident cause of Degradation, other primary factors sited include cutbanks associated with river fluctuation, vegetation encroachment and impacts from people. The cutbanks are found equally on beach faces running parallel to the river current and on the furthest upstream end of the return channel. The later incidents are most often associated with beaches were the camps are located in this same area. Besides erosion by continuous tracking on a particular pathway, other human impacts noted by volunteers included littering and intentional modification by constructing steps in embankments to access the river.

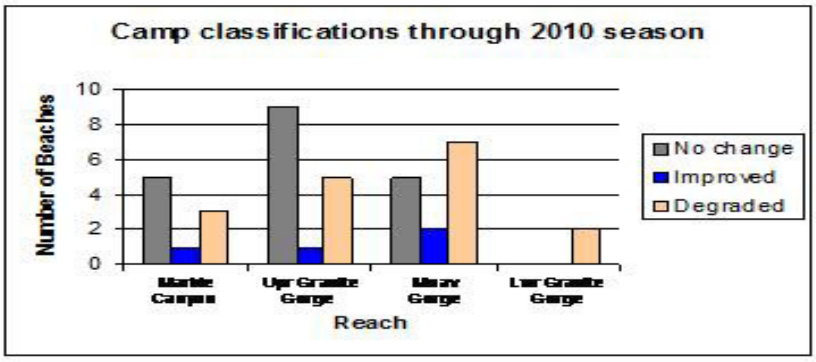

Figure 8. Graphic illustration for 2010 seasonal evaluations

Figures 9 & 10. Upper North Canyon , RM 20.7 R April 2, 2010 (left) and October 17, 2010 (right) documenting a rain erosion event.

Winter of 2009 - 2010

A comparison between the late 2009 and early April 2010 beach conditions was conducted to evaluate possible changes over the winter. Of the 37 beaches considered in this portion of the analysis, 59.5% of the beaches remained unchanged through the winter, 2.7% or one beach, had Improved and 37.8% were classified as Degraded. Of the Unchanged beaches, 16.2% are situated in Marble Canyon, 24.3% in the Upper Granite Gorge and 18.9% are located in the Muav Gorge. The single beach classified as Improved for this time period is the upstream most study beach in Marble Canyon reach and may have benefited from an increase in sediment inflow from the Paria tributary in late January or early February. Degraded beaches were dispersed, with 5.4% located in the Marble Canyon reach, 13.5% in the Upper Granite Gorge and another 18.9% located in the Muav Gorge. None of the beaches from the Lower Granite Gorge were considered in this part of the analysis due to a lack of photographs. Beach front erosion and recession, commonly associated with higher dam releases, were the predominant cause for a Degraded classification, with rain and human impacts sited as secondary factors.

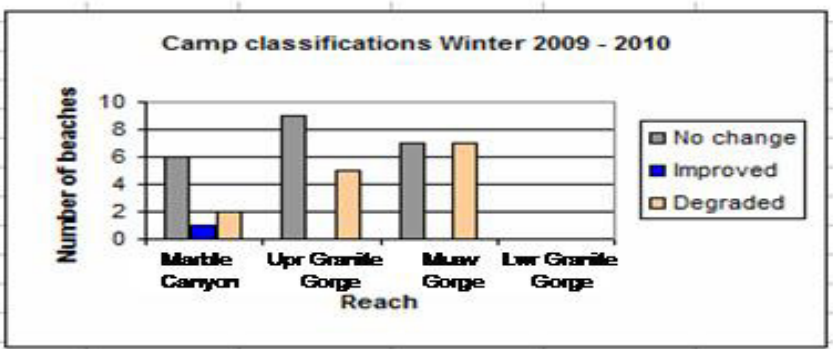

Figure 11. Graphic illustration of results, Winter 2009 - 2010

Figures 12 & 13. Owl Eyes beach, RM 135.2 L September 18, 2009 (left) and April 10, 2010 (right).

Changes since 2008 High Flow Experiment

Since 1996, a primary concern of researchers has been the longevity of conditions for those beaches which were considered as Improved by the High Flow Experiment conducted in March 2008. Forty-three of the Adopt-A-Beach camps photographed in

2010 were available for comparison to the late season photographs acquired in 2007 (Lauck, 2009). Of these, 46.5% were considered to be about the Same condition now as in 2007, 32.6% were classified as remaining Improved since the HFE and 20.9% have Degraded beyond their pre-2008 condition. When divided into their respective reaches, 16.3% of the Unchanged beaches are located in Marble Canyon, 11.6% are in the Upper Granite Gorge and 18.6% are in the Muav Gorge reach. None of the Unchanged camps were located in the Lower Granite Gorge. Those beaches considered Degraded are distributed as 4.7% in Marble Canyon, 2.3% or one beach, are located in the Upper Granite Gorge and 14% are found in the Muav Gorge. Again, there are no Degraded beaches located in the Lower Granite Gorge. For beaches classified as remaining Improved due to the HFE event, 4.7% are located in Marble Canyon, 20.9% in the Upper Granite Gorge, a single beach or 2.3%, is in the Muav Gorge and another 4.7% are located in the Lower Granite Gorge. For those beaches rated as Improved when compared to the 2007 images, most had a greater camping area available at the end of 2010. This was usually a combination result of both sand deposition and vegetation removal during the HFE. In one case, however, the vegetation decrease in a camp was the result of beaver activity! The most common cause sited for increased Degradation was sand removal at the beach front by river erosion, followed by erosion from rain events.

It is important to note that a few of the beaches 'reversed' in classification through the intervening three years. That is, some of the camps now considered as Improved when compared to the 2007 images were initially regarded as being less desirable following the 2008 HFE. This is predominantly a factor of those beach fronts found to be very steep or rocky immediately following the HFE having graded to a lower angle and extended forward in the subsequent years.

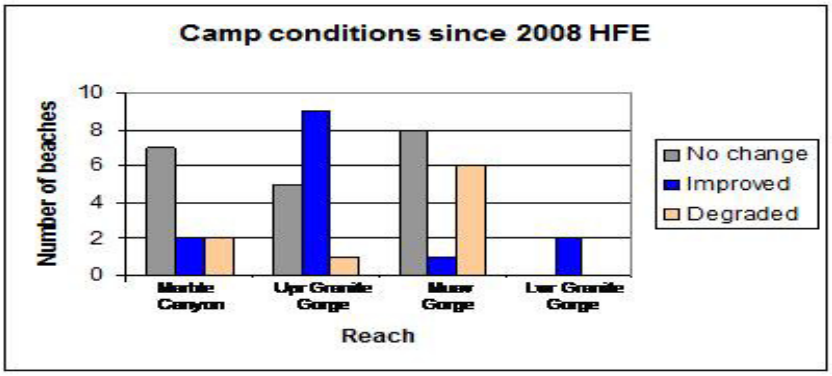

Figure 14. Graphic illustration for beach classifications, late 2010 compared to late 2007.

Conclusions

Throughout the fifteen years that the Adopt-A-Beach program has been in existence, the results have shown that the beaches used for camping along the Colorado River in Grand Canyon are continually subject to change. The river flow fluctuations still create impacts, both positive and negative. Rain still falls and runs across beaches creating gullies as it washes sand into the main stem channel. When camping activity slows on a beach for any appreciable length of time, or conditions are created which promote

propagation, vegetation growth will expand to fill in the unoccupied areas, just as high flows can remove portions of that vegetation. Aeolian activity constantly re-sculptures surfaces and disperses the sand, usually with degrading effects on campsites by exposing previously covered rock. And human use of the beaches continues to erode trails and introduce modifications. It is hoped that, through continued monitoring, sustainable patterns will emerge that may help direct management toward actions that will most benefit the beaches that are so integral to the numerous activities taking place along the river.

ACKNOWLEDGEMENTS

Grand Canyon River Guides, Inc. would like to thank all of the adopters for volunteering the time to pull over and photograph their beaches and for their valuable observations and written comments. It takes time and effort to do this, and the dedication shown by guides has literally kept this program alive for ten plus years. The result is the most comprehensive collection of repeat photographs of critical camping beaches in the Grand Canyon. An added benefit is the public outreach fostered by the volunteers' actions. By taking time to include guests as active participants and by answering their questions, volunteers can further explain how our resource in Grand Canyon is enhanced, degraded or maintained by the influence of man and technology.

Special thanks to Lynn Hamilton for exhaustive work in support of this project, and to Sam Jansen and Jerry Cox for their continued hard work representing recreational river running interests within the Glen Canyon Dam Adaptive Management Program.

Thanks also to our Adopt-a-Beach contributors over the years: the Grand Canyon Monitoring and Research Center; the Grand Canyon Conservation Fund, a non-profit grant making public charity established and managed by the commercial river outfitters in Grand Canyon; the Public Outreach Ad Hoc Committee of the Adaptive Management Program; and, finally, individual GCRG members who believe that the Adopt-A-Beach project is worthy of their support.

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Web

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http://www.geanious.com/gallery/main.php

Appendix A

Results of Analysis in Tabular Form

 Results of evaluations, Summer season of 2010

2010 Season	GCMRC				
Camp name	River mile	2010	thru	season	reason
		same	Improved	Degraded	
Soap Creek	11.3 R	X			Slight veg encroachment in back of camp
12.4 Mile	12.4 L				Only one photo date
Hot Na Na	16.6 L	X			Perhaps slight slope decrease in front
19.4 Mile	19.4 L	X			
Upper North Canyon	20.7 R			X	Rain impact! Gullies. Also shear cutbank
23 Mile	22.7 L	X			
Shinumo Wash	29.5 L			X	Sand loss from river flux, rain, people
Nautaloid	35 L				Only one photo date
Tatahatso	37.9 L	X			
Martha's	38.6 L		X		Some wind action - More sand @ parking
Buck Farm	41.2 R			X	Increase in vegetation on beach
Total above	11	5	1	3	
Nevills	76 L			X	Vegetation growth in camp area
Hance	77.1 L	X			
Grapevine	81.7 L	X			Gradual, minimal wind scour thru season
Clear Creek	84.6 R			X	Increasing slope throughout season
Zoroaster	85 L		X		Cutbank from winter has softened
Trinity Creek	92.1 R	X			
Schist	96.6 R	X			Slight erosion from traffic reported
Boucher	97.3 L	X			Minor change in camp area from wind scour
Crystal	98.7 R	X			
Lower Tuna	100.2 L			X	Lots of veg increase Camelthorn?!
Ross Wheeler	108.3 L	X			
Bass	109 R	X			
110 mile	110 R			X	Lots of human degradation and river erosion
Upper Garnet	114.9 R			X	Sand loss from cutbank, gullies
Lower Garnet	115.1 R	X			
Total above	15	9	1	5	
Below Bedrock	131.7 R			X	Rain erosion! Lots of sand loss, gullies
Stone Creek	132.5 R			X	Rain impact! Gullies - Also shear cutbank
Talking Heads	133.7 L	X			
Racetrack	134.2 R		X		More sand in front Better parking
Lower Tapeats	134.5 R	X			Some wind scour reported
Owl Eyes	135.2 L			X	River erosion impacted late season
Backeddy	137.8 L		X		More sand covering rocks at parking
Kanab	144 R			X	Vegetation growth and cutbank
Olo	146.1 L	X			
Matkat Hotel	148.9 L			X	Rain incisions galore! Sand loss @ beach
Upset Hotel	150.9 L			X	Sand loss from river flux and people
Last Chance	156.3 R			X	Erosion from rain and river
Tuckup	165.2 R	X			
Upper National	167 L				Only one photo date
Lower National	167.2 L	X			
Total above	15	5	2	7	
Travertine Falls	230.6 L				Only one photo date
Gneiss	236.1 R			X	River and wind have exposed more rocks
250 Mile	250.0 R			X	Less sand at beach front More veg
Total above	3	0	0	2	
Totals	44	19	4	17	40 of 44
% of beaches		47.5	10.0	42.5	90.9

2010 Season	GCMRC		COMPARE		
Camp name	River mile	early 2010	to	2009	reason
		same	improved	degraded	
Soap Creek	11.3 R		X		More sand - rocks covered in front
12.4 Mile	12.4 L			X	Steeper, more outbank
Hot Na Na	16.6 L	X			
19.4 Mile	19.4 L	X			
Upper North Canyon	20.7 R	X			
23 Mile	22.7 L	X			
Shinumo Wash	29.5 L			X	Much beach recession from river erosion
Nautaloid	35 L				No 2009 photo to compare
Tatahatso	37.9 L				No late 2009 photo to compare
Martha's	38.6 L	X			
Buck Farm	41.2 R	X			
Total above	11	6	1	2	
Nevills	76 L			X	Severe beach loss at parking
Hance	77.1 L	X			
Grapevine	81.7 L			X	Both river erosion and wind scour
Clear Creek	84.6 R	X			
Zoroaster	85 L			X	Cutbank, rain erosion, wind scour
Trinity Creek	92.1 R			X	Sand loss in front and back of camp
Schist	96.6 R	X			
Boucher	97.3 L	X			
Crystal	98.7 R	X			
Lower Tuna	100.2 L			X	River erosion
Ross Wheeler	108.3 L	X			
Bass	109 R				No late 2009 photo to compare
110 mile	110 R	X			
Upper Garnet	114.9 R	X			Slight cutbank
Lower Garnet	115.1 R	X			
Total above	15	9	0	5	
Below Bedrock	131.7 R	X			
Stone Creek	132.5 R			X	Some river erosion
Talking Heads	133.7 L			X	Considerable river erosion
Racetrack	134.2 R	X			
Lower Tapeats	134.5 R	X			Slight sand loss
Owl Eyes	135.2 L	X			
Backeddy	137.8 L	X			
Kanab	144 R			X	Some river/drainage erosion
Olo	146.1 L				No late 2009 photo to compare
Matkat Hotel	148.9 L	X			
Upset Hotel	150.9 L			X	Some river erosion
Last Chance	156.3 R			X	Rain and people erosion, gullies
Tuckup	165.2 R	X			Small rain impact
Upper National	167 L			X	Flash flood erosion!
Lower National	167.2 L			X	Flash flood erosion! Also cutbank
Total above	15	7	0	7	
Travertine Falls	230.6 L				No late 2009 photo to compare
Gneiss	236.1 R				No 2009 photo Reportedly much steeper
250 Mile	250.0 R				No 2009 photo to compare
Total above	3	0	0	0	
Totals	44	22	1	14	37 of 44
% of beaches		59.5	2.7	37.8	84.1

2010 Season	GCMRC	late		pre 08		Classification
Camp name	River mile	2010	to	HFE	reason	2008 Post HFE
		Same	Improved	Degraded		
Soap Creek	11.3 R	X				Degraded
12.4 Mile	12.4 L			X	Lots of recession, steeper	Improved
Hot Na Na	16.6 L	X				No 07 photo
19.4 Mile	19.4 L		X		Upper beach area still larger	Improved
Upper North Canyon	20.7 R			X	Rain gullies	Degraded
23 Mile	22.7 L	X				Improved
Shinumo Wash	29.5 L	X			Slight people erosion	Improved
Nautaloid	35 L		X		Better parking, bigger beach	Improved
Tatahatso	37.9 L	X			Poor photos	Degraded
Martha's	38.6 L	X				Improved
Buck Farm	41.2 R	X			Slightly more vegetation in 2010	Degraded
Total above	11	7	2	2		
Nevills	76 L		X		Better parking, bigger beach front	Improved
Hance	77.1 L	X				No 07 photo
Grapevine	81.7 L		X		More camp area	Improved
Clear Creek	84.6 R	X				Improved
Zoroaster	85 L		X		More sand in front and @ camp area	Improved
Trinity Creek	92.1 R			X	Sand loss at parking	Improved
Schist	96.6 R		X		Larger camp area	Same
Boucher	97.3 L	X				Improved
Crystal	98.7 R		X		Larger beach area	Degraded
Lower Tuna	100.2 L		X		Larger, but steeper - still better	No 07 photo
Ross Wheeler	108.3 L		X		Larger beach area, less vegetation	Same
Bass	109 R		X		Larger camp area	Degraded
110 mile	110 R		X		Larger camp area	Improved
Upper Garnet	114.9 R	X			Almost identical	Improved
Lower Garnet	115.1 R	X			Almost identical	Improved
Total above	15	5	9	1		
Below Bedrock	131.7 R			X	New rain impacts, erosion	Improved
Stone Creek	132.5 R	X				Improved
Talking Heads	133.7 L			X	Considerable outbank, steeper overall	Improved
Racetrack	134.2 R		X		More sand in front and @camp area	Same
Lower Tapeats	134.5 R	X				Improved
Owl Eyes	135.2 L			X	More beach, less slope in 2007	Improved
Backeddy	137.8 L			X	More beach, less slope in 2007	Improved
Kanab	144 R	X				Improved
Olo	146.1 L	X				Improved
Matkat Hotel	148.9 L	X			More sand in 2010, but more rain impact	Improved
Upset Hotel	150.9 L	X				Improved
Last Chance	156.3 R	X				Same
Tuckup	165.2 R	X				Improved
Upper National	167 L			X	Erosion from river and rain	Degraded
Lower National	167.2 L			X	Considerable erosion from river and rain	Degraded
Total above	15	8	1	6		
Travertine Falls	230.6 L		X		Larger camp area	Same
Gneiss	236.1 R		X		Much larger camp in 2010	Improved
250 Mile	250.0 R				Not part of monitoring in 2007	No 07 photo
Total above	3	0	2	0		
Totals	44	20	14	9	43 of 43	
% of beaches		46.5	32.6	20.9	100	

Appendix B

Adopt-A-Beach Data Sheet
Used by Volunteers to Record Comments

Adopt a Beach Data Entry Form

Guide s Name _____

Camp Name _____

Camp Mile _____

Date _____

River Flow (circle one) Low (5-12K) Med (12-18K) High (18-25K)

Photo Numbers: _____ (remaining)

Any Comments about Beach Change? (describe in this space)

Change in Beach Size from Previous Visit (circle one): Increase Decrease Same

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Dominant Cause of Change (circle one):

Spike Daily/Monthly Flow Rain Wind People Don't Know

Supporting Observations for Dominant Cause (check any that are appropriate):

- ☐ New cutbank
- ☐ Change of slope
- ☐ Bench in eddy
- ☐ Gully
- ☐ Trib/Debris flow
- ☐ Scour from wind or people
- ☐ Mounded sand

Secondary Cause of Change (circle one):

Spike Daily/Monthly Flow Rain Wind People Don't Know

Supporting Observations for Secondary Cause (check any that are appropriate):

- ☐ New cutbank
- ☐ Change of slope
- ☐ Bench in eddy
- ☐ Gully
- ☐ Trib/Debris flow
- ☐ Scour from wind or people
- ☐ Mounded sand

Campsite Quality Compared to Last Visit (circle one): Same Better Worse

Supporting Observations for Campsite Quality (check any that are appropriate):

- ☐ Boat parking
- ☐ Rockiness
- ☐ Vegetation encroachment
- ☐ Steepness
- ☐ Trail erosion
- ☐ Open sand area
- ☐ Human impacts- ants, pee spots, litter

(circle those that apply)

Any Comments about Campsite Condition? (describe in this space)