COLORADO RIVER MANAGEMENT PLAN
ANNUAL REPORT
FOR FISCAL YEAR 2012

Project Number 140653

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Executive Summary

The 2006 Colorado River Management Plan (CRMP) and associated Record of Decision prescribed a multi-resource monitoring and mitigation program to focus on areas affected by river recreation where the integrity of natural and cultural resources may be at risk and where visitor experience may be affected. The Record of Decision also prescribed a site-specific restoration program to address campsite impacts, trails, and campsite maintenance and mitigations.

The CRMP Mitigation Program was initiated in November 2006. Projects were identified, planned, and implemented by an Interdisciplinary Team that includes River Rangers, Backcountry Rangers, Resource Management Specialists, Trails Specialists, and others. The fieldwork is conducted in partnership with the Grand Canyon River Outfitters Association (GCROA).

In coordination with Northern Arizona University (NAU), the National Park Service (NPS) developed a monitoring plan to examine long-term trends in changes to campsites resulting from recreational use. The campsite monitoring program was designed to document changes to vegetation, avifauna, and general impacts from visitation during low- and high-use periods. The monitoring program was implemented in April 2007 and continued through September 2010

In 2012, NPS teams completed one CRMP mitigation river trip, two cultural resources monitoring trips, and one isolated mitigation project. Visitor experience monitoring was conducted at two locations during representative times of the river use season, and data were collected from administrative trips. The objectives, projects, and outcomes of each project are summarized below.

Mitigation Program

Lees Ferry to Diamond Creek Mitigation (November 2011)
In partnership with the GCROA, guides from Tour West joined the NPS interdisciplinary team to conduct site rehabilitation and maintenance projects at campsites and attraction sites. The partnership aspect of this program is its greatest asset. Project areas included Soap Creek, Hance Rapid, Tapeats Creek, and Deer Creek. Phase III of the Soap Creek restoration project consisted of continued experimentation with ollas (a passive irrigation system) and live plantings to address impacts in the old high water zone. Work at the other sites consisted of campsite clean-up, social trail eradication and delineation, and maintenance of primary access trails. The cyclic program also includes monitoring past projects using photo points and assessments, completed at nine sites this trip. The team also conducted site assessments at 16 campsites. These assessments serve as the primary tool for determining whether any site treatments are needed and formulating a monitoring schedule for the site.

Cardenas Mitigation (February 2012)
The project at Cardenas was the first attempt at a hybrid volunteer-staffed, backpacking crew with limited River District support to perform high priority mitigation work within the Colorado River Corridor. This method was done in response to the decreased CRMP budget so that the mitigation work could still be accomplished. The project was very successful and included obliterating tent pads, social trails, installing and updating photopoints, and assessing previous mitigation projects.

Monitoring Program

Natural Resources Campsite Monitoring

The natural resources campsite monitoring program measures recreation-use effects by documenting standard human impact variables and measuring and monitoring vegetation and avifauna in the river corridor. In 2011, following a program review, program managers decided to suspend campsite monitoring data collection in order to focus on analysis of data collected during the previous four years. An agreement with NAU was sought and funded, and data were prepared for analysis. In FY 2012, program managers and their staff refined protocols and documented deficiencies in the methods and the overall program. In September 2012, NAU delivered a draft report which was reviewed by program managers and staff. Prior to delivery of the Final Report, program managers agreed to move forward with hiring a one-year term Natural Resource Specialist to develop a revised monitoring plan based on several of the recommendations in the report.

Cultural Resources Monitoring

The primary goal of this monitoring program is to determine whether or not impacts have adversely affected archaeological resources along the river corridor. Results from monitoring activities provide information used to make decisions about treatments of impacts. A total of 111 archaeological sites were visited during three separate field sessions. Site condition records were updated for all these sites. A monitoring river trip occurred in February 2012, with all Grand Canyon cultural resource staff participating. The majority of the monitoring sites were visited on this trip.

Visitor Experience Monitoring

Visitor experience monitoring focuses on how encounters with other trips affect river runners' experiences by measuring use levels at attraction sites. During 2012, attraction site observations were conducted at the Little Colorado River confluence and Deer Creek for a total of 16 days. Data for attraction site monitoring in 2012 show that in general, observed conditions meet the CRMP standard of attraction sites having no more than 100 people at one time. Also, administrative river trip diary data were collected from 15 different administrative trips, providing information on trip type, number of boats, and number of people. These data were incorporated with campsite use data collected during the attraction site monitoring. These combined sources of data provided information on campsite occupancy levels for use in the analysis of the CRMP Integrated Resource Monitoring data.

Introduction

This report documents the accomplishments associated with the CRMP monitoring and mitigation program. In FY 2012, NPS teams completed four trips: a CRMP campsite and trails mitigation river trip (November), a CRMP backpacking trip (February), and two cultural resource monitoring trips (February and August). Visitor experience monitoring occurred at two attraction sites, and data were collected using river trip diaries.

This report provides an overview of the programs and recommendations for future actions. Details of the work accomplished are documented in the individual trip reports included in the Appendices.

Purpose and Need

The purpose of this report is to provide an overview of the CRMP monitoring and mitigation activities in FY 2012.

The updated CRMP was implemented in 2007 following a 2006 Record of Decision. Major changes to recreation and resource management include the establishment of a launch-based system of distributing use (to ensure capacity standards were met), a decrease in maximum group size (from 44 to 32), and an increase in use during the spring, fall, and winter months (due primarily to an increase in non-commercial launch opportunities).

The CRMP management objectives emphasize managing river recreation to minimize impacts to resources while providing a quality visitor experience. To ensure these objectives are met the NPS must determine, through a research-based monitoring and mitigation program, what impacts are occurring, how these impacts alter resource condition, and how adverse impacts can be effectively mitigated. The objectives of the CRMP monitoring and mitigation program include:

- Determine status and condition trends of selected resources
- Establish reference points and provide data to compare resource condition
- Understand and identify meaningful resource condition change associated with visitor use
- Understand effects of use patterns on visitor experience quality
- Provide early warning of deteriorating resource conditions that trigger mitigation (management action toward restoration)
- In response to monitoring results, identify appropriate changes to management practices
- Assess efficacy of management actions and restoration methods
- Develop an effective approach to impacted-site mitigation and restoration

Mitigation Program

Background

Visitation and management activities can impact park resources in beneficial and adverse ways. The CRMP Mitigation Program requires that park staff mitigate the adverse effects of visitation and management activities along the Colorado River corridor. Mitigation activities include delineating trails to decrease social trailing, obliterating trails that cause damage to natural resources or archaeological sites, actively planting vegetation in highly degraded campsites, and limiting sand erosion in campsites, archaeological sites, and along trails. Grand Canyon National Park staff, in conjunction with many other invested stakeholders, performs restoration activities to mitigate the effects of concentrated human impacts in the backcountry and to maintain natural processes throughout the Colorado River watershed. Under the current CRMP, a core planning team comprised of resource management specialists, planners, maintenance personnel, and river rangers develops procedures for site assessment, restoration implementation, and follow-up monitoring schedules and priorities. Staff from each discipline works on mitigation planning and participates in up to two mitigation river trips each year, typically in February and November. The work and assessments prescribed by the core team are implemented by the interdisciplinary CRMP Mitigation Team, which is led by the Outdoor Recreation Planner. This team includes a Restoration Biologist, Trails Supervisor, Archaeologist, and a River Ranger. However, due to budget and staffing shortfalls, as well as other program priorities, it was difficult in 2012 to secure the commitment of cultural resource and trail crew specialists to participate on the CRMP mitigation trips

The assessment and reassessment process through the CRMP Mitigation Program should not be confused with the CRMP Monitoring Program. The CRMP Monitoring Program collects data on long-term impacts to vegetation, wildlife, and visitor experience at campsites and attraction sites caused by visitation. The CRMP Mitigation Program addresses more short-term impacts to campsites and attraction sites resulting from a variety of causes. As more data are collected and analyzed through the CRMP Monitoring Program, these long-term trends can help provide insight in the direction of mitigation issues in the CRMP Mitigation Program. However, the assessment and reassessment process outlined in the mitigation program is the most practical way to maintain a long-lasting body of knowledge that focuses on specific impacts at a local scale.

Under the CRMP, restoration is first prescribed through an assessment system and is then completed according to priority ranking and available resources. Baseline assessments for all river campsites along the river corridor are ongoing. Attraction sites, research sites, rapid scouts, and other heavily impacted areas also fall under the assessment system. Once a site is assessed, it enters into a cyclical schedule for further assessment based on the severity of impacts at the site, which are determined by the CRMP Mitigation Team. This team also determines which sites will undergo restoration and maintenance at any given time. In order to develop priorities for a site, the team uses a monitoring data form in conjunction with aerial maps and photographs. This form records the findings of the initial site assessment, prescribes in detail the recommended actions, labor hours, and materials needed to accomplish the action, and monitors the effectiveness of mitigation and restoration actions. The team then uses a mitigation data form to document the work completed at each site, along with aerial maps to delineate where work has been completed. The team also uses long-term photo points to visually monitor work that has been completed.

Once a site has been assessed, prioritized, and restored, it falls into the cyclical reassessment phase. If the team determines during the reassessments that work is needed again, the site goes back into the queue for restoration or maintenance work.

Through reassessments, mapping, and long-term photo points, the team can determine if the methods are effective. If a method is not proving effective, the team has the flexibility to try something new. New methods for restoration are being explored with each restoration effort. Each site is different, and each requires creativity and consensus to formulate a mitigation plan that will work for that particular site.

After all the forms have been filled out (assessments, mitigation data sheets, reassessments, and photo points), they are stored in the Vegetation Office with the Restoration Biologist in hard copy form. They are also summarized after each trip in an Excel table, which is also maintained by the Restoration Biologist. These records are accessible by anyone at any time, with prior notice to the Restoration Biologist. These records are stored in a network-accessible database, and the hard copy forms will be archived in the park's museum collection.

Objectives

General

- Expand stakeholder involvement with river corridor restoration under the CRMP by actively seeking volunteer participation on park trips.
- Expand outreach and education efforts by conducting lectures and orientations for park staff and stakeholder groups, publishing articles in river journals, and distributing site bulletins to the public.

Lees Ferry to Diamond Creek (Zone 1)

- Continue to complete written assessments and plans for recommended actions to establish baseline data for all 234 campsites that lie within the area of effect for CRMP implementation.
- Continue to perform mitigation actions according to the priorities established through the CRMP mitigation assessment process.
- Continue reassessments at previous restoration sites and maintain documentation as prescribed in mitigation assessment forms.

Lower Gorge (Zones 2 and 3)

- Remove invasives and expand existing campsites as allowed to accommodate visitor use.

Results and Observations

Two mitigation projects were conducted in FY 2012 to assess and mitigate damage to campsites: a Lees Ferry to Diamond Creek river trip in November 2011, and a Cardenas Camp backpack trip with river support in February 2012.

Lees Ferry to Diamond Creek, November 1 – 18, 2011 (See Appendix A for details)

This trip was conducted in cooperation with Tour West under the Cooperative Resource Conservation Program. The main purposes of the trip were to eradicate social trails primarily from the post-dam riparian zones to the pre-dam high water zones of campsites and attraction sites, to delineate trails and campsite perimeters in order to decrease vegetation damage, and to combat erosion that threaten the stability of trails, camping areas, or mooring areas. Work was primarily done at Soap Creek, Hance Rapid, Tapeats Creek, and deer Creek. Several one- to two-hour projects were completed at Upper 185 Mile, Lower 185 Mile, 202 Mile, and Granite Park, as well as assessments for project planning and

photopoint monitoring. Additional objectives included the evaluation and removal of climbing slings, planning for future interdivisional work projects at South, Nankoweap, Tanner, Cardenas, Unkar, Hance, and Granite, and generating enthusiasm for future collaboration with NPS resource work through the Cooperative Resource Conservation Program agreement and volunteerism.

Most of the objectives were accomplished on this trip. The Soap creek pilot project has been extremely successful in establishing data for active restoration projects such as specific methods, plant species, and frequency and duration of active maintenance (i.e., filling of berms and ollas) requirements. It continues to serve as an excellent training and outreach location for NPS staff and commercial guides to highlight river resource management efforts and foster stewardship within the boating community. Past projects were monitored at nine sites using photo points and assessments. Pre-work assessments and mitigation assessments occurred at 16 and 11 campsites respectively. Native seeds were collected for future projects at Upper Saddle and Lava Chuar, and toilet maintenance was done at Tanner, Tapeats, and Deer Creek. Climbing equipment was evaluated, removed, and/or replaced at Sheer Wall, Deer Creek Falls, the lower gorge of Deer Creek, and Olo Canyon.

Mitigation monitoring and photo points at several popular campsites showed the need for further mitigation efforts, primarily closing of social trails and campsites in the old high water zone at Soap, South, all campsites comprising the Nankoweap complex, Tanner, Cardenas, Unkar Delta, and Hance Rapid. Ideally, most of these sites would be addressed in the near future, as vegetation and archaeological resources are currently threatened, and conditions will likely deteriorate over time.

Problems Encountered and Solutions: In spite of communication with all other trips encountered en route, upon arrival at Hance for a scheduled project layover, another group was already camped there. As a result, much of the planned project time for Hance was lost. A limited amount of the originally scheduled work was completed, and important reevaluation of the scope of the site prescription was completed.

In the past, the CRMP project leaders have attempted to enlist the support of the Lees Ferry staff to ensure that an outreach letter and copies of the itinerary are made available to private trips launching around the date of a CRMP trip, as well as carrying extra itineraries along for trip leaders we encounter on river. Perhaps it would be more effective to provide the outreach material to trip leaders by mail or email ahead of their trip as well, to help ensure positive interactions between visitors and administrative trips.

Several of the high priority sites for the next mitigation trip are adjacent to known archaeological sites. Due to a lack of funding and available personnel, this trip lacked representation from the Cultural Resources program. The CRMP mitigation project lead will provide a work plan to the CRMP program manager and seek input and direction from the CRMP interdisciplinary team members (and their program managers, if necessary) prior to scheduling the work.

Cardenas Mitigation, February 21-25, 2012 (See Appendix B for details)

The project at Cardenas camp was one of six mitigation projects identified for implementation in February 2012 as part of the CRMP resource monitoring and mitigation program. The CRMP budget, however, was unable to support a river trip to accomplish all six of the prescribed projects in February. To accommodate the decreased budget, this trip was the first attempt at a hybrid volunteer-staffed, backpacking crew with limited River District support to perform high priority mitigation work within the Colorado River Corridor.

The project work was very successful. The crew obliterated five large tent pads and seven social trails leading into the old high water zone, installed two new photopoints and took update photos at nine other photopoints throughout the campsite. The updated photopoints showed that mitigation work completed in

2009 and 2010 has remained intact. The satisfactory condition of past projects in the area eliminated the need for retreatment that had been budgeted into the project schedule, and both crews were able to leave a day ahead of schedule.

The river support for this project was extremely beneficial, providing food, tools, kitchen and toilet facilities, and working alongside the crew on the project itself. It is strongly recommended that the park continue to support interdivisional cooperation to accomplish resource stewardship projects with a minimal administrative footprint.

Problems Encountered and Solutions: A recurring theme that may affect visitor impacts at river camps is the inconsistency of Leave No Trace messages and contradictory information in some of the route and trail descriptions produced by the Backcountry Information Center. A grassroots effort has been under way among staff of Science and Resource Management, the Backcountry Information Center, and Canyon District rangers for more than eighteen months to bring park-wide resource protection messages into alignment. It is strongly recommended that supervisors continue to support this effort in order to provide the best quality resource education to visitors. Also, a medical situation that arose with one of the volunteers highlighted the need to refine protocols for volunteer recruitment and possibly increase the number of park staff to allow crew leaders greater flexibility should any problems arise.

Monitoring Program

Background

The CRMP Record of Decision (2006) called for a resources monitoring program that focuses on areas affected by river recreation where visitor experience may be negatively affected and where the integrity of natural and cultural resources may be at risk. The primary components of the CRMP monitoring program include an integrated natural resources monitoring program to establish baseline conditions and to monitor long-term trends in campsite condition, an archeological site monitoring program to document and monitor archeological resources that may be affected by visitation along the Colorado River corridor, and a visitor experience monitoring program to assess how current management of daily trip launches, group size, trip length and other river trip attributes affect the quality of the visitor experience. Until 2011, campsite monitoring trips were conducted twice each year to monitor conditions in April following a low-use period, and in September, following the high-use period. Archeological site monitoring is scheduled every two years.

Natural Resources Campsite Monitoring

Background

The natural resources campsite monitoring program measures recreation use effects by documenting standard human impact variables and measuring and monitoring vegetation and avifauna in the river corridor's new and old high water zones. Using aerial photographic maps, the team also documents changes to the campsite boundary and campable area polygons. A collection of campsite maps and a database documenting all previous campsite inventories, termed a Campsite Atlas of Maps, was developed for all campsites from Lees Ferry to Diamond Creek in coordination with the Grand Canyon Monitoring and Research Center (GCMRC) beginning in 2007. The *Vegetation and Avifauna Monitoring*

Plan (2007) described a sampling framework to ensure that a variety of campsite sizes, locations, and levels of use were represented. In 2011, following a program review, program managers decided to suspend campsite monitoring data collection in order to focus on analysis of data collected during the previous four years. An agreement with NAU was sought and funded, and data were prepared for analysis. In FY 2012, program managers and their staff refined protocols and documented deficiencies in the methods and the overall program. In September 2012, NAU delivered a draft report which was reviewed by program managers and staff. Prior to delivery of the Final Report, program managers agreed to move forward with hiring a one-year term Natural Resource Specialist to develop a revised monitoring plan based on several of the recommendations in the report. The final report from NAU was received in the second quarter of FY2013 (see Appendix C to view a portion of the report; the entire report is available upon request from the Division of Science and Resource Management). Objectives and preliminary results for FY 2012 are summarized below.

Objectives

The overall objects for the CRMP campsite monitoring program are to determine resource condition trends for campsites by examining changes to vegetation and avifauna, and to determine impacts from human use of campsites. Given the objectives of the overall program and the need to more closely review the data, the NPS employed the services of the NAU Lab of Landscape Ecology and Conservation Biology. The primary goals of the analyses were to 1) analyze and interpret monitoring datasets to help answer key management questions, 2) use data from 2007-2010 to qualitatively and quantitatively assess the current study design and monitoring indicators, and 3) analyze and interpret the avifaunal data within the broader framework of the CRMP data analysis.

Results and Observations

During FY 2012, NPS program managers and staff worked closely with NAU staff on the analysis and interpretation of the data. It was important for NPS staff to help the NAU staff understand the "on the ground" protocols and applications, and how and why the management questions were formulated.

The specific conclusions and recommendations for vegetation, recreation, and avifauna monitoring are outlined in the NAU Final Report and will be more closely examined by a NPS Natural Resource Specialist to be hired in early FY 2013. The idea is to utilize this information to design a new monitoring program. In general, we learned that most of the response variables measured for vegetation and recreation monitoring had strong associations with visitor use levels, including hiker accessibility, while physical attributes of the river corridor (river mile and volume) had weaker associations with response variables. It was also found that there were few differences between data collected in spring (post-low-use) and fall (post-high-use season). For the avifauna component, it was determined that the sample size was inadequate to draw conclusions. NPS had previously conceded that this monitoring program may have weak associations with recreational use, and was considering ceasing monitoring efforts in 2011, but it had agreed to move forward with the analysis.

Recommendations for the Future

A new term Natural Resource Specialist will be hired in FY 2013 for a one-year period to design a new monitoring program. The specialist will review the NAU final report and determine how to incorporate

recommendations. A new monitoring program may include other resources and possibly incorporate research and monitoring conducted by the GCMRC.

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Cultural Resources Monitoring (See Appendix D for details)

Background

The river corridor archaeology program scope encompasses 277 miles of the Colorado River and adjacent side canyons with over 674 recorded archeological sites. Site types include both temporary and long-term use and date from 7,000 years ago to the historic era. The project methods and protocols for monitoring are contained in the CRMP Monitoring Protocol (Dierker, 2011). The program is intended to be responsive to condition data. Program methods will continue to be refined and updated as needed.

Program Goals and Objectives

The primary goal of this monitoring program is to determine whether or not impacts have adversely affected archaeological resources located within the project area. Results from monitoring activities provide information used to make decisions about treatments of impacts. The program is also intended to inform managers about when new mitigation may be necessary and the appropriateness of preservation measures previously implemented. Disturbance thresholds determine when to implement mitigation treatments to prevent resource or integrity loss.

NPS Cultural Program objectives focus on the identification of processes affecting National Register integrity. Cultural resource monitoring results in the identification of observed processes and disturbance levels and the assessment of the potential threats associated with a site and identification of the time interval when a site threat may become a disturbance. The observed threats and disturbances are assessed to determine what the effects on integrity are, and which aspects of integrity are affected. Treatment (mitigation) recommendations are made during the monitoring observation.

Program management objectives for cultural resources include the maintenance of site integrity with site stability and preservation as the desired state. If site stability cannot be maintained and preservation is not viable, minimizing effects to site integrity is required. Preservation of historic property significance and integrity are keys to continued access by traditionally associated American Indian tribal members.

Field visits consist of reviewing previous site forms including condition data, maps and photographs. A walkover of the entire site ensures a complete observation of disturbances. For each scheduled site visit, a field packet is assembled consisting of a printed site form containing all previous condition and monitoring information, photos of each feature, and site, and maps. Black and white film is used to document current condition as these negatives are currently the only stable photographic medium meeting NPS documentation standards. Updated site records, monitoring forms, and photographic documentation are all entered into the Grand Canyon archaeological sites database upon return from the field.

A total of 111 archaeological sites were visited during three separate field sessions. Site condition records were updated for all these sites. A monitoring river trip occurred in February 2012, with all Grand Canyon cultural resource staff participating. The majority of the monitoring sites were visited on this trip. All paperwork and photographs were entered into the Grand Canyon archaeological sites database.

Visitor Experience Monitoring

Background

The 2006 CRMP modified several aspects of river trips (e.g. launch scheduling, trip length, group sizes) which are expected to change use patterns and impacts on visitors' experiences. A Visitor Experience Monitoring Plan (Shelby, Whittaker, Oregon State University, 2007) proposed several methods to monitor the effects of the plan on visitor experience, including: 1) annual use information report, 2) researchers documenting observations on trips, 3) post-trip surveys, 4) non-commercial post-trip contacts, 4) attraction site observations and on-site interviews, 5) administrative trip diaries, and 6) search and rescue analysis. During 2012, attraction site observations were conducted at two locations, and trip diaries documenting campsite use was collected.

Attraction Site Observations: Visitor experience monitoring focuses on how encounters with other trips affect river runners' experiences by measuring use levels at attraction sites. Staff was present at sites at representative times during the visitor use season to measure the number of trips and people at one time and to assess if campsite competition occurs near the attraction sites. Observers collected detailed information on the each trip including number of people on each trip, arrival and departure time, the previous night's campsite, and the planned campsite for the night.

Attraction site observations were conducted at two highly visited locations along the Colorado River corridor. Monitoring from Lees Ferry to Diamond Creek occurred at the confluence of the Little Colorado River and at Deer Creek in early May to collect data during the shoulder season – high use period transition.

Observation dates were as follows:
Little Colorado River: May 3-9
Deer Creek: May 5-11

Administrative Trip Diary Data: Administrative river trip participants collected information on all observed trips such as trip type, number of boats, and number of people. They also documented where trips had stopped and what activities trip participants were engaged in at each location (for example, scout, hike, camp, lunch, project work, etc.). These data were incorporated with campsite use data collected during the attraction site monitoring. These combined sources of data provided information on campsite occupancy levels for use in the analysis of the CRMP Integrated Resource Monitoring data.

Objectives

- Gather data at attraction sites during the transition week from spring shoulder season to the high use season (late April to May) to assess the effects of transitioning from a lower use season with 2-4 daily launches and maximum 21-day trips to the high use 5-6 daily launches with a maximum 16-day trip length.
- Determine frequency of use by different types of trips at Colorado River campsites from Lees Ferry to Diamond Creek.

Results and Observations

Attraction Site Monitoring: Attraction site observations were documented for a combined total of 16 days in 2012 to collect data during the spring shoulder to high-use transition period.

Table 1. Attraction Site Observations for Lees Ferry to Diamond Creek, 2012

Site	Little Colorado River	Deer Creek
Monitoring days	8	8
Total trips recorded	33	41
Total people recorded	606	664
# Trips did not stop at site	0	1
Private trips recorded	10	15
Commercial trips recorded	22	23
Administrative trips recorded	1	2
Longest visit	2:10	9:20
Shortest visit	0:30	0:55

The 2006 CRMP set a standard for visitor experience that **"**100 people or less at any one time are encountered at attraction sites." Data for attraction site monitoring in 2012 show that in general, observed conditions meet this standard. During all monitoring periods, the number of people at one time never exceeded 100. However, on May 6 at Deer Creek, while several "trips" were at the site at one time, many of the trip participants were actually on the Surprise Valley hike that starts at Tapeats Creek and ends at Deer Creek. On this particular day, 149 people visited the site, but no more than four groups were moored at the mouth of Deer Creek at one time.

Administrative Trip Diary Data

The administrative trip diary data were collected from 15 different administrative river trips, including Science and Resource Management, Grand Canyon Youth, and river trip patrols. A total of 755 database entries documented campsite use by commercial, non-commercial and administrative trips. These data were included in the dataset provided to the NAU lab conducting campsite condition monitoring data analysis along with campsite data from other sources.

Recommendations for the Future

Attraction site monitoring. Conduct monitoring in September 2013 during the transition from high use season to fall shoulder season. Prepare synthesis for all attraction sites. Work with Grand Canyon data manager to include Visitor Experience Monitoring Program data into park-wide database.

Administrative trip diaries. Continue data collection in 2013 and request participation from the GCMRC and river outfitters.

Summary of Partnerships and Cooperation

- The CRMP projects and river trips were accomplished in cooperation with several internal and external partners. Partnership projects ranged from hands-on campsite mitigation and trails maintenance to data collection and on-site consultations.

- Grand Canyon Interdisciplinary Teams included staff from River District, Canyon District, Trails, Backcountry & River Permits Office, Resources Management, and Concessions.

- The Cooperative Resource Conservation Program is conducted under a cooperative agreement with the GCROA. Tour West, the host outfitter, provided logistical support and labor for the November mitigation trip.

- CRMP Research, Monitoring and Mitigation Program data analysis was conducted under a cooperative agreement with NAU.

Overall Recommendations

- In 2013, review the findings of the statistical analysis of the 2007-2010 integrated campsite monitoring program.
- Revise protocols for the vegetation, recreation, and avifauna monitoring programs.
- Establish a relationship between the monitoring program and the impact mitigation program.
- Draft a five or six-year synthesis report incorporating all elements of CRMP monitoring and mitigation programs. This technical report mayl be peer-reviewed and published through the NPS Natural Resources Publications Program.

Appendix A - November Mitigation Trip Report

Trip Dates November 1 – 18, 2011

Trip Objectives

As a part of the CRMP Mitigation Program, the main objectives of the trip were to address the following:

- Social trails: excessive and damaging trails leading from the post dam riparian zones of camps and attraction sites to the pre dam high water zones; usually typified by damaged soil crust, gully formation, broken vegetation, and compacted soils. The pre dam high water zone is home to fragile plants, biological soil crusts that are easily damaged and cultural resources.
- Vegetation damage: usually caused by social trailing and trampling of grasses, shrubs, cactus, and biological soil crust; tree, shrub and cactus damage from campsite pioneering or illegal firewood gathering; and tree and shrub damage from unauthorized and improper pruning at campsites and attraction sites.
- Erosion: combination of weather or natural conditions that threaten the stability of trails, camping areas or mooring areas. This usually occurs when water runoff is captured within the existing trail resulting in down cutting or soil loss.

This trip was executed through the Cooperative Resource Conservation Program. An interdisciplinary team of Grand Canyon National Park staff and guides from Tour West joined forces to conduct various rehabilitation and maintenance projects at camps and attraction sites along the Colorado River. The major work projects for the November 2011 trip were conducted at Soap Creek, Hance Rapid, Tapeats Creek, and Deer Creek. Several one to two hour projects were completed at other locations, as well as assessments for project planning and photopoint monitoring.

Additional objectives included the evaluation and removal of climbing slings, planning for future interdivisional work projects at South, Nankoweap, Tanner, Cardenas, Unkar, Hance, and Granite, and generating enthusiasm for future collaboration with NPS resource work through the Cooperative Resource Conservation Program agreement and volunteerism.

Brief Description

The park staff rendezvoused with the Tour West crew on October 31 at Lee's Ferry to conduct introductions, overview of roles and responsibilities, and safety briefing. Several crew members from both NPS and Tour West were new boatmen, so the trip leaders established a suitable running order for each boat operator to ensure safety and provide mentoring opportunities.

Table 1. Participant List

Name	Affiliation	Role
Dave Loeffler	NPS V+RP River	NPS Trip Leader/Boatman
Bryan Yadon	Tour West	Tour West Trip Leader/Boatman
Vanya Pryputniewicz	NPS S+RM Recreation	Project Coordinator/Boatman
Kassy Skeen	NPS S+RM Vegetation	Vegetation Project Lead
Shayne Rasmussen	NPS FMD Trails	Trail Crew Lead/Boatman
Lisa Hendy	NPS V+RP Canyon	Technical Rescue specialist/laborer
Michael Wolcott	NPS S+RM	Vegetation Crew Lead
Russ Gregory	Tour West	Boatman/laborer
Jake Skeen	Tour West	Boatman/laborer
Dave Stratton	Tour West	Boatman/laborer
Katrina	Tour West	Boatman/laborer
Cole Barton	Tour West	Boatman/laborer
Kevin	Tour West	Boatman/laborer
Jarred	Tour West	Boatman/laborer
Mike Coltran	NPS VIP Lee's Ferry V+RP	Laborer
The following participants hiked into the trip at a few key locations. These staff members hiked in to participate as laborers, become acquainted with the CRMP Mitigation Program and increase their understanding of resource concerns and how we communicate them both internally and externally to best benefit the preservation of quality resource conditions for the enjoyment of park users.		
Name	**Affiliation**	**Role**
Debbie Brenchley	NPS V+RP Canyon	Laborer
Jed Dyer	NPS VIP V+RP BIC	Laborer
John Vonk	NPS V+RP Canyon	Laborer

Table 2. Itinerary

Date	Day	River Mile	River Side	Work Location	Project Details	Campsite Name
11/1/ 2011	1	11.3	R	Soap Creek	Morning launch, Arrive Soap by noon. Camp at Soap. Project orientation and introduce hikers	Soap Creek
11/2	2	11.3	R	Soap Creek	Work Soap project. Watering, social trail obliteration, last phase of ollas installation.	Soap Creek
11/3	3	31.9	R	South Canyon	Beach cleanup, photopoints and mitigation monitoring at South Canyon	South Canyon
11/4	4	47.5	R	Upper Saddle	Lunch. Mitigation monitoring	Point Camp
		52.1	R	Little Nankoweap	Water plants	
		53.4	R	Nankoweap	Photopoints, mitigation monitoring at Main and Point camp. Assess for pruning and touchup needs	Nankoweap
11/5	5	53.4	R	Nankoweap	Work if needed (per assessment)	
		56.5	R	Kwagunt	Photopoints and mitigation monitoring	
		61.9	L	LCR	Photopoints and mitigation monitoring	
		65.1	R	Carbon	Mitigation monitoring	
		65.9	R	Lava Canyon	Mitigation monitoring	Lava Canyon
11/6	6	69	L	Tanner	Mitigation monitoring and photopoints; toilet maintenance.	
		71.6	L	Cardenas	Mitigation monitoring and photopoints	
		72.9	R	Unkar Delta	Lunch. Mitigation monitoring and photopoints at Unkar loop trail	
		77.1	L	Hance	Hikers in. Mitigation monitoring and photopoints. Project scoping and orientation/discussion.	Hance
11/7	7	77.1	L	Hance	Project walk around, crew assignments. Trail realignment, social trail obliteration, pruning, campsite construction, and beach cleanup.	Hance
11/8	8	77.1	L	Hance	Wrap up project, hikers out	

		88	R	Phantom	Exchange if any, fill water, charge batteries. Lunch?	
		93.8	L	Granite	Hikers in; watershed project overview	Granite
11/9	9	93.8	L	Granite	Beach cleanup on downstream dunes	Parkins
11/10	10	114.9	R	Garnet	Transit; mitigation assessments at upper and lower Garnet	
		133.7	L	Talking Heads	Mitigation assessment and mapping	Racetrack
11/11	11	134.3	L	Tapeats Creek	Work up Tapeats Creek; stir toilet; trail work; campsite delineation; pruning	Racetrack
11/12	12	135.2	L	Owl Eyes	Mitigation monitoring and photopoints	
		136.9	R	Deer Creek	Mitigation monitoring and photopoints; toilet maintenance	Poncho's Kitchen
11/13	13	144.6	R	Kanab	Assessment/monitoring at mouth of Kanab	Upset
11/14	14	174.7	L	Cove	Transit; mitigation monitoring	Cove
11/15	15	183	R	Chevrons	Lunch and pruning	
		185.8	R	185-mile	Pruning at upper and lower 185 Mile	Whitmore
11/16	16	188.5	R	Whitmore	Work Whitmore area if needed	Granite Park
11/17	17	225.9	L	Diamond	Transit; de-rig; round-robin discussion on future trips	Diamond
11/18	18	225.9	L	Diamond	Early take-out	

Results and Observations

Overall, the trip went very well, and most of the objectives were accomplished. The Soap creek pilot project has been extremely successful in establishing data for active restoration projects such as specific methods, plant species, and frequency and duration of active maintenance (i.e., filling of berms and ollas). It continues to serve as an excellent training and outreach location for NPS staff and commercial guides to highlight river resource management efforts and foster stewardship within the boating community.

Mitigation monitoring and photopoints at several popular camps showed the need for further mitigation efforts, primarily closing of social trails and campsites in the old high water zone at Soap, South, all camps comprising the Nankoweap complex, Tanner, Cardenas, Unkar Delta, and Hance Rapid. Ideally, most of these sites would be addressed prior to the onset of the 2012 high use period, as vegetation and archaeological resources are currently threatened, and conditions will likely deteriorate over time.

Major Mitigation Projects Accomplished

Soap Creek
108 plants planted for phase III of olla project, representing 9 species of grasses, plants and cacti
14 social trails obliterated
1 excess tent pad obliterated
163 meters of campsite perimeters and trails pruned and delineated
130 meters of rock lining delineating trails

Hance
2 social trails obliterated
50 meters of trail pruned and delineated
~1650 meters of social trails evaluated for future work

Granite
150 meters of trails pruned and delineated
3 fire rings removed
human waste removed

Tapeats/Thunder River
1 social trail obliterated
1550 meters of trail pruned and delineated
1500 meters of trail maintained (rocked)

Deer Creek
4320 meters of trail pruned and delineated
2160 meters of trail maintained (rocked)

Routine Mitigation Maintenance Projects Accomplished

Upper 185 Mile
100 meters of trail pruned and delineated
1 log check installed

Lower 185 Mile
100 meters of trail pruned and delineated

202 Mile
50 meters of trail pruned and delineated

Granite Park
200+ meters of trail pruned and delineated

Additional Accomplishments

Climbing equipment was evaluated and removed at Sheer wall and Deer Creek Falls by Lisa Hendy, with assistance from Kassy Skeen and Dave Loeffler. Approximately 50 yards upstream of the mouth of Sheer Wall, Hendy used technical lead climbing equipment to access a 10 foot long bright red section of 1" tubular webbing to remove it from a natural anchor point. In order to facilitate Hendy's subsequent descent, another 6' section of subdued color webbing was placed in the same location, although care was taken to reduce visual impacts through both the color and the size of the webbing. At Deer Creek, Loeffler and Hendy descended the lower gorge of the canyon from the Patio down through Deer Creek Falls. A total of six anchor points were assessed, and approximately 75' of webbing, 4 rapid links, a disintegrating bolt and hanger, a carabiner and several rusted rappel rings were removed from the canyon. All of the anchors were then re-threaded with new, subdued color webbing and hardware using only the minimum amount of equipment needed to maintain standard safety margins. One of the anchors, located approximately 25' below the top of the falls in a small alcove, was deemed to be unnecessary to the completion of the canyoneering route and a significant visual impact when viewed from the river. Several feet of prussic cord and a 4' piece of webbing were removed from this anchor. An attempt was made to remove the bolts to prevent further use of the anchor, but they had been installed using epoxy, and the wrench the team was carrying would not create enough torque to remove them without damaging the surrounding rock surface. In the future, a socket wrench with a handle extension would be recommended.

Finally, a sling was evaluated at Olo canyon, hanging just above the mouth from historic bolts. The sling was not visible from the river and not noticeable until viewed from immediately below the pour off. This sling was left in place.

Photopoint monitoring was done at the following campsites: Soap Creek, South Canyon, Main Nankoweap, Lower Nankoweap (Point), Kwagunt, Cardenas, Unkar Delta, Owl Eyes, and Deer Creek.

Pre-work assessment and project planning was done at the following campsites: Soap, South, Upper Saddle, Little Nankoweap, Main Nankoweap, Lower Nankoweap, Lava Canyon, Tanner backpacker camp, Cardenas, Unkar Delta, Hance, Tonto trail into Hance, Deer Creek trail and 202 Mile.

Mitigation assessments were done for the following camps: Upper and Lower Garnet, Talking Heads, Lower Tapeats, Keyhole, Above Kanab, Below Kanab, Upset Hotel, 158 Mile, First Chance, and Last Chance.

River resource issues and CRMP mitigation overview were presented to the Prescott College trip at Hance rapid camp by Kassy Skeen, Dave Loeffler, and Vanya Pryputniewicz.

Native seeds were collected future projects at Upper Saddle and Lava Chuar.

Human waste and trash removal was done at various locations.

Toilet maintenance was done at Tanner, Tapeats, and Deer Creek.

Problems Encountered and Solutions

In spite of communication with all other trips we encountered en route, when we arrived at Hance for our project layover, another group was already camped there. Our trip leader was able to hand signal the rest of our group to eddy out and camp at Papago, as well as row himself back upstream. The following morning, we waited for several hours for the other group to get packed up, as our project area was in the central camp. In the meantime, foul weather had moved in, and between these two unforeseen circumstances, we lost much of our planned project time for Hance. However, the Prescott College trip pulled in to scout just as we were unloading, affording the opportunity to do an impromptu resource management talk and take questions from the students, and we still managed to accomplish some of the necessary work.

Another situation developed due to a preexisting medical condition of one of our trip participants. The 70-year-old man was evacuated out at Phantom Ranch after showing signs of hemodynamic instability for several days. The patient had a previous history of cardiac deficiency and that was likely a contributing factor. Both Ranger Lisa Hendy and trip leader Dave Loeffler are to be commended for keen situational awareness and tactful, professional handling of a potentially serious medical emergency arising on the lower half.

Follow- up Actions

In the past, the CRMP project leaders have attempted to enlist the support of the Lees Ferry staff to ensure that an outreach letter and copies of the itinerary are made available to private trips launching around the date of a CRMP trip, as well as carrying extra itineraries along for trip leaders we encounter on river. Perhaps it would be more effective to provide the outreach material to trip leaders by mail or email ahead of their trip as well, to help ensure positive interactions between visitors and administrative trips.

Several of the high priority sites for the next mitigation trip are adjacent to known archaeological sites. Due to a lack of funding and available personnel, this trip lacked representation from the Cultural Resources program. The CRMP mitigation project lead will provide a work plan to the CRMP program manager and seek input and direction from the CRMP interdisciplinary team members (and their program managers, if necessary) prior to scheduling the work.

For the duration of the CRMP implementation, mitigation trips in the past have been scheduled for November and February. Unfortunately, the program is unable to fund a CRMP mitigation trip for this February. The mitigation field crew is exploring other options for accomplishing some of the most urgent priority work with backpacking trips and limited river support from other administrative trips.

Appendix B – Cardenas Mitigation Trip Report

Trip Dates February 21 – 25, 2012

Trip Objectives

The project at Cardenas camp is one of six mitigation projects identified for implementation in February 2012 as part of the CRMP resource monitoring and mitigation program. The CRMP budget was unable to support a river trip to accomplish all six of the prescribed treatments in February. This trip report documents the first attempt at a hybrid volunteer-staffed, backpacking crew with limited river support to perform high priority mitigation work within the Colorado River Corridor. Objectives for the trip include:

- Obliteration of social trails leading from camping beach into the Old High Water Zone (OHWZ), and shortcutting main trails and routes.
- Obliteration of several large tent pads that had developed in or near the OHWZ, causing erosion of fragile relict dunes and threatening vegetation and cultural resources in the area.
- Update photo documentation throughout Cardenas camp
- Cross train vegetation crew leader in standard techniques for backcountry site restoration.
- Training and orientation for incoming YCC crew leader in leading and coordinating project work and support for backcountry crews.
- Explore the efficacy of alternative trip models to address resource damage in sensitive areas

Table 1. Participant List

Name	Affiliation	Role
Vanya Pryputniewicz	S+RM Recreation Planner	Trip Leader
Gayle Nance	S+RM Vegetation Program	Vegetation Crew Leader
Andrew Wood	Volunteer	Laborer
Mark Gilbert	Volunteer	Laborer
Dan Shein	Volunteer	Laborer
Gene Fowler	Volunteer	Laborer

In addition, a routine river patrol provided additional support and labor for the project:

Table 2. River Patrol Participant List

Name	Affiliation	Role
Dave Loeffler	Visitor and Resource Protection	Trip Leader
Dave Walton	Visitor and Resource Protection	Boatman
Mike Harris	Visitor and Resource Protection	Boatman
Drew Podany	Volunteer	Laborer
Jaime Smith	SCA, Interpretation / Vegetation	YCC Crew Lead/trainee
Lyman Evert	Volunteer	Laborer

Table 2. Itinerary

Date	Day	River Mile	River Side	Work Location	Project Details	Campsite Name
2/21/ 2012	1	68.7	L	Tanner use area	Crew meet on South Rim, hike in on the Tanner trail	Tanner
2/22	2	71.6	L	Cardenas	Hike to Cardenas, rendezvous with River Patrol; project orientation and materials gathering.	Cardenas
2/23	3	71.6	L	Cardenas	Social trail obliteration, campsite restoration and trail maintenance at Cardenas camp.	Cardenas
2/24	4	47.5	R	Cardenas	Photopoints and project documentation. Then hike back to Tanner use area	Tanner
2/25	5				Hike out Tanner trail	

Results and Observations

The project work was very successful. The crew obliterated five large tent pads affecting an area of 45 square meters, and obliterated 7 social trails leading into the OHWZ for a total of 40 square meters. Vertical mulch installation was accompanied by the emplacement of numerous boulders to make the obliterated tent pads unsuitable for camping in the future. The crew installed two new photopoints and took update photos at 9 other photopoints throughout the campsite. The updated photopoints showed that mitigation work completed in 2009 and 2010 has remained intact. The satisfactory condition of past projects in the area eliminated the need for retreatment that had been budgeted into the project schedule, and both crews were able to leave a day ahead of schedule.

Both the vegetation crew leader and the Youth Conservation Corp crew leader proved to be very capable in managing crews, directing various components of the project, maintaining safety awareness, and producing quality work.

The river support for this project was extremely beneficial. Approximately 75 pounds of food and tools were carried in on the river rather than on the backs of the volunteers and staff who had hiked in from the South Rim. The river patrol crew augmented the labor pool for the project, which resulted in expediting the most labor intensive and time consuming component of gathering materials for effective obliteration of unwanted trails and campsites. The river camp enhanced the ability of the backpack crew to Leave No Trace by providing a river toilet system for the duration of the project. It is strongly recommended that the park continue to support interdivisional cooperation to accomplish resource stewardship projects with a minimal administrative footprint.

Problems Encountered and Solutions

One of the volunteers on the trip began experiencing difficulty during the hike in on the Tanner trail. Although the individual had indicated extensive Grand Canyon hiking experience on the volunteer application, he failed to disclose the fact that he had not maintained a very high level of fitness in recent months. Once in camp, he explained that he suffered from a vitamin deficiency, and the primary symptom was extreme fatigue. He assured the crew leaders that he could correct his condition by increasing his medication. He went on to assist the project without further difficulty. In order to ensure the health and safety of the crew, the crew leaders arranged with the river patrol to transport the volunteer to Phantom Ranch where he could hike out on a less demanding corridor trail, accompanied by a ranger.

A recurring theme that may affect visitor impacts at river camps is the inconsistency of Leave No Trace messages contained in some of the route and trail descriptions produced by the Backcountry Information Center. Trail descriptions, campsite recommendations, and special use area messages often contradict information given to boaters. A grassroots effort has been under way among staff of Science and Resource Management, the Backcountry Information Center, and Canyon District rangers for more than eighteen months to bring park-wide resource protection messages into alignment. It is strongly recommended that supervisors continue to support this effort in order to provide the best quality resource education to visitors.

Follow- up Actions

Continue working toward consistent resource stewardship messages with all park information outlets.

Review and revise existing Job Hazard Analysis forms for CRMP mitigation projects.

Refine protocols for volunteer recruitment for CRMP mitigation projects to ensure the safety of all participants:

- Ensure that each participant is thoroughly vetted through either recommendations for other project leaders and/or a personal interview with the crew leader
- Make the health form mandatory for any backcountry volunteer applicant
- Consider increasing the number of park staff accompanying volunteer crews to allow crew leaders greater flexibility should any problems arise.

Appendix C – Monitoring Program Data Analysis Report

The following is the introduction found within the NAU CRMP Final Report. This report is also available from the Division of Science and Resource Management, Grand Canyon National Park.

Introduction

The 2006 Colorado River Management Plan (CRMP) is a visitor use management plan that specifies actions to conserve natural and cultural resources, as well as visitor experience in Grand Canyon National Park (GRCA) while enhancing river running recreational opportunities on the Colorado River through the park. To determine and address effects of the 2006 CRMP recreational use limits and launch patterns on park resources, the National Park Service (NPS) developed a Research, Monitoring, and Mitigation Program (RM&MP). The key objectives of the RM&MP are to determine the status and trends of key resources (i.e., vegetation, soil, recreation, and avifauna), identify and understand meaningful resource condition changes associated with river use, identify appropriate mitigation and management actions, and assess the efficacy of such actions within an adaptive management framework (Kearsley & McMaster 2011). Grand Canyon National Park partnered with the Lab of Landscape Ecology and Conservation Biology (LLECB) in the School of Earth Sciences and Environmental Sustainability at Northern Arizona University through the Colorado Plateau Ecosystem Studies Unit Cooperative Agreement to analyze the RM&MP data (Projects #: P11AT10396/NAU-398 and P12AC10331/NAU-413).

The analyses described in this report had three primary goals. The first goal of the analysis was to analyze and interpret monitoring datasets within an information-theoretic modeling and inferential framework (Burnham & Anderson 2002) to help answer key management questions and address the overall objectives of the RM&MP. The overarching question was: what are the effects of river recreation on natural resources within the river corridor in GRCA from 2007-2010 as implemented under the 2006 CRMP? Other key questions focus specifically on soil-, vegetation-, and recreation-related resources. These more specific questions are addressed later in this report.

The second goal was to use data from 2007-2010 to qualitatively and quantitatively assess the suitability of the current study design and monitoring indicators for subsequent analyses and monitoring efforts by GRCA. Elements of the study design and existing data that were assessed included the number of sites surveyed, the timing and frequency of surveys, and the precision and accuracy of estimates generated from the data. This work was intended to provide guidance to the NPS on any changes that could be made to the study design and survey methods upon re-initiation of RM&MP sampling efforts in 2013.
The third and final goal of the project was to analyze and interpret the avifaunal data within the broader framework of the RM&MP data analysis. The first objective of the avifaunal work was to determine which analytical methods were most appropriate to estimate detection probabilities and other species- or guild-level parameters, given the structure of the data and small sample sizes. The second objective involved calculating occupancy probabilities for species and guilds, and relating these parameters to several different habitat, environmental, or detection variables, including vegetation volume, campsite (i.e., site) location and use level, and hydrologic zones in order to answer key management questions. The third objective was to estimate and compare community parameters (i.e., diversity and richness) among different hydrological zones, use levels, and control and campsites. General questions included whether occupancy and community diversity were negatively associated with site use level, higher at control sites versus campsites, and positively associated with total vegetation volume. More specific questions related to determining whether riparian nesting bird species, non-residents, and different dietary guilds had higher abundance at control sites versus campsites.

Appendix D – 2012 Cultural Resource Monitoring Report

Introduction

This report describes work completed along the Colorado River corridor during fiscal year 2012. The work effort included site condition monitoring and site record updates, check dam monitoring, and the identification of treatments to mitigate impacts to archaeological sites. A total of 111 archaeological sites were visited in 2012. Specific mitigation treatments implemented at two sites are described below. The river corridor monitoring program achieves objectives by conducting field visits to selected sites.

Background

The river corridor archaeology program scope encompasses 277 miles of the Colorado River and adjacent side canyons with over 674 recorded archeological sites. Throughout the project area, desert and riparian habitats sustain abundant plants and animals. Site types include both temporary and long-term use and date from 7,000 years ago to the historic era.

The project methods and protocols for monitoring are contained in the CRMP Monitoring Protocol (Dierker, 2011). The program is intended to be responsive to condition data. Program methods will continue to be refined and updated as needed.

Program Goals and Objectives

The primary goal of this monitoring program is to determine whether or not impacts have adversely affected archaeological resources located within the project area. Results from monitoring activities provide information used to make decisions about treatments of impacts. The program is also intended to inform managers about when new mitigation may be necessary and the appropriateness of preservation measures previously implemented. Disturbance thresholds determine when to implement mitigation treatments to prevent resource or integrity loss.

NPS Cultural Program objectives focus on the identification of processes affecting National Register integrity. Cultural resource monitoring results in the identification of observed processes and disturbance levels and the assessment of the potential threats associated with a site and identification of the time interval when a site threat may become a disturbance. The observed threats and disturbances are assessed to determine what the effects on integrity are, and which aspects of integrity are affected. Treatment (mitigation) recommendations are made during the monitoring observation.

Program management objectives for cultural resources include the maintenance of site integrity with site stability and preservation as the desired state. If site stability cannot be maintained and preservation is not viable, minimizing effects to site integrity is required. Preservation of historic property significance and integrity are keys to continued access by traditionally associated American Indian tribal members.

Field visits consist of reviewing previous site forms including condition data, maps and photographs. A walkover of the entire site ensures a complete observation of disturbances. For each scheduled site visit, a field packet is assembled consisting of a printed site form containing all previous condition and monitoring information, photos of each feature, and site, and maps. Black and white film is used to document current condition as these negatives are currently the only stable photographic medium meeting

NPS documentation standards. Updated site records, monitoring forms, and photographic documentation are all entered into the Grand Canyon A archaeological sites database upon return from the field.

FY2012 Field Sessions

A total of 111 archaeological sites were visited during three separate field sessions. Site condition records were updated for all these sites. A monitoring river trip occurred in February 2012, with all Grand Canyon cultural resource staff participating. The majority of sites monitored along the river corridor in FY12 were visited on this trip. Additional field opportunities provided staff a chance to collect additional condition assessment data. A summary of field sessions is provided below.

All paperwork was entered into the Grand Canyon archaeological sites database; all photographs were also processed and entered into the database. Sites with updated maps were first scanned and then redrawn in Adobe Illustrator. GIS data were updated by the GIS technician.

February 2012 Archaeology Monitoring

The primary focus of this trip was to conduct condition assessments at sites within the project area. Vanishing Treasures staff conducted treatment assessments at 22 locations, including sites where previous stabilization has occurred and 15 sites with no previous preservation work.

Steve Rice, Grand Canyon hydrologist, and archaeologist Jeremy Pribyl, conducted reconnaissance and documentation of a complex of cave sites accessible from the river. This important work has been incorporated into both the cultural resource site database and the NPS cave resources databases. These two programs continue to coordinate efforts and share data.

As in 2010, extra time was devoted to Kwagunt Creek and the Kwagunt Delta. The creek work is essential for understanding the condition of sites up this drainage. The Delta complex work consisted primarily of fully documenting the original R. Euler "loci" of a single site (C:09:0028). These loci have now been assigned separate site designations, but the database was incomplete.

As a follow-up to the extensive documentation work at Unkar Delta, the crews spent additional time there more fully documenting sites that had incomplete records. Work up the drainage also resulted in documentation of additional granary sites in the creek.

A total of 101 site records were updated as a result of visits during this river trip. The extensive work on the Kwagunt Delta added complete documentation of eight sites to the Grand Canyon and Archaeological Site Management Information System (ASMIS) databases.

May 2012 Zuni Cultural Resource Advisory Team (ZCRAT) river trip

NPS was invited to participate in the Pueblo of Zuni's cultural resource river trip. The ZCRAT are charged with documenting river corridor resource condition and relating this information back to the Pueblo of Zuni. Stops consisted of important plant and water locations, shrines, and five archaeological sites. Condition assessments were completed when the trip visited the archaeological sites. NPS documented tribal concerns for resources and produced a trip report for use by NPS.

August 2012 Ground Penetrating Radar (GPR) river trip

The August, 2012 GPR trip tested the utility of this remote sensing method at sites previously identified for some form of data recovery. Data were collected at portions of five sites. A report on project findings is due to NPS in December, 2012. The methods tested during the trip may provide another tool for prioritizing treatment recommendations where subsurface features are visible. Two sites had new condition assessments completed, three of the sites were visited in February, and no new changes were observed.

May 2012 Watershed Stewardship Program Excavation

Site B:16:0911 was excavated due to the presence of visitor and natural impacts. The site is within the area of the Granite Camp rehabilitation project. Grand Canyon staff partnered with the Museum of Northern Arizona to complete field work. Analysis is ongoing, with a draft report of results due to the NPS in February, 2013.

FY2012 SUMMARY RESULTS

The following section describes the results of field observations for 111 site visits this fiscal year.

Site Condition

Assessing site condition is based upon a deliberate and methodical evaluation of both the physical stability and the presence of deterioration to an archaeological site. Site condition assessments require field inspection and are aided by the comparison of baseline data (last monitored condition) with current conditions. As seen in *Figure 1* below, the majority of sites visited in 2012 were observed to be in *Good* condition. Condition definitions have been provided by NPS Washington Office (USDOI 2007) and are printed on field forms and reviewed during annual crew training to ensure a consistent application of the terms across the entire Cultural Resource program at Grand Canyon National Park.

Good:
Shows no evidence of noticeable deterioration by natural forces and/or human activities. The site is considered currently stable and its present archeological values are not threatened. No adjustments to the currently prescribed site treatment are required in the near future to maintain the site's present condition (USDOI 2007). Sites observed in *good* condition will not require treatment recommendations.
85 of the 111 sites monitored in 2012 have been documented as in Good condition. These sites span the length of the entire river corridor from river mile 12 to 223.5.

Fair:
Shows evidence of deterioration by natural forces and/or human activities. If the identified impacts continue without the appropriate corrective treatment, the site will degrade to a poor condition and the site's data potential for historical or scientific research will be lowered (USDOI 2007). Sites observed in *Fair* condition will have associated recommendations for either treatment assessments or actual treatments. Both the type of disturbance and the disturbance levels are considered when making treatment recommendations and identifying timeframes to implement treatments.

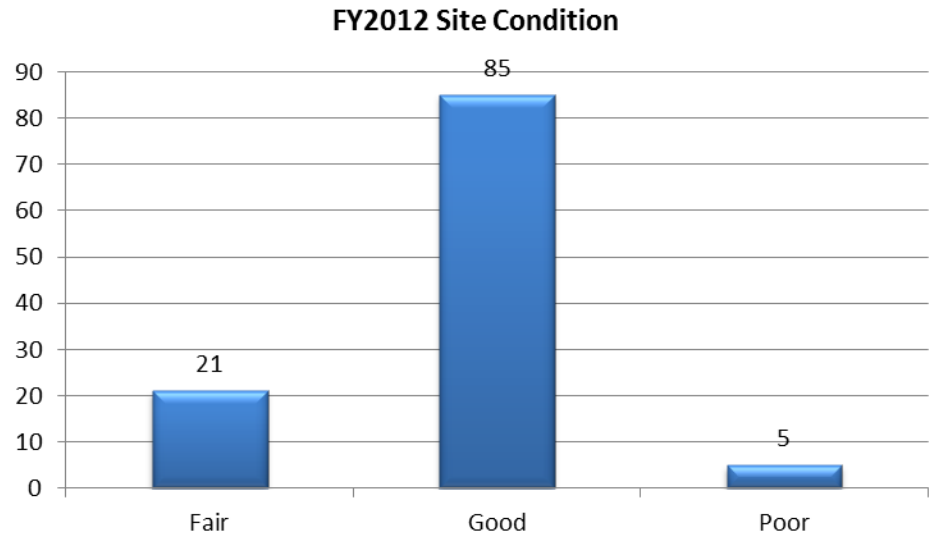

Figure 1. Histogram of Site Condition for 111 sites monitored in FY2012.

Poor:
Shows evidence of severe deterioration by natural forces and/or human activities. If the identified impacts continue without the appropriate corrective treatment they site is likely to undergo further degradation and the site's data potential for historical or scientific research will be lost (USDOI 2007). Sites in *Poor* condition will have immediate treatment needs associated with the identified disturbance(s). The 2012 site pool contains five sites documented in *Poor* condition; each is a different site type.

Site Type
The FY2012 site sample represents a broad spectrum of site types throughout the project area. NPS Intermountain Region officially recognizes 17 unique site types from which to classify and categorize archaeological sites. The program monitored 10 site types. *Figure 2* shows that the majority of sites visited in FY2012 were sites related to habitation (n=50) with either single structures or multiple units present.

For administrative purposes each archaeological site can only have one site type per site as recorded in the database, though sites can have multiple feature types. This categorization is based on the highest level of complexity of all the features represented at the site. The assigned Site Type is intended to best represent the primary inferred function of the site.

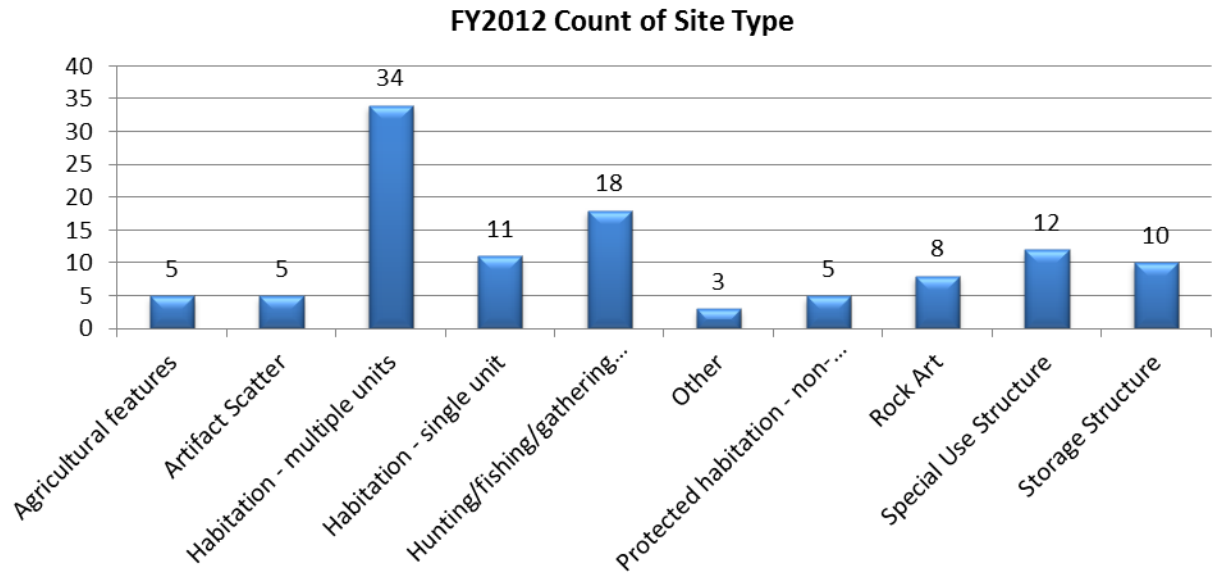

Figure 2. Counts of Site Types monitored in 2012

As a comparison, Figure 3 below shows the counts of all the river corridor sites by Site Type. The site pool monitored in FY2012 was not exactly a close representation of the counts of Site Type in the entire project area.

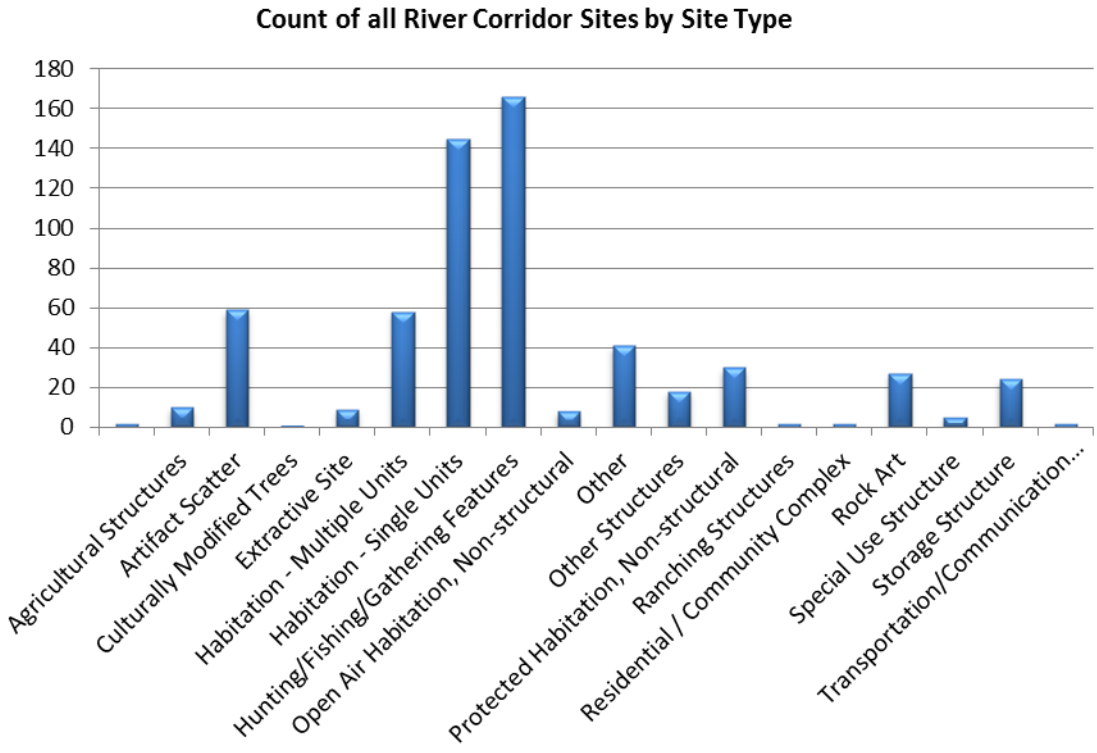

Figure 3. Count of Site Types for the entire river Program.

Identifying the causes of disturbance enables managers to better prevent or reduce impact to site integrity by implementing preservation treatments or managing visitation through education, area closures, or maintenance of on-site conditions.

One assumption of cultural resource managers is that visible features or site types are more likely to have visitor related disturbances, and in turn require treatments and therefore be assessed as in a condition other than *Good*. *Figure 4* summarizes the counts of 2012 Site Type by their condition. The five sites identified in *Poor* condition are each different site types. Only site B:10:0262 is being impacted by visitors due to its proximity to a major river camp; the remaining four sites are impacted by erosion.

Management planning focuses on assessing current condition, identifying small-scale treatments that may be implemented to curtail disturbance, and a more in-depth review of sites in poor condition to determine if previous treatments have been appropriate or if new methods should be considered.

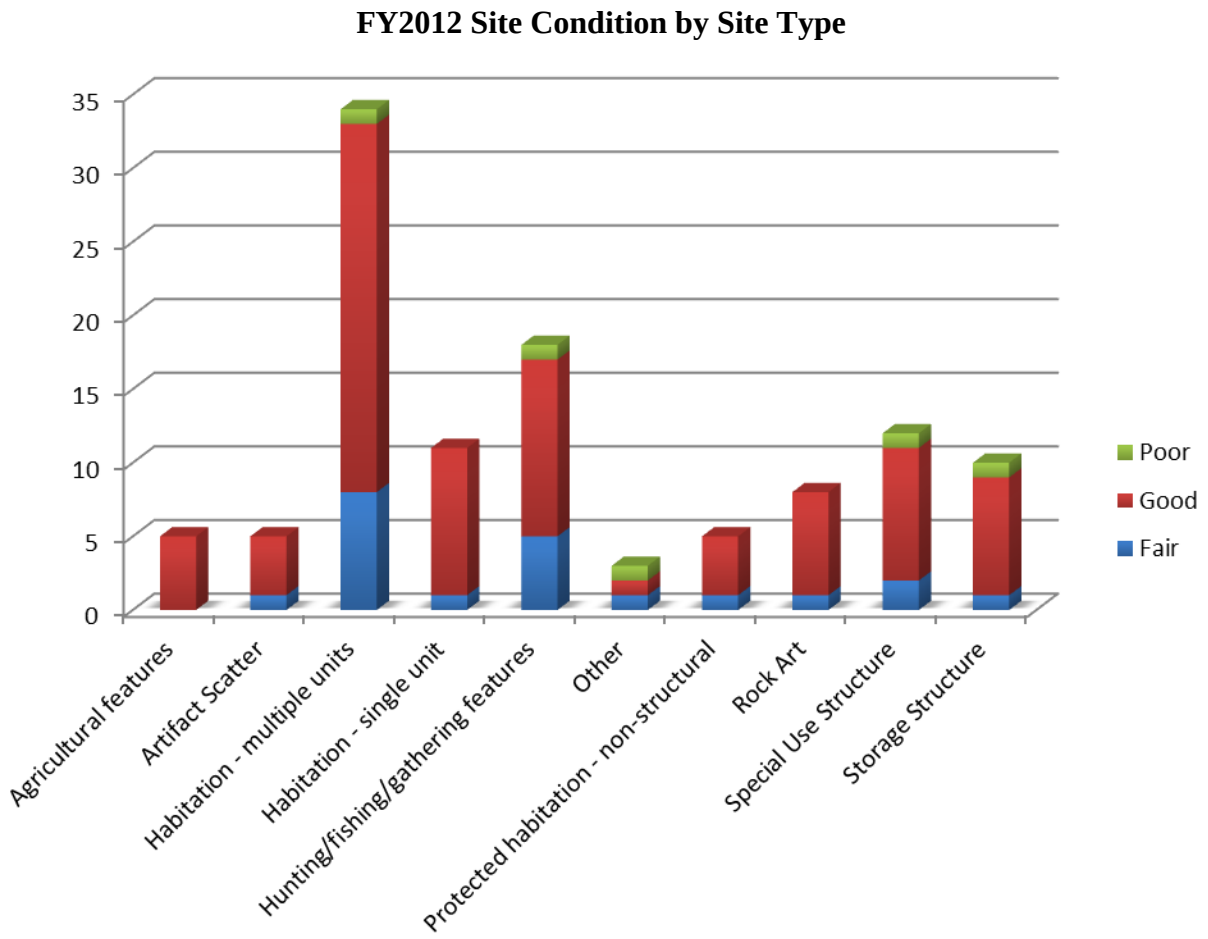

Figure 4. Documented condition of FY2012 Sites Monitored by Site Type

Disturbances

A review of the 2012 monitor data shows 181 disturbances recorded at 87 archaeological sites. *Figure 5* illustrates the counts of disturbance types documented in 2012. More disturbances were noted from erosional forces (91 total occurrences) such as water or wind erosion than visitor-related (52 total) such as social trailing.

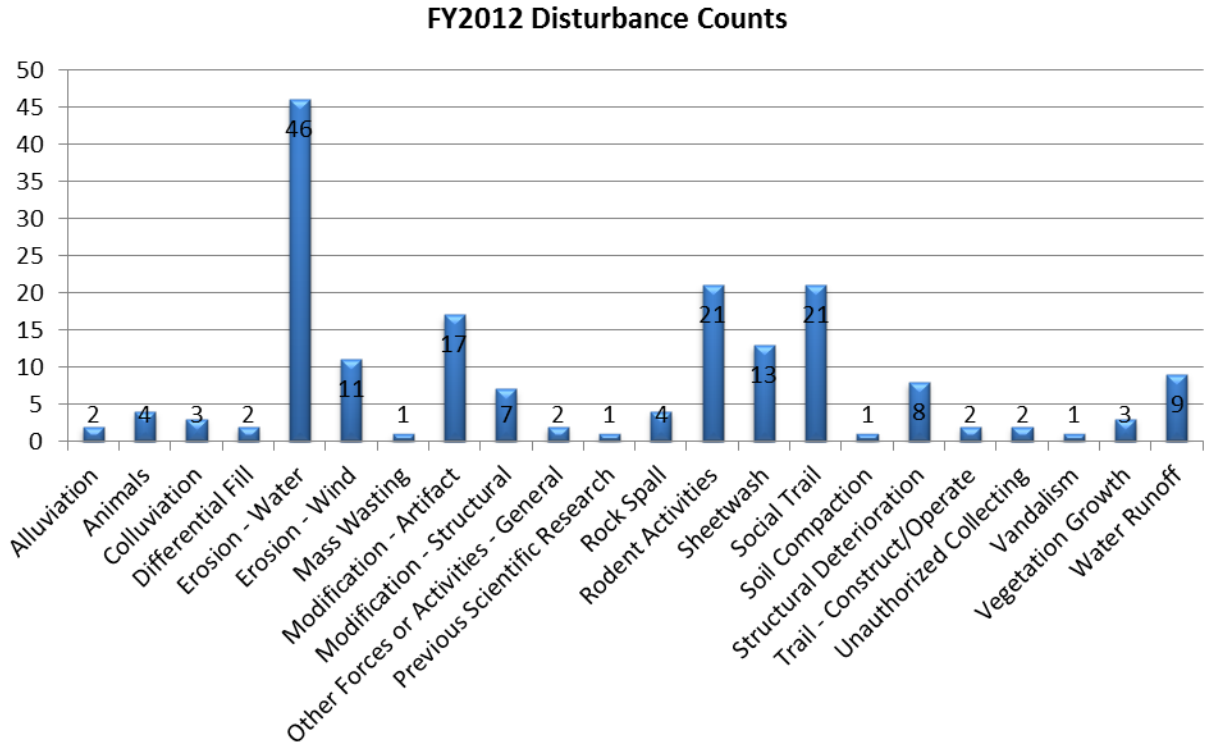

Figure 5. Histogram showing the counts of all documented disturbances recorded in 2012.

When disturbance types are collapsed into fewer categories such as visitation, animal, and water disturbance, water erosion is the most frequently recorded disturbance to archaeological sites within the CRMP project area, followed by visitation. Figure 6 shows counts by general disturbance type.

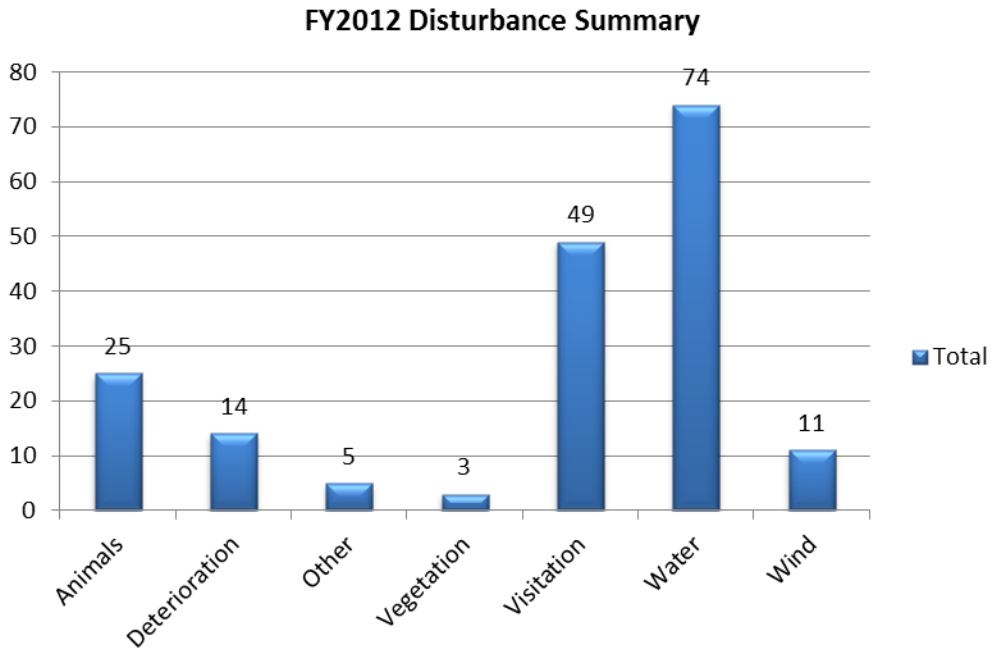

Figure 6. Summary Histogram of 2012 Disturbances.

Treatment Recommendations

The FY2012 monitoring resulted in 133 treatment recommendations at 100 archaeological sites. *Figure 7* displays these recommendations. Continued monitoring of identified threats and disturbances was the most often recommended treatment. If site integrity is not currently impacted, or if the rate of the disturbance was not yet assessed, then continued monitoring is warranted over implementing treatment.

Data recovery was recommended 11 times. Seven of these sites overlap with the 2007 BOR Treatment Plan recommendations. Erosion control was recommended at 9 sites, although three of these already contain check dams constructed prior to 2005 through the BOR river program. Sites with check dams are monitored to ensure the continued effectiveness of the treatment (Pederson et al 2006, O'Brien and Pederson 2009).

Trail work was recommended at 8 sites where social trails cross through sites or lead directly to features that are not open for public visitation. Trail work recommendations will be reviewed and implemented under the direction of a Grand Canyon archaeologist during the CRMP mitigation trips occurring biennially (November 2012 and February 2013). The Vanishing Treasures treatment assessments include documentation (2), restoration (1), and architectural stabilization (2).

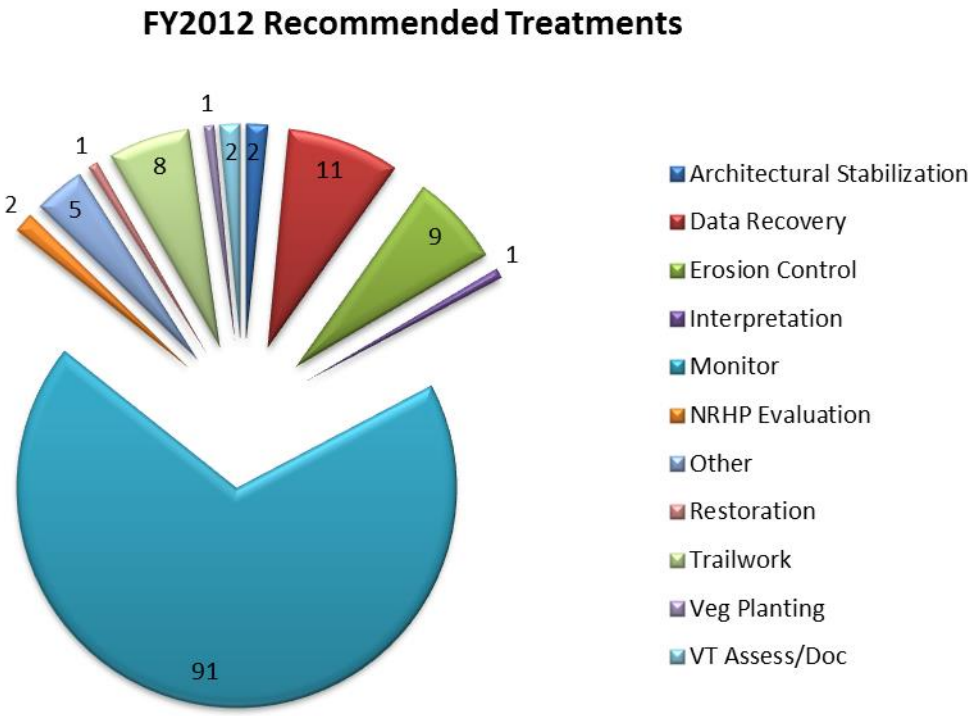

Figure 7. Pie Chart of Recommended Treatments in FY2012

Sites in Poor Condition

B:10:0262 Special Use Structure
Reach 8 River Left
The site consists of a single masonry alignment buried by Tapeats Sandstone and river alluvium. Structure elements are visible on the surface. The wall has been disturbed by visitor use as the site is adjacent to a major river camp. Lithics and a single Tusayan grayware sherd were documented in 1990.

Monitoring Notes
There are visitor trails running through the site that appear to lead to an adjacent prehistoric site. Rocks from the feature have been moved and spaces have been cleared of debris. The area is used as a sleeping location during inclement weather and it is unclear how extensively altered the site has been. Trash has been observed and removed from the site. Tramping is apparent. Water is channelizing in the trail leading down to the site.

Treatment Recommendations
This site should be considered for eligibility testing. During 2013 Mitigation activities, a Grand Canyon archaeologist will conduct testing at this location. Visitor use of the area will continue to be a major disturbance to this location due to the proximity of the river camp. It is unclear to what extent previous visitor use disturbances have altered the integrity of this site.

FY2012 Implemented Treatments

Collection: C:13:0330 Artifact Scatter
Reach 4 River Right
The site consists of a pot cached in a rock crack and a surrounding scatter of lithic material. The flake scatter is on the ridge of a talus slope. The cached pot has been typed as a Tusayan Gray Ware, Lino Tradition type indicated an early Formative affiliation (Basketmaker III- Pueblo I). When the site was originally recorded there was no indication of visitation.

Monitoring Notes
This site is regularly visited with a well-defined social trail leading to the pot. The pot is being handled by river users as confirmed by the changing position of the pot within the small alcove. As a class III site no guided trips should be going there. E. Brennan submitted a request to close the site to visitation in 12/2011.

Treatment History
After numerous reports and observations that the pot had been removed from its archaeological context and placed in a vulnerable position in a drainage away from the site, and after repeated reports of commercial and private river trips stopping at this location, the pot was removed during a river patrol trip in July 2012 and is now housed in the park's museum collection facility

Data Recovery: B:16:0911 Habitation – single unit
This site has been severely impacted by side canyon erosion and visitation. As part of a larger Watershed Stewardship Program, funding was received to address ongoing impacts to this site.

Prior to starting the excavation, the crew met on-site with vegetation crew members to determine appropriate plants to remove and cache during the excavation and to identify reseeding efforts. While on site, 32 river users and 16 backpackers stopped in to view the project. Upon completion of the excavation,

the area was completely backfilled and the slope re-contoured to reduce the likelihood of additional erosion of the area. The site continues to be monitored to ensure successful rehabilitation of the area. Complete analysis and final reporting on findings are due to NPS June, 2013.
The site consisted of multiple fire features visible in profile, and a structure on the terrace top. During excavation three distinct occupations were evident

- Transition to agriculture period (1000 B.C to A.D 500) based on dates obtained from the charcoal present in the fire features along the drainage bank
- Pueblo I (AD 800-1000) based upon the pottery found inside a small basin hearth
- Pueblo II (AD1000-1150) based upon the construction of the terrace structure.

FY2013 Work Plan

Campsite mitigation trips are currently scheduled for November 2012 and March 2013. Archaeology staff will accompany the mitigation crew to assist with campsite rehabilitation work ensuring no adjacent cultural resources are disturbed during project activities. When appropriate, the archaeologist will also visit sites and complete condition assessments. Approximately 15 sites are scheduled for condition assessments in November 2012. CRMP mitigation work will also include minor rehabilitation of trails, and obliteration of social or spider trails. Work will follow protocols for rehabilitation described by the NPS vegetation program. Trail recommendations made during FY12 monitoring will be implemented by the CRMP mitigation crew under the direction of an NPS archaeologist.

Additional tasks scheduled for completion in 2013 include:

- The GPR data collection will be summarized fiscal year 2013 though a cooperative agreement with the University of Kentucky. A final report is due to NPS, December 2013.

- The final excavation report for the B:16:0911 Monument Creek site is due to NPS June, 2013. Analysis and write up is currently underway.

- NPS Cooperators are currently reviewing CRMP monitoring data collected between 2006 and 2010. Analyses of variables collected and the management goals and objectives are intended to streamline and improve data collection for this program. A final report of these analyses is due NPS January 2013.

- No new excavation treatments will be implemented in 2013 without planning documentation and approval.

- The CRMP Cultural Resource Treatment Protocol document will be finalized in 2013.