

Vanishing Treasures

National Park Service
U.S. Department of the Interior

Vanishing Treasures Program



A CLIMATE OF CHANGE Climate Change Issue



WILDFIRES & DEFORESTATION



CHANGING FREEZE/THAW CYCLES



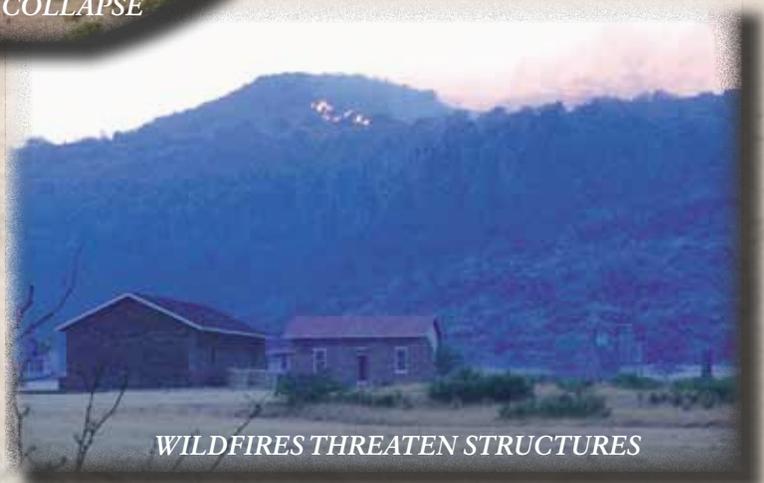
HEAVY RAINS & FLOODING



RAIN EVENTS & COLLAPSE



FLOODS



WILDFIRES THREATEN STRUCTURES

**Fiscal Year 2010 Year-End Report
and
Funded Projects for 2011**

Acknowledgments:

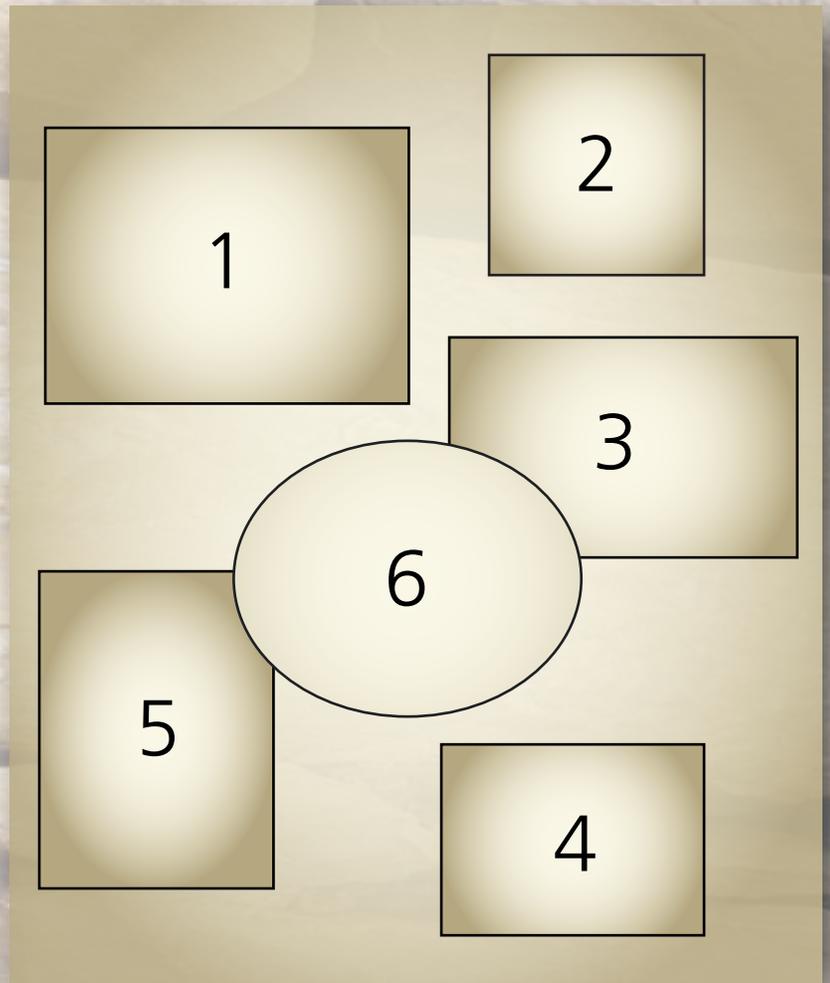
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Cover Photos: Legend

Extreme weather events including drought, floods, and increasing or decreasing temperatures all presage the possible effects of climate change. These changes have the potential to impact cultural resources in many ways, some of which are illustrated here.

- 1. Mesa Verde National Park** - Drought, heat, and high winds have fueled fires in Mesa Verde National Park. The effects of wildfire on cultural resources can be manifold, including damage or destruction from the fire itself, increased erosion resulting from devegetation, and the staining of rock formations and historic masonry by fire retardants. Here, blackened trees and orange staining can be seen on the mesa above one of Mesa Verde's alcove sites. Photo: Wikimedia.org
- 2. Navajo National Monument** - Although typically referred to as "global warming", one effect of climate change can be colder winter temperatures. Colder temperatures can mean an increased number of freeze/thaw cycles that can impact both natural and constructed stone features. Water, expands as it becomes ice and can produce considerable pressure that can blow apart stone and masonry features. This may have been a contributing factor in the collapse of the roof of the alcove above Keet Seel which narrowly missed crushing part of the structure. Photo: NPS
- 3. Big Bend National Park** - Flooding along the Rio Grand necessitated the construction of a temporary levee and the use of pumps to protect the historic adobe Alvino House. Photo: NPS
- 4. Fort Davis National Historic Site** - The driest March in Texas history spawned the recent Rock House Fire that burned at least 20 homes in the town of Fort Davis and threatened the historic fort. Here flames and smoke are visible in the hills above the fort. Photo: NPS
- 5. Big Bend National Park** - Flooding engulfs the historic Hot Springs store and post office. Flooding can destroy historic fabric resulting in a loss of both decorative and structural components that compromises the integrity of historic resources. Photo: NPS
- 6. Tumacácori National Historic Site** - Heavy rains, also an expected result of climate change, can impact all historic buildings but have the potential to literally dissolve earthen structures. A heavy monsoon rain in 2010 overwhelmed the drainage system on the mission church at Tumacácori and infiltrated the adobe wall resulting in the loss of tons of plaster and adobe from the wall of the sacristy. Photo: NPS

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Christine S. Lehnertz



John A. Wessels

Message from Our Regional Directors

As employees of the National Park Service, we share an important and noble mission - to protect our most treasured natural and cultural resources for present and future generations and to serve the public. Now, more than ever, the national park system provides America with opportunities to enjoy our shared heritage and to get away with family and friends to magnificent places. The National Park Service values the accomplishments of programs and individuals who are able to persevere and innovate during these times. The Vanishing Treasures Program, VT, in its 12 year history, has proven to be a significant program that has been able to persist and succeed in preservation efforts.

As a result of the efforts of the Vanishing Treasures Program and park staff, hundreds of the most valued resources in the NPS are being actively preserved and maintained. The VT Program itself, through its focus on training, youth programs, community involvement/consultation, partnerships, and cross-discipline collaboration, has become a model for resource protection programs service-wide. By utilizing the knowledge and expertise of individuals from a range of disciplines including the natural sciences, organizations including non-profits and universities, and cultural perspectives, VT takes a holistic approach to the preservation of heritage resources. VT staffs develop a preemptive, proactive and prescriptive treatments based on knowledge of environmental conditions, material characteristics, and structural concerns, as well as traditional practices and beliefs. We commend this multi-disciplinary approach which recognizes that being inclusive provides the best methods to solve preservation issues.

We support and commend the Vanishing Treasures Program, and program and park staff in both the Intermountain and Pacific West regions who have dedicated themselves to the preservation of both the physical remnants of the past, and the intangible values and cultural connections that keep our history alive. We are steadfast in our belief that the VT Program is vital to the continued preservation of park resources, and the connection of traditional communities to places of their heritage.

It is with great pleasure that we introduce the 2010 Annual Report, which focuses on change in both our national reality, and our world. Whether in the form of fiscal challenges or changes in climate, we are confident that the Vanishing Treasures Program will remain as a model for success in the NPS.

Christine S. Lehnertz
Regional Director
Pacific West Region

John A. Wessels
Regional Director
Intermountain Region

The Vanishing Treasures Program spans two regions of the National Park Service (the Intermountain and Pacific West) and encompasses 45 units of the National Park System. Our resources are many and varied, but all are architectural sites located in the arid West that contain the exposed remains of buildings or other structures. While the primary focus of the Program is the preservation of the cultural resources in these parks, whenever possible the VT Program also provides technical assistance to other governmental agencies, tribes, and to local communities.

I am pleased to introduce this 2010 issue of the Vanishing Treasures Program Annual Report. In the face of the recent emergency preservation concerns that some VT parks have had to address, the seemingly accelerating rates of resource deterioration, the identified need for changes in preservation methodologies, and a changing fiscal environment, the Vanishing Treasures Leadership Committee suggested that this issue have a theme of “A Climate of Change”. In addition, this theme was intended to include resource preservation issues that we may need to address as a result of a changing climate.

Although climate change is now an accepted reality, it was a challenge for the authors of our feature articles to make definitive statements regarding the risks and impacts of climate change on cultural resources. Natural resource managers in the National Park Service have been conducting research and documenting various changes to the climatic and environmental conditions in which our cultural sites exist for some time now. The challenge for us is to work with those who are studying the natural environment to understand how their research may apply to the variety of preservation issues and methods that we are using to maintain our cultural sites.

The preservation treatments we have applied in the past may not be appropriate in a future altered by climate change, but through cooperative work with the natural sciences VT will be better able to respond strategically. The feature articles that follow present a starting point for a process that can identify opportunities for collaborative research with natural resource professionals. They also propose research questions that may be answered by data gathered by natural scientists, and the possible need to reconsider current methods of cultural resource preservation. This is just the beginning of a dialog that needs to occur to ensure that we are prepared to address the preservation needs of a changing future.

Despite the many changes currently swirling around us, several constants remain – the rock-solid mission of the National Park Service and the dedication of our employees and partners in meeting that mission. This Annual Report provides an introduction to the Vanishing Treasures Program and documents the preservation work accomplished by the Program, its employees, and partners over the course of the last fiscal year.

Regardless of the possible results of a changing climate, the feature articles in this Annual Report are meant to start or expand dialogs that will help us anticipate and understand the changes we will face as we continue our work to preserve the resources entrusted to our care.



Virginia Salazar-Halfmoon

Preston Fisher, Structural Engineer

Preston Fisher, the Vanishing Treasures Program Structural Engineer, is duty stationed at MEVE.

In FY 2010 Preston provided assistance to:



- Casa Grande National Monument – Evaluated data from crack monitor points and established new monitoring locations.
- Big Bend National Park – Participated in Resource Program Review. Reevaluated conditions at Alvino House, Hot Springs Historic Site, Mariscal Mine, and Luna's Jacal structure.
- Santa Clara Pueblo – Evaluated structural conditions at Santa Clara Church and made erosional and drainage recommendations for the exterior of the church.
- Fort Union National Monument – Assessed conditions at the Fort and made stabilization and monitoring recommendations.
- Attended Southern Arizona Parks Meeting in Phoenix in May
- Montezuma Castle National Monument – Evaluated structural stability of log smokehouse at Montezuma Well.
- Bandelier National Monument – Evaluated existing structural conditions at Group M Cavates and The Motor Car Bridge constructed in 1949.
- Golden Spike National Monument – Identified major structural threats to and assessed structural conditions of various trails and structures throughout the park.
- Navajo National Monument - Evaluated conditions at Betatakin Ruin and recommended monitoring at areas within the site.
- Canyon De Chelly National Monument - Evaluated conditions at White House Ruin and made monitoring recommendations.
- Fort Laramie National Historic Site - Attended VT Leadership committee meeting.

(See *Preston*, Page 4)

Lauren Meyer, Exhibit Specialist/Conservator

2010 was a year of change for me. After 8 years as a field conservator, project manager and finally program manager for the VT Pro-



gram at Bandelier National Monument, I left the park for the VT Program office in Santa Fe. Sold to me by Virginia, Randy and Preston as the 'best job I would ever have,' I began my position as the VT Exhibits Specialist in mid-April. After spending months going through boxes of project reports, research documents, and other materials left behind by Jake Barrow (I'm still trudging through some of those boxes a year later!), I realized that I had a lot to learn about conservation in the National Park Service and the varied resources protected and preserved in the Vanishing Treasures parks. With the support and assistance of Virginia, Randy and Preston, I was able to spend much of the second half of the FY visiting our parks, learning about the program and the parks which we serve, and assisting with programmatic efforts that will benefit the VT Program as a whole.

My field time in FY 2010 included site visits to Bandelier National Monument to assist with the evaluation of cavate masonry at Group M, development and implementation of LiDAR and tuff analysis contracts/agreements, database development and maintenance, and tribal consultation with San Ildefonso and Santa Clara Pueblos; Fort Bowie National Historic Site to assist with project development for FY 2011 VT funding; Yuma Crossing National Heritage Area, along with Jake, Randy and Virginia, to assess the condition of adobe and stone masonry structures, and provide recommendations; Acoma Pueblo for the assessment of a tribal building intended for use by the Southwest Conservation Corps;

(See *Lauren*, Page 4)

Randy Skeirik, Historical Architect

Fiscal Year 2010 turned out to be another busy year. October began with a walk-through of the Walnut Canyon



Visitor Center to discuss potential impacts of a mechanical system upgrade. Later that month I was at Organ Pipe to participate in a review of their cultural resource program.

November saw lots of travel starting with a trip to Phoenix for a meeting of the southern Arizona parks cultural resource managers. Then I was off to Death Valley to help plan for a field school to be conducted through a cooperative agreement with the University of Vermont on the Keane Wonder Mine Tramway. A week after the Death Valley trip I was at Tumacácori for the Vanishing Treasures Leadership meeting, and then went directly to Organ Pipe for a site visit to prepare for the first of two upcoming field schools to be held there.

December was fairly quiet with only a quick visit to Arches to assess the condition of a stone miner's cabin there.

January of 2011 began with the Organ Pipe field school, conducted through the University of Arizona with Cornerstones Community Partnerships that focused on conducting a condition assessment at the Bates Well Ranch. The following week, I was back in Phoenix for another meeting of the southern Arizona cultural resource focused on preservation materials. At the end of the month I visited Hubbell Trading Post to help with planning for the installation of an HVAC system in the historic ranch house.

In February I was at Tumacácori as part of a team to assess and evaluate possible causes for the collapse of tons of adobe from the west wall of the sanctuary of the mission church. (See Jeremy Moss's feature article on page 12)

(See *Randy*, Page 4)

(Preston, continued from Page 3)

- El Morro National Monument - Evaluated conditions at Atsinna making monitoring and stabilization recommendations.
- Tumacácori National Historic Park - Evaluated wall collapse and made stabilization recommendations at the Mission Church.
- Aztec Ruins National Monument – Assisted with recording and interpreting data from monitor points throughout the monument.
- Attended FMSS and Maintained Archeological Sites training at

Mesa Verde National Park.

- Mesa Verde National Park – Assisted with UPENN wall capping/moisture thesis project at Far View Ruin. Assisted with structural evaluations at various back country sites. Served as Contracting Officer's Technical Representative for a contract to replace site shelter panels at site shelters on the Mesa Top Loop on Chapin Mesa and Wetherill Mesa.

(Lauren, continued from Page 3)

Fort Union National Historic Site in an effort to develop a better understanding for conservation issues related to adobe structures; and El Morro National Monument to evaluate graffiti on the North Point of Inscription Rock and assist Preston with an evaluation of the structural stability of Atsinna Pueblo. Many of these site visits were done alongside Randy, Preston and/or Virginia in an effort to introduce me to both the sites and the preservation specialists in the parks. In addition to these site visits, I also provided a special tour of Bandelier National Monument for a delegation of government officials from China for the Getty Conservation Institute. This was a great learning experience for me, as I had the opportunity to discuss preservation issues with a group of international conservation professionals and resource managers, and discuss challenges and accomplishments related to large-scale park issues (visitation, land acquisition, presentation and interpretation of sites, etc.), and resource-specific issues (documentation methods and methodologies, material characteristics, site and material-specific deterioration, and conservation methods). I also completed ATR training, and am now available to assist with agreements development and oversight.

While in the office, I was able assist in the development and establishment of several programmatic endeavors. These included the establishment of two VT youth training programs, one with the Southwest Conservation Corps and Petrified Forest National Park, and the other with Cornerstones Community Partnerships, Ohkay Owingeh Pueblo and Bandelier National Monument, that will provide training in historic preservation to a number of individuals from tribes affiliated with NPS cultural sites; the develop-

ment of a project proposal for an Administrative History for the VT Initiative (which is funded in FY 2011); the development of a GIS-based inventory and monitoring system for the VT Program (the system is in-development, with assistance being provided by the NPS GIS program in Denver); the establishment of a work group focused on documentation of VT sites; and the design of publicity materials for the program (including brochures and logoed uniform items for VT staff). In addition, I was given the opportunity to produce a poster on the digital documentation of heritage sites in the NPS for an international conference called SMARTdoc Heritage (the conference was held in Philadelphia in November, 2010). This poster, which was developed with assistance from Jim Kendrick and Steve Baumann of El Malpais and El Morro, Shannon Dennison from Bandelier, project partners from Bandelier, and Duane Hubbard from Tonto/SOAR, highlighted cutting-edge digital documentation projects in the VT parks. This poster won one of five best-poster awards at the conference, and an article has been requested for publication in a scholarly journal based on the projects included.

In my short time with the VT Program office, I have reaffirmed my belief that this is one of the most valuable programs in the NPS. I feel extremely fortunate that I am able to provide assistance to Virginia in the further development of the program, and to the VT parks in their preservation endeavors. Along with Preston and Randy, I am available to provide assistance for issues related to Vanishing Treasures resources in the parks, and I look forward to working with all of you in FY 2011.

(Randy, continued from Page 3)

March found me back at Death Valley to participate in the first week of the Keane Wonder Mine field school. From Death Valley, I went directly back to Organ Pipe for the second field school at Bates Well, this one focused on executing preservation treatments identified during the January field school. Before heading home, I swung by Fort Bowie where I presented an interpretive talk on a mapping project we had conducted there in the summer of 2009.

April saw my only trip to the VT program's headquarters in Santa Fe to meet with Program Manager Virginia Salazar-Halfmoon. While there, I travelled up to the Santa Clara pueblo to assist with assessing the condition of their historic adobe church. The end of that month found me back at Death Valley where I participated in a trial application of a newly developed UV protectant at Scotty's Castle. While Scotty's Castle is not a VT resource, this is a project that I "inherited" from Jake Barrow when he retired, and the results should have wide application at many VT sites with wood components.

In May I was back in Phoenix once again to participate in the regionally sponsored Arizona Integrated Resources Meeting that brought together natural and cultural resource employees from all of the parks in Arizona. This meeting presented an excellent opportunity to meet others working in the field of resource preservation and to learn what was happening in other parks. The following week I was at El Malpais where I had been asked to assist with the condition assessment of the log Head Homestead, and to give a one-day field school on the uses and application of borate wood preservatives.

July's only trip was a long one; up to Fort Laramie in Wyoming for a second VT Leadership Meeting. It was a great opportunity to get to this far-flung park, meet with their preservation staff, and become familiar with their resources.

As the year began to wind down I spent a very hot week at Saguaro and Fort Bowie. At Saguaro we visited the site of a CCC camp and discussed possibilities for preservation and interpretation. For the

Fort Bowie segment of the trip I was joined by VT Exhibit Specialist and Conservator Lauren Meyer. We met with the Acting Superintendent and the park's Site Manager to lay the groundwork for two VT funded projects that will begin in FY 2011.

The year ended with a marathon trip that started at Organ Pipe, where I met with former VT colleague Jake Barrow, now a Cooperator, to plan for an FY 2011 field school that would continue the momentum established by the two previous field schools. From Organ Pipe, Jake and I continued on to Yuma, AZ where we were joined by VT Program Manager Virginia Salazar-Halfmoon and Lauren Meyer. We were invited to Yuma to consult with Yuma Crossing on two Arizona State Park sites they now manage. Both sites, the Quartermaster Depot and the Territorial Prison contain many preservation challenges and the non-profit Yuma Crossing will use our preservation report to assist with their fund-raising efforts for this National Heritage Area. After Yuma, Jake and I continued on to Joshua Tree where Jake will be participating as a Cooperator in a field school to stabilize a small mining site.



Randy measuring the stack at Panamint City, Death Valley National Park.

Photo: Jeremy Stoltzfus

My final trip of the year ran right up to the last day of the fiscal year and found me back in west central New Mexico at El Morro where I met with VT Exhibit Specialist Lauren Meyer and VT Structural Engineer Preston Fisher who were assisting the park with the preservation of Atsinna Pueblo and El Morro's famous inscriptions.

As I've said in previous years, Preston, Lauren, and I are all available to Vanishing Treasures parks to provide specialized technical assistance for Vanishing Treasures Resources. In past years I have also stressed that our services came free of charge, but it appears that strict enforcement of travel ceilings in FY 2011 may prevent VT from fulfilling all of our technical assistance requests. If you would like to receive help from any of the VT Staff, I would encourage you to explore the possibility of funding the travel under your own park's travel ceiling. When this can be done, the savings will allow us to assist parks that cannot do so. Either way, be sure to submit your technical assistance requests during the upcoming call so that we can show that there is a continuing need for our services.



Preston investigating a wall crack at Victoria Mine, Organ Pipe Cactus National Monument.

Photo: Joe Toumey

The services that I can provide include identification, research, planning, treatment, and preservation maintenance of historic and prehistoric structures. I can also help to document existing conditions, define treatment actions, and help prepare historic structure reports, and I can assist parks that lack staff experienced in the preparation of VT SEPAS proposals to develop competitive project proposals. As a certified ATR I may also be available to help develop cooperative agreements for projects on VT resources and to serve as the ATR for those projects.

I continue to look forward to expanding my role in both the overall management of the program and the preservation of individual VT resources.



Lauren, along with Virginia Salazar-Halfmoon, assessing adobe damage at the Quartermaster Depot, Yuma National Heritage Area.

Photo: Jake Barrow

Feature Articles



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Where Nature and Culture Meet:

A Historical Perspective on the National Park Service Response to Climate Change

Chris Johnson

National Park Service Director Jonathan Jarvis recently described climate change as “potentially the most far-reaching and consequential challenge to our mission than any previously encountered in the entire history of the NPS.”¹ The anticipated environmental impacts of climate change are becoming better understood. However, the challenges facing the Park Service arise not only from the novel threats of a warming climate, but also from the politics and priorities that have governed national park management over time.

The history of the Park Service’s response to climate change since the 1980s illustrates some of the core political, administrative, and philosophical challenges of national park management in this period. In particular, it reflects the agency’s struggles to develop its scientific research capabilities, and suggests the benefits of a cultural resource perspective in developing new responses to global-scale environmental change.

Historian Richard Sellars has argued that with the rise of environmentalism in the 1960s and 1970s, pressure from inside and outside the agency spurred a shift in priorities, away from its traditional focus on tourism toward science-based resource management. However, Sellars adds, while many superintendents and resource managers were committed to this goal, they faced a number of cultural, institutional, and political barriers. Change took place slowly as a result. In 1980, Congress requested that the agency conduct an internal study of its natural resource policies. The resulting report, *State of the Parks – 1980*, revealed a continuing lack of attention to “the development of a sound resources information base.” To remedy this, the authors recommended a “comprehensive inventory” of park resources, drafting of revised natural resource management statements for individual parks, and the establishment of an agency-wide natural resource training program.²

A number of parks including Great Smoky Mountains, Everglades, Yellowstone, and the newly established Channel Islands

National Park developed policies in response to the report. The Park Service also initiated a trainee program and stepped up efforts to monitor air and water pollution. However, disagreements within the agency, opposition from fiercely conservative Secretary of Interior James G. Watt, and decreasing budgets impeded progress. By the end of the decade, despite a strong groundswell of support for ecological management, the Park Service still lacked adequate leadership, funding, and staffing to take significant action. The agency’s initial engagement with the issue of global climate change reflected this incomplete commitment to scientific research.

By the late 1980s, developments in climate science and increased media coverage of global warming forced many government agencies to take notice. In the Park Service, climate change considerations were voiced initially in conjunction with research projects at the park level. As public concern over climate change increased, the issue garnered more attention at the national level. At a 1990 congressional hearing, Paul Pritchard, president of the National Parks and Conservation Association, and Park Service Director of Natural Resources F. Eugene Hester touted the parks as ideal locations for monitoring climate change. The argument, as Hester framed it, was that since the parks were “well buffered... from the day-to-day activities of man,” they could provide valuable baseline data for understanding the ecological effects of climate change.³

Following this, the federal Committee on Earth and Environmental Sciences (CEES) included the Park Service in its Global Change Research Program (GCRP). For fiscal year 1991, the CEES allotted \$2.1 million to the agency for data collection in four fields. Three of the fields – ecological systems and dynamics, earth system history and paleoecology, and earth processes – meshed with the agency’s increased emphasis on ecological research. The fourth field, “human interactions,” would involve research into “the effects of climate change on subsistence and other ecosystem uses of native and other small-scale societies.”⁴

The inclusion of this field was appropriate considering the Park Service’s mandate to protect both the nation’s natural and cultural heritage. As plans developed, however, the program became focused exclusively on the natural sciences. As a result, the historical and anthropological

aspects of the proposal fell by the wayside; and in 1992, the field of human interactions was dropped from the program.⁵ Although not recognized at the time, this was an unfortunate omission since the Park Service was one of the few agencies in the GCRP capable of examining past and present human responses to environmental change.

The agency also faced obstacles in implementation. Part of the problem, according to biologist Stephen Nodvin, was the “too much, too far, too fast” nature of federal research programs. Understanding climate change required long-term monitoring that might not provide usable results for years, even decades. Nodvin had little confidence that funding could be sustained over such a long time frame, especially considering the inconsistency of public support for a federal response to global warming at that time.⁶ Maury Nyquist, chief of the Park Service’s remote sensing division, was also pessimistic. Despite the recent push to expand the agency’s scientific research capacity, only minimal progress had been made, especially in the crucial field of resource inventory. Even if the national parks were “perfect natural laboratories” for documenting change, as Pritchard and Hester had asserted, the reality remained that the Park Service had limited data on baseline biological conditions. “Until the USNPS makes a commitment to become and is recognized as a major player in the arena of environmental sciences,” Nyquist concluded, “we will continue to dance to someone else’s tune.”⁷

Nyquist’s warning proved prescient. In 1993, the Department of Interior transferred most of its biological research functions to the newly established National Biological Survey. Two years later, budget cuts necessitated the merger of the Biological Survey with the U.S. Geologic Survey (USGS). As a result, a number of the Park Service’s fledgling science programs, including the global change program, ended up under the direction of the USGS. The shift made administrative sense considering that the Park Service’s small science staff was already overcommitted. The USGS was also more experienced with scientific research and had more resources at its disposal. The parks continued to serve as locations for climate research, but the Park Service missed an opportunity to make an agency-specific contribution to the broader federal response.

At the same time, the Park Service initiated a

more modest “sustainable design” program in response to a recommendation made during its 75th anniversary symposium on the future of the national parks held in Vail Colorado in October 1991. The report on the symposium, *National Parks for the Twenty-first Century*, better known as the “Vail Agenda,” identified energy conservation as an important aspect of elevating the Park Service’s capacity for “environmental leadership.” The sustainable design program involved reducing the energy requirements of the agency’s operational infrastructure by installing renewable energy systems and promoting energy conservation.⁸

The program became a launching pad for a more ambitious partnership with the Environmental Protection Agency (EPA) to improve energy conservation in the federal government beginning in the late 1990s. The two agencies formalized and expanded the partnership in 2002 following a 2001 executive order mandating federal land agencies to include climate change considerations in their operational and management policies. The resulting Climate Friendly Parks program encouraged individual parks to monitor their carbon footprints, improve energy efficiency through conservation and clean energy systems, and to educate visitors about how climate change could impact the parks and what they could do to help. By 2007, the program included more than a dozen parks, and had helped reduce the Park Service’s overall energy usage by 15 percent.

A number of political developments in this period spurred the Park Service to more fully address the resource management implications of climate change. In 1999, Congress approved the Natural Resources Challenge, providing long overdue funding for a long-term, system-wide natural resource inventory and monitoring program. The program substantially increased the agency’s capacity for collecting data on climate change and its ecological effects. Also, while partisan antagonisms persisted, scientific understandings of climate change had developed to a point that the public and most policymakers could agree that it was time to act. Then, in 2007, a Government Accountability Office (GAO) study reported that federal land agencies including the Park Service “had not made climate change a priority.”⁹ The study found that while Park Service officials felt they were addressing the 2001 executive

order, the agency had not developed specific policy guidance. In response, the DOI assembled a task force to explore how its agencies could do more to address climate change.

Following the release of the GAO report, the Park Service appointed a Climate Change Coordinator and established working groups to develop proposals in law and policy, planning, science, resource stewardship, greenhouse gas mitigation, and communication. These efforts resulted in a 2008 proposal for an agency-wide response. The proposal stressed three strategic aims: “mitigation” which involved reducing greenhouse emissions; “adaptation” which meant using the “best science available” to anticipate and address the impacts of rapid climate change; and “communication” which involved educating visitors and employees about the impacts of climate change and measures being taken to reduce them.¹⁰ These aims provided the framework for a “toolbox” approach to resource management policy. Rather than relying exclusively on traditional notions of “naturalness” and historical fidelity as benchmarks for resource management, biologists and land managers were developing other strategies or “tools” which could be used selectively or in combination to address particular management issues.¹¹ For the Park Service, this approach allowed for flexibility in addressing existing, anticipated, and unanticipated impacts of climate change on the array of natural and cultural resources comprising the national park system. The 2008 report became the basis for the agency’s official response strategy released in September 2010.

Regional offices also took the initiative to develop their own plans. The Pacific West Region (PWR) was particularly active. In 2007, the region established a climate leadership initiative to achieve carbon neutrality in all its parks by the centennial of the Park Service in 2016. By 2008, thirty seven of the region’s parks had renewable energy systems. Most of the maintenance and visitor transportation fleets in the region had also been converted to hybrid or bio-fuel. In 2009, the region increased its photovoltaic capacity 200 percent to nearly 400 kilowatts. Also in this period, the PWR conducted several climate change workshops to assess threats and strategize responses.

The PWR also placed an emphasis on the neglected issue of cultural resources management. Under the direction of

Stephanie Toothman, then the region’s director of cultural resources, the office drafted “A Framework for a Regional Strategic Response to Global Climate Change and Cultural Resource Management.” The document stressed the unique challenges of managing cultural resources in light of climate change:

Unlike plants and animals which are capable of adapting to new circumstances through migration, cultural resources are typically fixed in place on the landscape. Most cannot be moved except at great cost, and many cannot be moved without incurring severe damage and loss of integrity. In addition, cultural resources are unique; they do not reproduce when conditions improve, and once lost, they are lost forever.¹²

Addressing these challenges would require close cooperation with the agency’s climate change coordinator, natural resources staff, and partner agencies. Through scientific assessments, historical and archeological studies, GIS mapping, and network-level workshops, the region’s cultural resources staff could evaluate various factors including threat severity, resource significance, park-specific management objectives, feasibility of protection, and cost. The results would aid in the prioritization of responses to specific resource threats.

The report also stressed a broad definition of “cultural resources” to include not only structures, landscapes, and museum collections, but “all the resources necessary to sustain a way of life.”¹³ By this time, the Park Service had recognized that many natural areas were also cultural landscapes: that is, they held specific meanings for, or had been shaped by, particular cultural groups. The PWR’s definition went further. It suggested that cultural landscapes were also dynamic, meaning that past and present cultural uses were deeply linked to ecological processes. This interpretation blurred the line between natural and cultural resources and suggested that preserving or restoring ecological function would, in many parks, also require close attention to cultural knowledge and cultural uses of natural resources.

This idea has been considered in the development of management strategies in the Pacific Island Network. At a 2009 workshop in Honolulu, Hawai’i Pualani

Kanahele of the Edith Kanaka'ole Foundation spoke about native Hawaiian conceptions of environmental change. In contrast to western science, which has only begun to view change rather than stability as the basic condition of the environment, Hawaiians have traditionally understood their embeddedness in an impermanent landscape that arose from fire but will eventually erode back into the sea.¹⁴ At the workshop, discussions centered on how the Park Service might incorporate traditional Hawaiian methods of adapting to environmental change when crafting management responses to climate change in Hawaiian parks.

One lesson of this history is that climate change has and will continue to demand a creative approach to protecting, managing, and interpreting natural and cultural resources. This involves more than simply greater attention to the latest developments in the natural sciences. Policies to protect and manage park resources in light of climate change can also benefit from attention to culture and history. This is important not only because climate change threatens specific historical sites and structures, but because efforts to preserve or restore park environments invariably involve questions about social values, politics, and the cultural significance of dynamic ecosystems.

Greater collaboration between natural and cultural resources staff will continue to be an essential component of the Park Service's response to climate change.

Breaking down the division of labor between the two programs may prove to be a difficult task, but it is not impossible. The Park Service has adjusted its management philosophies in response to new resource threats, new social values, new political pressures, and new developments in science and history many times in the past. Through a cooperative, inter-disciplinary approach to climate change, the agency can continue to fulfill its core mission to protect the nation's most important natural and cultural resources.

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Hawaiians have traditionally understood their embeddedness in an impermanent landscape that arose from fire but will eventually erode back into the sea. Here, Masons at Kaloko-Honokohau NHP work to prevent the Kaloko Fishpond wall from washing back into the sea.

Photo: Courtesy Kaloko-Honokohau National Historical Park

What Happens When the Rains Don't Come?

Climate Change, Southwest Migrations, and Where We Go From Here

Rory P. Gauthier, Jamie A. Civitello, and Craig D. Allen

Droughts are a common theme in the Southwest. In the recent past the most severe drought on record occurred in the 1950s and, more recently, the second driest year on record was in 2002. In both cases, these severe climatic episodes caused profound changes in southwestern landscapes. The 1950s drought affected the distribution of Ponderosa Pine, which died at the lower, drier portions of their range, and, in effect, pushed the average tree distribution higher in elevation. The drought in 2002 killed many trees, shrubs, and even grasses, including about 95 percent of mature Piñon trees in Bandelier National Monument. Researchers believe the difference between the 1950s drought and the most recent drought that caused a widespread tree die-off was temperature – an increase of a mere 1.5 degrees F amplified the water stress and bark beetle populations, killing nearly all local mature Piñon trees (even though most had survived the earlier and more severe 1950s drought) and a great many of the Ponderosa Pine, Douglas-Fir, and White Fir trees in Bandelier. This is an example of one of the effects of climate variability and change that we all have experienced.

Are these examples unique? Yes and no. Our modern climate records only document the last 130 years. However, climate histories based on tree-ring studies, going back over 2,000 years, have documented a number of severe droughts, some of which were longer and drier than the recent droughts of the historic record. What the climate researchers like to point out to us now is that the temperature is increasing, it is projected that climate will continue to get drier, and there are a lot more people living in the Southwest. These predicted climate trends should make us reflect on our future locally and globally.

People have been living in the Southwest for at least 12,000 years. The earliest populations witnessed a major drying trend beginning at the end of the Pleistocene that continued until approximately 6,000 years ago, when climate and the distribution of vegetation roughly assumed today's pat-

tern. These early hunting-gathering populations did not appear to be greatly affected by the vagaries of weather – population is believed to have only gradually increased over a span of 6,000 to 7,000 years. Only after people began to rely on agriculture for a large part of their diet did climate become a major player in understanding the distribution and movement of people across the Southwest.

The role climate plays in Southwest migrations was first advanced by A.E. Douglas, who is often referred to as the father of dendrochronology, the study of tree-ring growth patterns and assigning absolute dates to the tree rings. In his studies, Douglas discovered that a severe drought coincided with the movement of populations out of the Four Corners region. He reasoned that these Pueblo populations were heavily dependent on farming and the “great drought” of 1276 CE was the causal factor behind this abandonment. This was a very important break-through and subsequent archeologists began to use climate, drought, and favorable wet years,



Dead Alligator Juniper killed in the 1950s drought. Note thinning in the area to reduce tree density and to encourage grass and forb regeneration.

Photo: Courtesy Bandelier National Monument

all determined by tree-ring studies, to explain distribution of early farmers across the southwest. These explanations not only include out-migrations but also colonization of new areas.

Recent explanations of Southwest migrations have become more complex. These arguments now include discussions of moisture seasonality (i.e., winter-dominant moisture regimes or summer-dominant moisture regimes), water table elevations, arroyo down-cutting, and cumulative effects such as soil exhaustion, to name a few variables. Social unrest, violence, and warfare have also become the focus of recent migration theories. Most archeologists still contend, however, that a lack of moisture was the main culprit for making people leave their homes, while these other variables were related to, or amplified the effects of drought.

Pueblo history also documents movement and migrations as the result of climate. A translation of verse from Santa Clara Pueblo touches on many of the topics we are pursuing here:

Long ago in the north
Lies the road of emergence!
Yonder our ancestors live,
Yonder we take our being
Yet now we come southwards.
For cloud flowers blossom here
Here the lightning flashes,
Rain water here is falling!
(Santa Clara Turtle Dance song, collected by Elsie C. Parsons, 1925)¹

This translation states that they originally came from the north and that is where their ancestors live. It covers a migration (Yet now we come southwards), most likely a description of leaving an area in the north (the Four Corners region during the late 1200s?). And the reason for moving to the south is because that is where the rain is (cloud flowers = summer thunderhead clouds).

Another theme in Southwest studies is the concept of “Push” and “Pull” - what are the causes that will Push a population out of a region and what will Pull migrants to settle in a new territory? Again, these discussions rely heavily on climate as a causal factor. For example, we know there was a drought in the Chaco region in the early to mid-1100s and this drought is often used to explain the cessation of building activity and a decline in population throughout the Chaco region. What is not clearly understood is why Chaco society had withstood earlier droughts of equal magnitude

and continued to build great houses with the population remaining intact. What changed Chaco society this time? Some explanations now add in the concept of political processes such as a ruling class making decisions for people to move to new areas like Aztec or Salmon. These decisions were in response to climate change and are manifested in the archeological record as abandonment or the establishment of new settlements in areas promising agricultural success.

Perhaps the most famous drought-induced migration (often referred to as the “Great Drought”) is usually cited as the reason for the movement out of Mesa Verde, Montezuma Valley, and all of the population centers in the Four Corners region. Again, like Chaco, this region had already weathered bad droughts and had not moved but, by 1300, everyone moved out - in the midst of a rather severe drought. As this region was declining in population, the Bandelier area/Pajarito Plateau and the Chama Valley regions were experiencing tremendous population growth. Even though this northern Rio Grande region was in drought too, these areas are somewhat higher in elevation and, as one goes up in elevation, there is more precipitation as a result of orographic uplift. In addition, there is more reliable summer monsoonal moisture as one moves southeast from the Four Corners area. Similar migrations to higher elevation areas during this time are evident in the Zuni highlands and Acoma/Cebolleta Mesa areas. The out migrations from the Four Corners region to the highlands around New Mexico are excellent examples of the Push – Pull concept.

What about the Southwest today? Climate models are not kind to the Southwest. Nearly all models of future climate predict sub-tropical areas such as New Mexico, Arizona, and northern Mexico will get drier and warmer. Projected changes in precipitation patterns will push the Sonoran and Chihuahuan deserts pole-ward (north) and this pattern will also occur in the same latitudes worldwide. With these changes, there likely will be increases in catastrophic wildfires, forest die-off, big changes in vegetative composition, and associated increases in erosion. A region already characterized by drought and temperature extremes will become even more extreme.

Current vegetative species will become stressed and plant distributions will be in transition. Unlike human and animal populations, trees will have difficulty in migrat-

ing to new, sustainable areas. Forest die-off along with wildfires will impact many of the Southwest’s watersheds, further affecting water within an already water-stressed region. Sustainability of the Southwest for current human populations may not continue, since many believe that there will not be enough water to maintain Southwestern population levels at today’s numbers. Will we again see climate cause future migrations out of this region?

The treasures of Chaco, Mesa Verde, Bandelier, and thousands of other sites throughout the Southwest are projected to be affected by major climate change in this century. Wildfires can and will damage cultural resources if not made resistant to fire effects. Cultural landscapes will be greatly altered unless vegetation is made more resilient to climate change. Erosion will impact both cultural landscapes and archeological sites.

There are projects underway to address these concerns. Heavy, hazardous fuels are being removed from archeological sites

situated in areas that historically burned on an average of ten years or less. Today, many have not burned in over a century and are now loaded with hazard fuels. The same situation exists in many of our cultural landscapes. Some of these areas are being mechanically thinned to reduce tree density, making more moisture available for the remaining trees and for the soil-stabilizing herbaceous and grass ground cover – in effect, making the landscape more resilient to the extended periods of drought and heat that we can expect in the future.

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Drought-killed Piñon impacting archeological site in the Bandelier region. Fallen trees not only damage fabric but add to hazard fuel loading on the site. Photo: Courtesy Bandelier National Monument

Climate Change and Historic Structures:

The Curious Case of the West Sanctuary Window

Jeremy M. Moss

The past year has been an interesting time at Tumacácori National Historical Park (NHP). Two major rainfall events within one year resulted in damage to our primary resource, the Franciscan church of San Jose de Tumacácori. This 200-year old adobe church is the primary resource for which Tumacácori NM was established in 1908. In the early winter of 2010, Tumacácori received almost 4 inches of rainfall over four days. On January 22, a hole formed around the west window exterior of the sanctuary. Over a ton of adobes and two window lintels were lost (Figure 1). Following monsoon season in 2010, a large portion of the north wall of the sacristy collapsed and is presently in repair (Figure 2). The two repairs required the replacement of over 500 hundred adobes, a third of which were historic fabric.

Climate Change in Action?

In the current climate of global warming awareness, the initial reaction to these rainfall events may be to ask if the damage to the building is from a change in weather

patterns or an increase in rainfall intensity attributable to global warming. It amazed me how many people asked whether the problem was associated with climate change! This reaction makes sense because large rainfall events in January are atypical for winter in the last decade, and global-warming-induced climate change is a very hot topic. However, I chose to first analyze cause and effect and weigh the variables that could have resulted in such significant losses of historic fabric. So was it just a fluke rainfall event in the winter of 2010 that caused so much damage to the west window? Or is it the beginning of a new, more variable weather pattern associated with climate change?

Buzz phrases and hot topics come and go, but climate change and global warming will continue to be topics of concern for resource managers. Some resource managers are thinking about how climate change may effect, or is already affecting, park resources. Wildlife biologists and ecologists have been studying and predicting the effects of climate change on animals, plants, and ecosystems for decades. However, cultural resource managers have just begun thinking about the effects of global warming and climate change on archeological sites and historic structures. Cultural resource management is behind the biological/ecological sciences when it comes to understanding

the connection between climate change and park resources. How do we determine if loss/erosion/damage is from climate change? This question is a little loaded. In the Tumacácori example although the rainfall event resulted, at least partially, in damage to our primary historic resource, the event itself was not climate change. The scale of climate change is much larger than any one rainfall event and an understanding of the local environment is crucial.

Predicting Precipitation in the American Southwest and at Tumacácori

The connections among large rainfall events, on-going climate change, and the predicted effects of global warming must be analyzed to place the recent destructive events at Tumacácori into a larger context. Past climate patterns and scientific models predicting effects of global warming are useful for establishing this context.

Overall, the Earth has heated 1.5 degrees F in the last one hundred years.¹ The American Southwest is warming more rapidly than any other area. Scientists have developed predictive models for temperature and precipitation to understand the effects of continued global warming on the Earth's environment.² There are many climate change models for the Southwest and, although some differ, there are commonalities. Models suggest that global warming in the Southwest will result in a reduction in spring precipitation, declines in snowpack and overall more rain than snow, with drier winters. Precipitation models show a 5% decline in precipitation in the greater Southwest,³ with the largest decrease of 10% occurring in southern Arizona.⁴ Some models indicate that precipitation in the Southwest could increase in the summer, and rainfall events will be more intense, but there will be longer dry spells.⁵

Other models show a northerly shift in precipitation during the summer due to changes in atmospheric circulation patterns (Hadley Cells) with increased surface temperatures.⁶ Although increased temperature and humidity could result in an enhanced El Niño effect, the northern shift of the jet stream due to expanding Hadley Cells could leave the southern part of the Southwest very dry. Climate change models for the southern half of the Southwest show overall more aridity, less rainfall, and temperature increases by as much as 10 degrees F by 2100.⁷ Rainfall may be less predictable and more intense.⁸ All precipitation scenarios must be considered since climate change models only predict



Figure 1: West sanctuary window, exterior 2010.
Photo: Courtesy Tumacácori National Historical Park



Figure 2: Sacristy, north wall exterior collapse, 2010.

Photo: Courtesy Tumacácori National Historical Park

precipitation correctly 50-60% of the time. Data from the rain gauge at Tumacácori NHP show that the January 2010 rainfall event was large, on par with the largest summer monsoon storms of 2010 (Figure 3). The average rainfall in the last 30 years for January is .05 inches, so the 2010 winter event that damaged the sanctuary window appears to be an outlier (~4 inches). Winter rains of this magnitude occur once or twice within a decade. The collapse of the north sacristy wall occurred after 6 inches fell between late July and early August, but overall rainfall during monsoon season was fairly normal in 2010.

How do we place the January rainfall at Tumacácori within the larger context of climate change in the Southwest? Arizona's precipitation in the last 60 years has been dominated by El Niño patterns. In winter of 2010, southern Arizona received greater than normal rainfall. However, the record of precipitation in AZ suggests that large January rainfall events occur occasionally and could be part of decadal oscillations in El Niño patterns. The association between global warming, or climate change, and unusual rainfall events at Tumacácori seems tenuous at best.

Towards Determining Causality

Plants and animals adapt and change their behavior in response to climate param-

eters, therefore causality may be easier to determine when studying natural systems. Compared to biological systems, buildings are static and do not adapt to climate changes without human intervention. The materials used in building construction do react to environmental factors through alterations of chemical and physical properties; but the reaction involves material stress dynamics and expansion/contraction of chemical bonds, which eventually lead to deterioration. Changes in the environment, including increased precipitation, humidity, and temperature, can result in accelerated deterioration, especially with salt dissolution/recrystallization and freeze/thaw cycles. The stresses causing deterioration relate to the inherent properties of the materials and changes in the local environment. The nature of the building materials and the chemical bonds must be understood to interpret whether increased deterioration is associated with changes in the environment. In reality, to determine cause and effect, all variables must be considered including material constraints, preservation treatment histories, preservation maintenance backlogs, and the overall condition or problem areas of the building. Perhaps monitoring and management played the primary role in the recent losses at Tumacácori and climate change was not the ultimate cause.

Intense rainfall events are rarely so ex-

trema that they are the ultimate cause of damage, but they can provide the erosive energy to cross a threshold or increase the kinetic decay rate of materials. Large storms can expose weaknesses in materials due to preservation treatment techniques or inadequate management. This could be the case with the west window collapse. In July 2009, water began to leak through the sanctuary window, causing mud drip stains on the interior plaster below. The large amount of old mud staining below the window shows that this was not the first time water leaked through the window. The interior window lintels are severely rotted from water and insect damage. The adobes surrounding the window had been wet previously and bonds started to breakdown long before July, 2009. When the sky opened up and dropped over 3 inches in January 2010, previous leaks had already weakened the area. Therefore, the rainfall event did not ultimately cause the collapse but provided the erosional energy necessary to further breakdown the chemical bonds between the adobes, mud mortar, and lime plaster, thus increasing the degradation process in a previously weakened area.

Many of our structures have old repairs or problem areas that have not been adequately resolved and large rain fall events often bring them to our attention. There are a lot of old problem areas for a resource like the Tumacácori church, which has received preservation treatments for over 100 years. Many of these treatments fixed the symptoms, not the causes. Proper water drainage is important for conserving earthen architecture, and repeated leaks indicate drainage problems. To detect drainage problems, monitoring must be both proactive and reactive. It is necessary to observe how water drains off and near the structure during rainfall events. At Tumacácori, the removal of original canales has resulted in a drainage pattern that is more likely to cause leaks around the windows and behind plaster as water flows over the corbels and onto wall faces. Monitoring during and after rainfall events can help determine drainage patterns and where water is entering the building or getting behind plaster. Treatment recommendations can be developed that react to how the building sheds water.

Monitoring is an important part of resource management, but it only works if we follow through with monitoring recommendations before large destructive weather events. Erosion happens at the

intersection between our management actions and natural forces, and rarely solely due to single weather events. We missed the signs, our monitoring/maintenance schedule was inadequate, or we are still fixing the symptoms and not the causes. The drainage issues above the sanctuary window and the north wall of the sacristy have not been fully resolved but appear to relate to the removal of the original canale system.

After analyzing climate change and preservation histories, it's clear that other factors contributed to the collapses at Tumacácori. Although the damage cannot be directly attributed to climate change, the analysis process raised some questions. Are enough cultural resource managers looking for connections between loss of historic fabric and global warming? How can we improve monitoring to understand whether our resources are being impacted by climate change? Unlike animal and plant populations, most of the NPS historic and prehistoric structures have not been monitored consistently over decades. Biologists are seeing the effect of global warming on animals and plants after decades of monitoring. The effects of climate change on cultural resources may not be as obvious as effects on natural systems. In parks with snow pack, glaciers, or lakes, or in parks along seashores, the effects are obvious and on-going. But in other geographic areas, the effects of global warming on cultural resources appear difficult to detect. This is especially true in the American Southwest since climate and precipitation have been highly variable over the last 6,000 years.

Presently, our monitoring is not multidis-

ciplinary or long-term enough to establish connections between climate change and cultural resources. I suspect we are missing some of the initial effects of climate change. Complicating attempts to determine cause-and-effect relationships between climate change and structural damage is the fact that many of our structures have not been adequately maintained and we really don't understand the full range of variables we should be studying. More materials testing and micro-analysis are needed to understand how global warming affects the slow decay of materials through biological/microbial action, changes in temperature and humidity, freeze-thaw cycles, and the efflorescence of salts.

Two crucial tasks need to be accomplished to address the problem. First, cultural resource managers need to work more with climatologists and environmental scientists to develop and understand local climate change models and climatological/biological effects on cultural resources. We may find it difficult to detect changes when they occur if we are not working with other scientists-- not all changes are going to be extreme or immediately noticeable. Monitoring schedules often revolve around catching problem areas before the major rainy season(s); but if established weather patterns become more variable and rainy seasons less distinct, our monitoring schedules will need to be changed or perhaps be more fluid. We also need to work more with the material sciences to understand how global warming could accelerate the break down of materials in our historic structures. Second, scenario planning is needed so managers can identify strategies

for monitoring and protecting or salvaging cultural resources in many circumstances. Planning for various outcomes and more frequent condition monitoring is needed, especially in the Southwest where precipitation variability is the norm and global warming models suggest increased precipitation variability in the future.

UNESCO advocates scenario planning so that managers consider how they would react to any change in the natural environment.⁹ Plans can range from shelters to relocation of historic structures. Increased precipitation and temperature variability will require the NPS to have a flexible team of masons and historic preservation specialists that can assist parks with limited staff. At most of our parks, we have long-established schedules for hiring seasonal preservation workers and for conducting preservation treatments. We have to think about how we can be more flexible in the future because we may be caught off-guard more often. Proactive preservation may become more difficult if we do not work with environmental scientists to develop monitoring thresholds specific to our local climate, that when crossed, result in preservation schedule adjustments or the development of new treatments.

Scenario Planning at Tumacácori

Scenario planning should include an assessment of how particular building materials may react to changes in the environment. The mission church is made up of different materials that can have unique reactions to changes in the environment. To understand a small aspect of scenario planning related to Tumacácori, I would

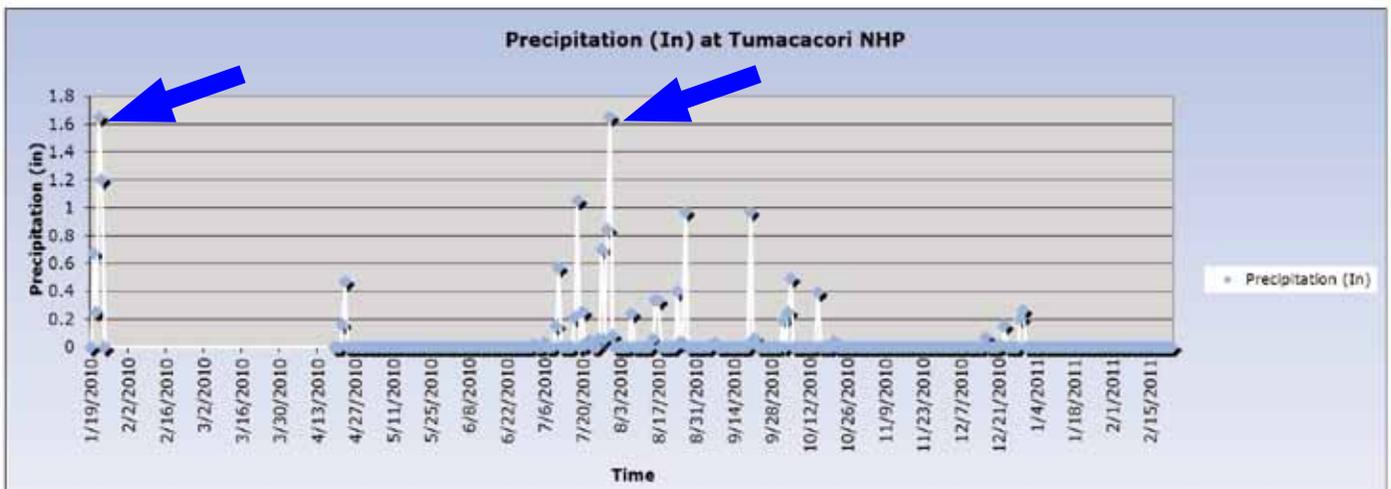


Figure 3: Precipitation (in) from the NOAA rain gauge at Tumacácori NHP (2010-2011). Arrows show precipitation received during loss of adobes around the sanctuary window and from the north wall of the sacristy. Note the lack of rainfall in winter 2011 due to La Niña effect.



The mission church of San Jose de Tumacácori seen from the east.

Photo: Randall Skeirik

like to discuss the influence that increased temperature and/or humidity could have on the degradation of original fabric. More specifically, what would happen to original gypsum plasters if Tumacácori saw an increase or change in humidity or temperature?

The amount and rate of degradation depends on the primary binders in the building material and the environmental conditions. The interaction between building materials and the environment determines the types and rates of chemical changes. Water and porosity are generally the primary parameters affecting the speed of degradation of earthen or stone materials.¹⁰ The relationship among water, salts, and pore space is most important with earthen materials. The amount of water present in the air or ground or from rainfall, and the amount of pore space in the material affect the chemical and mechanical behavior of the material. A general increase in temperature could result in increased relative humidity (RH) and would affect the absorption of water and the efflorescence of salts. Increased variability in temperature and humidity could change cycles of condensa-

tion/evaporation and create new patterns of water transport through the structure and new freeze/thaw cycles.

Changes in water content can activate chemical processes and increase mechanical breakdown. One way this occurs is in salt weathering, when recrystallization of mobile salts in pores increases the fracturing of binders. Salt weathering is currently a big problem at Tumacácori and new areas of salt damage can be expected if environmental changes create new moisture circulation patterns, especially in areas where synthetic fixatives were used in the past.

If the climate is overall drier, low humidity may also be a problem, especially concerning gypsum-based mortars and plasters. Low humidity coupled with high temperature can cause gypsum-based plaster to dehydrate and breakdown¹¹ (at > 30 degrees C and < 30% RH). The final painted layer of the original plaster at Tumacácori is gypsum. Increased humidity or temperature (and low RH) could result in accelerated degradation of the painted gypsum plaster in the interior, especially in the sanctuary and cupola.

The scenario I am considering is increased degradation of painted gypsum plaster due to changes in the environment (either more humidity or higher temperatures), perhaps attributable to global warming. First, we need to build a monitoring program focused on detecting environmental changes. We also need to develop a material testing program and a salts and moisture mapping program that allows us to assess rate, location, and type of degradation to gypsum plasters.

Our program would need to start monitoring well before the changes occur. This is a problem of scale and timing. It is difficult to know if we are starting early enough to detect change or if we are already within a transition period climatically. We would need to monitor environmental variables and analyze the building materials frequently and multiple times of the year to determine normal seasonal or diurnal variability. Second, we would need to analyze whether our established treatment protocols need to be adjusted. Do we need to use different conservation materials due to increased temperature or humidity? This would entail a testing program with long-

term monitoring of test areas. To carry out this program would require long-term planning and follow-through on a scale surpassing our present efforts. The program would need to evolve over decades and collect comparable data sets.

Monitoring and mapping of moisture, heat, and salts in the walls and plaster could be done using thermography, scanning electron microscopy, multi-spectral imaging or resistivity. Condition assessments and material analysis can confirm problem areas. If we determine that the gypsum plaster has crossed a critical threshold due to increased humidity or temperature variability, there are a few possible solutions. Climate control could slow erosion but may not be feasible. Working with conservation scientists, plaster treatments that slow dehydration would need to be developed. If degradation cannot be slowed, then documentation using laser imaging technologies could be used to record details before total loss. The solution depends on the correct determination of the cause, which requires long-term study. The point is that scenario testing needs to be detailed and specific to materials and be applied to various scales (micro vs. macro analysis).

Conclusion

The events at Tumacácori raised important questions concerning the connection between climate change and cultural resources. The loss of fabric around the west sanctuary window following the winter rains of 2010 was not due solely to rainfall or global warming, but the exercise of analyzing cause and effect was valuable for thinking about cultural resource management in the context of climate change. It's clear that cultural resource managers need to work with interdisciplinary teams to better understand climate change models and plan for uncertain futures. Without this team approach we may misinterpret or fail to notice the effects of climate change. The future lies in developing long-term multidisciplinary research teams that monitor and react to climate change. We need scenario planning that considers the effects on and responses of building materials and building systems to different climate change models. The first step should be developing our environmental monitoring systems and understanding temperature and humidity thresholds specific to the materials that comprise our historic and prehistoric structures.

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Climate Change and the Deterioration Of Cultural Resources: *El Morro And El Malpais National Monuments In West-Central New Mexico*

Steven M. Baumann and James W. Kendrick

INTRODUCTION

The Vanishing Treasures Program at El Malpais, El Morro, and Petrified Forest began between 1999 and 2000. The three-park program established permanent VT staff at El Morro and El Malpais, who also assist Petrified Forest with VT projects. Over the past 11 to 12 years, the VT Program at these parks has conducted numerous projects focused on examining or improving the condition of cultural resources. Staff members, as well, have been visiting the parks for many years prior to the establishment of the VT Program, providing a basic idea of the condition of these resources over the past generation. As we discuss in this article, deterioration of certain types of cultural resources, such as the historic inscriptions of El Morro, has accelerated rapidly in the past 20 years or so. We know this from formal condition assessment projects and from our own anecdotal observations made over many years. Can we demonstrate that this deterioration is caused by climate change? Not definitively, because correlation of these conditions with our recognition of climate change does not necessarily indicate a causal role. We present two compelling narratives, however, of changes to cultural resources at El Morro and El Malpais that may indeed be the result of a changing climate. These narratives are discussed in the context of paleoclimatic data discerned from the tree-ring records of El Malpais.

CLIMATIC EFFECTS ON CULTURAL RESOURCES AT EL MALPAIS AND EL MORRO NATIONAL MONUMENTS

El Malpais and El Morro National Monuments are both located in Cibola County, New Mexico, and are co-managed by the National Park Service. Located between the Pueblos of Acoma and Zuni, and neighboring the Navajo Nation, El Malpais and El Morro have long histories and extensive Vanishing Treasures resources.

El Malpais National Monument

El Malpais National Monument was established on the last day of 1987 and encom-

passes nearly 115,000 acres in west-central New Mexico. The monument was created to protect the cultural and natural resources associated with the extensive lava flows and volcanic features that are found south of the small town of Grants and just west of the Pueblo of Acoma. In this location, we find a fascinating archeological record associated with the volcanic landscape and the sandstone mesas and mountain ranges that border it. Typical of this region, El Malpais contains a Chaco-style great house and great kiva, smaller pueblos, field houses, prehistoric reservoirs, and petroglyphs, most of which date between the AD 800s and 1200s. What is fascinating about the archeology here, however, is that these sites, representative of ancient communities, are also associated with a unique suite of site types associated with the lava flows. We have, for example, discovered archeological resources in lava tubes that contain ice year round and prehistoric trail systems that contain elaborately constructed bridges, shrines, cairns, and even basalt pavement in places.

One of the truly globally significant resources of El Malpais, however, is one that you typically would not even notice: the old-age conifers and dead-and-down timbers. Due to the extremely rugged nature of the landscape, many areas have never been logged. The landscape also protects many of the old trees from damaging fires. El Malpais, for example, contains the oldest living Douglas-fir known. When these long-lived conifers die and fall, they fall on basalt rather than soil and they are slow to decay. As with any such resource, world-class scholars have studied them. El Malpais' tree-ring chronology has been created through studies combining analyses of both the old-age conifers and the dead-and-down timbers (Grissino-Mayer et al. 1997). Paleoclimatic data have been discerned from the tree-rings and models have been constructed that estimate the amount of precipitation in any given year. For El Malpais, we can extend this precipitation record back to 136 BC. In fact, it is the longest tree-ring chronology in the American Southwest. The tree-rings of El Malpais, then, give us an exceptional look at how cyclic is the climate of this region of New Mexico.

Dendroclimatology of El Malpais

Dendroclimatic research focused on El Malpais' extensive tree-ring record has been, in large part, led by Dr. Henri Grissino-Mayer of the University of Tennessee.

Grissino-Mayer conducted his dissertation research at El Malpais as a graduate student at the University of Arizona and continues to conduct and guide graduate research in this area from Knoxville. Grissino-Mayer et al. (1997) modeled past annual precipitation in El Malpais from the early 1990s to 136 BC. Their reconstruction accurately identified the severe droughts of the middle 1100s and the late 1200s (which contributed to the end of the Pueblo II and III periods, respectively). Not surprisingly, their data also indicated that this area of the Southwest has experienced cycles of both above and below normal precipitation. What is interesting, however, is that the longest-term wet period began around 1800 and continued into the late 1990s. What's more is that the wettest period in the past 2100 years occurred from the late 1970s to the early 1990s (Grissino-Mayer et al. 1997).

Could this wettest period known for the past 2100 years be the result of climate change? We know that warm air can hold more moisture, and increasing "greenhouse" gases such as carbon dioxide are contributing to a warmer climate. Increased carbon dioxide levels in the air began with the industrial revolution and have increased rapidly since that time. Kennedy (2009) notes that atmospheric carbon dioxide levels have increased 38 percent in the past 150 years, to a level "higher than the highest value measured for over the previous 800,000 years."

It's not surprising, then, that 2010 tied for the warmest year on record, according to the National Oceanic and Atmospheric Administration. The tree-rings of El Malpais are sensitive to these climatic changes. Tree-rings across the southern Colorado Plateau, in fact, have recorded similar changes. Salzer and Kipfmüller (2005), for example, identified from tree-ring records a warm/wet period for the southern Colorado Plateau beginning around 1976 that they say is "unprecedented in [the past 1,425 years] both in amplitude and duration."

So, how is this warmer/wetter period affecting cultural resources in El Malpais and El Morro? Below, we discuss two very different types of cultural resources: ice caves in El Malpais and Inscription Rock at El Morro.

Rusty Barrel Ice Cave

Rusty Barrel Ice Cave is located in the west-central portion of El Malpais, in a



Figure 1a: View into Rusty Barrel Cave in the 1980s (left) showing the year-round ice. The same area seen in 2007 (right) shows that the ice is completely gone.

Photos: Courtesy El Malpais National Monument

rugged area known as the Classic Cave System. It is named after fragments of old barrels that can be found near the entrance of the cave or lava tube. Some speculate that moonshine was being made here during Prohibition. It would have been well hidden among the Ponderosa-forested lava flows in this area of the monument. Aside from this interesting period in its history, Rusty Barrel Ice Cave contains an impressive ceramic artifact assemblage dating to

the late Pueblo II period (AD 1050-1150, also known as the Chaco Era). Numerous decorated jar fragments can be found across the floor of the cave. Thick deposits of charcoal and burned wood can also be found throughout the cave, suggesting that the ice resources of the cave were being melted and the water was collected in jars. Ice forms and accumulates in the lava tubes from the combination of precipitation and cold air drainage into the tubes. In lava tubes that contain ice year round, annual

The assemblage in Rusty Barrel Ice Cave may be informing us about the effects of climate change on cave resources (all of which are considered cultural resources, including the ice). Sandia Grotto, a local caving society, has partnered with El Malpais for many years to monitor the cave. Back in the 1980s, Sandia Grotto photographed the entrance of the cave (Figures 1a & 1b), and documented that it was nearly full of ice. Today, all of this ice has melted and remains only in the bottommost (and therefore coldest) portion of the cave. It is clear, then, that temperatures within Rusty Barrel since the late 1980s have exceeded freezing and have not allowed ice to remain throughout any given year. Increasing summer precipitation, too, can cause

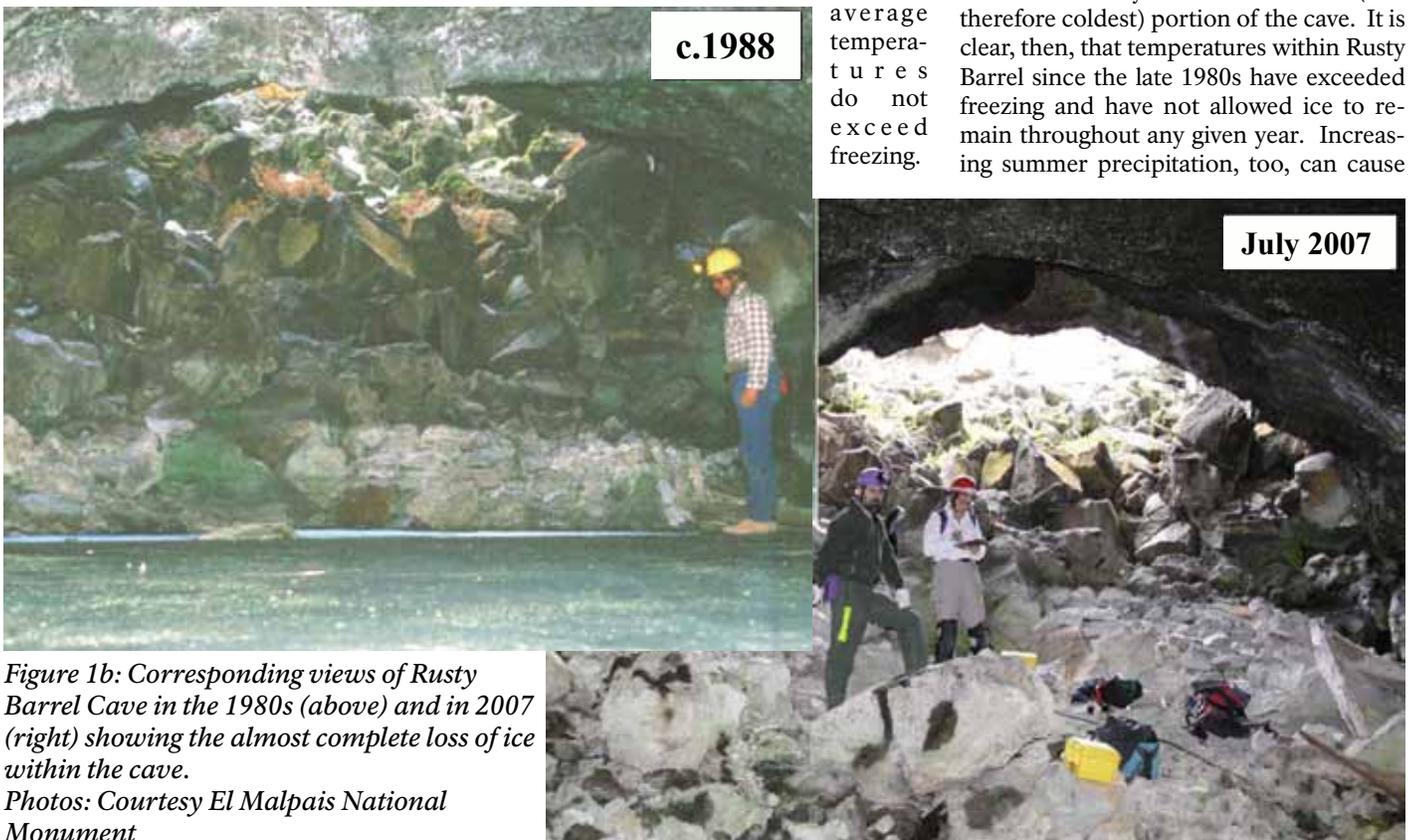


Figure 1b: Corresponding views of Rusty Barrel Cave in the 1980s (above) and in 2007 (right) showing the almost complete loss of ice within the cave.

Photos: Courtesy El Malpais National Monument

average temperatures do not exceed freezing.

ice ablation (Dickfoss et al. 1997).

The archeological record suggests intensive use of the ice resources over 800 years ago in this cave, indicating a high volume of ice at that time. Our records from just 20 years ago indicate that ice levels were very high. Yet, today the ice is essentially gone. Clearly, temperatures throughout the year in this location are now exceeding freezing and not allowing the ice to remain frozen and accumulate annually.

El Morro National Monument

El Morro was the nation's second national monument, proclaimed under the Antiquities Act by Theodore Roosevelt on December 8, 1906. It was established to preserve and protect Inscription Rock, its historic inscriptions and archeological sites. Additions to the monument in 1917 and 1950 enlarged El Morro to its current 1,276 acres and extended protection to many more archeological sites. These legislative achievements preserved El Morro's cultural landscape as well as its distinctive natural setting: a classic *cuesta* with sandstone cliffs that rise 200 feet above the valley floor, concealing a box canyon and plunge pool. Visitors can stand almost anywhere in this landscape and get a sense of history that is perhaps unparalleled in the Southwest. Petroglyphs, pictographs, and over 2,500 inscriptions dating from the early 1600s to the early 1900s have been documented on Inscription Rock. The earliest known Spanish inscriptions in the United States, beginning with Governor Juan de Oñate recording his travels in 1605, are on Inscription Rock. Subsequent Span-

ish, Mexican, and American travelers also carved their names on the cliffs. For over 300 years, then, El Morro has been a passive participant in the history of the Southwest, documenting the passing of explorers, soldiers, and travelers.

Archeological sites from the Pueblo III through Pueblo IV periods (A.D. 1200s to late 1300s) are found throughout the monument and include pueblos, field houses, cultural material scatters, water control features, and hand-toe trails pecked into the sandstone cliffs. Prominent among El Morro's pre-contact sites are the contemporaneous pueblos of Atsinna and North Atsinna atop Inscription Rock. The pueblos occupy an imposing position on the edge of the escarpment overlooking the El Morro Valley. Atsinna is the larger pueblo, with an estimated 900 rooms, compared to North Atsinna's 180 rooms. Archeological excavations conducted at Atsinna between 1954 and 1961 opened 16 rooms, a circular great kiva, and a large rectangular kiva. The exposed walls offer visitors a glimpse of 14th-century pueblo architecture and are the focus of Vanishing Treasures preservation activities at the site.

Assessing Loss at Inscription Rock

Efforts to preserve and protect El Morro's inscriptions go back to the mid-1920s and may represent the earliest such efforts in New Mexico. Weather is by far the greatest threat to the inscriptions. The mechanics of weathering and its impacts on the inscriptions are just beginning to be understood, however. Though weathering of the inscriptions appears to be a slow and

incremental process, recent climatic trends at El Morro suggest otherwise. The pace of erosion at the North Point of Inscription Rock provides compelling evidence for the rapid loss of inscriptions that may have been brought on by the wettest period at El Morro in the last 2100 years.

The North Point of Inscription Rock is a promontory that extends out toward the El Morro Valley. The top of the rock is 200 feet above the valley floor. The Point is actually at the base of the rock and stands no more than about 10 feet above the ground. Over time, erosion has had an effect on the Point: at times gradually and at times rapidly. In 1979, El Morro rangers reported a substantial loss of inscriptions at the North Point. Initially, it appeared that seven inscriptions had been lost from one panel to surface spalling, while partial losses had occurred at eight other inscriptions. Additionally, white streaks (possibly efflorescence) and cracks were found on adjacent inscription panels. A more comprehensive tally of the losses conducted in 1980, however, found that up to 15 inscriptions had been lost to weathering in 1979 (Burriss 2007). In a report documenting the damage, Supervisory Park Ranger Steve Miller attributed the loss of inscriptions to natural forces (Oliver and Padgett 2005). His photographs of the damage seemed to support this conclusion. Where the inscriptions had been, the photographs showed a newly exposed rock surface that was very damp from moisture. This singular loss of inscriptions in 1979 is noteworthy because the event occurred during the period between the late 1970s and the early



Figure 2: As part of the Inscription Preservation Project at El Morro, historic and contemporary photographs are compared to identify areas where inscriptions are being lost. Here a photo from 2006 (right) clearly shows deterioration on the face of the sandstone bluff when compared to a photo from 1994 (left).

Photo: Courtesy El Morro National Monument

1990s, which, as recorded in El Malpais' tree-rings, had the highest rainfall of any 15-year period in over 2100 years (Grissino-Mayer et. al. (1997). Additionally, this period of above-average precipitation occurred within an even longer-term trend of above-normal precipitation beginning in 1800 and persisting through the present (Grissino-Mayer et. al. (1997).

Through the 1980s increasing concern over the rate of inscription loss and deterioration, particularly around the North Point, led to the initiation of the El Morro Inscription Preservation Project (EMIPP) in 1992 (Oliver and Padgett 2005; Burris 2007). Over the next 14 years, EMIPP conservators conducted condition assessments and monitoring at 610 inscription panels, photographing each panel and making treatment recommendations for the most at-risk inscriptions (Oliver and Padgett 2005). Their work indicated that the major impacts to inscriptions such as erosion, spalling, contour scaling, delamination, abrasion (from runoff), granular disintegration, clay wash, efflorescence and alveolar erosion can be traced to moisture in the sandstone (Burris 2007; Fix et. al. 2007; Oliver and Padgett 2005). Incremental changes to inscription panels were documented annually by the EMIPP monitoring. The results of the monitoring showed dramatic changes to the North Point Inscription panels between 1992 and 2004 (*Figure 2*).

The only known equivalent to the mass spalling of inscriptions observed at the North Point in 1979 occurred at El Morro's plunge pool after the 1940s. The plunge pool is a water-filled depression. It fills when water pours off the top of Inscription Rock. The pool has long been a reliable water source for travelers, explorers and the occupants of Atsinna and North Atsinna pueblos. A dam was built in 1926 to increase the monument's water supply and to help control erosion from runoff.

The water impoundment was substantially increased in the 1940s when a new dam was built following a rock fall that destroyed the 1926 dam. Prior to this, the volume of water was low and a sandbank surrounded the pool (Dalton 1971). Historically, the sandbank served as a platform for making inscriptions, and it probably functioned as a buffer between the water and the sandstone cliffs, helping to protect the inscriptions around the pool. The new dam raised the pool through increased retention of runoff, and many inscriptions

were lost.

Inscription losses at El Morro's North Point in 1979 and around the pool after the 1940s are related only in the sense that the sandstone at both locations became saturated, causing surface spalling and inscriptions loss. Additionally, the trend of above-normal precipitation punctuated with periods of even higher precipitation may have caused inscription losses by increasing the moisture in the rock at both locations.

Sandstone and the Mechanics of Moisture

Moisture's effect on El Morro's sandstone is a function of the structure and composition of the stone (cf. Fix et. al. 2007; Burris 2007). Inscription Rock's Jurassic Zuni Sandstone is argillaceous. A recent study of sandstone samples from the North Point found that the rock is composed of well-sorted grains of quartz and orthoclase, poorly bound by kaolinite clay (Burris 2007). The friable quality of the sandstone makes it soft and ideal for inscriptions, but this same quality also yields easily to moisture and erosion.

Nowhere on Inscription Rock is this more evident than at the North Point, where we find the highest concentration of inscriptions and the greatest loss from weathering. The potential causes of weathering to Inscription Rock are a function of the composition and matrix of the sandstone and how these are affected by precipitation, hydrology, geological faults, vegetation, microflora, insects, topography, salts, and thermal response (cf., Austin, 1992; Burris 2007; Van Dam and Hendrickx 2006; St. Clair and Knight 2001). Moreover, many of the causes are interrelated. For example, the mechanics of moisture in sandstone push salts to the surface and moisture favors the growth of microflora such as lichen.

Lichen growth, efflorescence and spalling are all a response to increased moisture. The North Point's soft sandstone appears more vulnerable to the effects of moisture than the rock around it. Vibration studies conducted at El Morro found that the North Point has a natural vibration that is different from the surrounding rock (King and King 2003). Faults and fissures behind the "block" of sandstone that forms the North Point essentially separate it from the rest of the rock around it. Though the cracks and fissures in the North Point's sandstone are only millimeters wide, they

allow precipitation to infiltrate the sandstone, transferring water from precipitation to the rock's interior (Burris 2007).

Rising Moisture from the Ground at the North Point

The possibility of a perched water table at Inscription Rock was thought to be responsible for the increased moisture levels in the sandstone around the pool and at the North Point (Burris 2007). A 2004 study of Inscription Rock's hydrology, however, concluded that a water table does not exist at the pool or North Point (Van Dam and Hendrickx 2006). The same study also concluded that the cliffs do significantly influence the moisture content of the ground around Inscription Rock, increasing the moisture in March from snowmelt and in July-September from summer rains.

Runoff supports abundant vegetation around Inscription Rock. The vegetation, in turn, helps retain moisture in the ground around the cliffs and is a factor in creating microenvironments at the cliff base (cf. Fix et. al. 2007). Thick grass and shrubs are abundant below the pool. Grass and moss grows at the base of small pour-offs all along Inscription Rock; and at the North Point, junipers shade the rock where dense colonies of lichen thrive, covering many inscriptions. Early photographs of El Morro show an abundance of grassland and few shrubland species (cf. Wheeler Survey photographs in Jurovics et. al. 2010; Schackel 1984). Where shrubland vegetation was once sparse, it is now dominant. This is particularly true around the slopes of Inscription Rock. The monument's vegetation has changed little since the 19th century, but the configuration and density of vegetation has noticeably changed due in part to the protected status of the monument (Schackel 1984).

The change in the configuration and density of the vegetation along the front of Inscription Rock also may be attributed to changes to the landscape made there in 1934. By the late 1880s, an arroyo was developing along the front of Inscription Rock below the pool. By 1916, the arroyo was reported to be 15 feet wide and 15 feet deep. In 1934 a Civil Works Association project filled the arroyo, re-contoured the ground surface and planted vegetation. The grass thrived, but the shrub vegetation did not (Schackel 1984). By the 1940s, though, the shrub growth had taken hold naturally. By the 1980s, the shrub growth and Piñon-juniper woodland had transformed the appearance of the slopes in

front of the rock. Where open grassland had been (and later an arroyo), the area now has abundant trees and shrubs. The soil where the arroyo had been holds enough water to support this now abundant vegetation (Van Dam and Hendrickx 2006).

Precipitation and Ground Moisture Effects at the North Point

In Burris's (2007) insightful study of sandstone deterioration at the North Point, she describes how moisture enters and is retained by the sandstone and how this process can deform and ultimately decay the sandstone. Precipitation flows through cracks and fissures going deep within the sandstone, and moisture from the ground rising through capillary action in the stone, combines to make the sandstone very damp. Hydric dilation is the capacity of the sandstone to absorb and swell with increased moisture and then contract as it dries. The capacity of the sandstone to absorb the moisture and deform in this way has limits. The higher the clay content of the sandstone, the greater its capacity for deformation through hydric dilation. The drying effects of wind can pull moisture from the stone through capillary action, possibly causing moisture to move through the sandstone more rapidly than other areas of Inscription Rock. The North Point, at the tip of Inscription Rock, is at a confluence of prevailing weather conditions, exposing it to the full force of prevailing wind and precipitation. Repeated cycles of wet and dry can then lead to material fatigue, deformation, and collapse (Burris 2007). With the increased precipitation beginning in late 1970s, the moisture content of the North Point's sandstone appears to have reached the point of fatigue and then collapse, causing the major loss of inscriptions in 1979.

CONCLUSIONS

The dendroclimatic record for El Malpais reveals several long-term periods of above- and below-normal precipitation. The effect of long-term, above-normal precipitation, particularly over the last 30 years, has had an impact on the ice in the caves at El Malpais and the moisture content of the sandstone at El Morro. Increased summer precipitation since the late 1970s has contributed (perhaps even more than increasing temperature) to ice ablation in Rusty Barrel ice cave and other caves in El Malpais. This same trend of increased precipitation also appears to have elevated the moisture content of the sandstone at the

North Point through rising dampness from ground moisture and runoff from precipitation that enters the rock through cracks and fissures. Our observations of changes in the condition of these resources over the last 30 years has focused on the symptoms – increased moisture, erosion, spalling, but they have not as yet established a correlation between impact events, such as inscription loss and melting ice and climate change. We have focused primarily on the gradual deterioration of inscriptions and the gradual loss of ice in some of the caves. What brings such observations to prominence are the sometimes abrupt changes to resource condition, such as the loss of inscriptions at the North Point in 1979.

These observations present a compelling case concerning direct adverse effects of climate change to the cultural resources of El Malpais and El Morro National Monuments. The nature of our observations, though, limits our ability to fully interpret the implications of climate change on these resources. Studying past climate and changing conditions of cultural resources is informative, but it will not lead to determining if climate change is directly affecting those resources. To move beyond inference, then, cultural and natural resource managers in the National Park Service and our research partners must begin to establish a more rigorous scientific approach to better understanding those effects. Explicit hypotheses and test implications must guide the next generation of research. El Morro and El Malpais National Monuments are in a perfect position, as are many parks in the Vanishing Treasures Program, to lead this new phase of study.

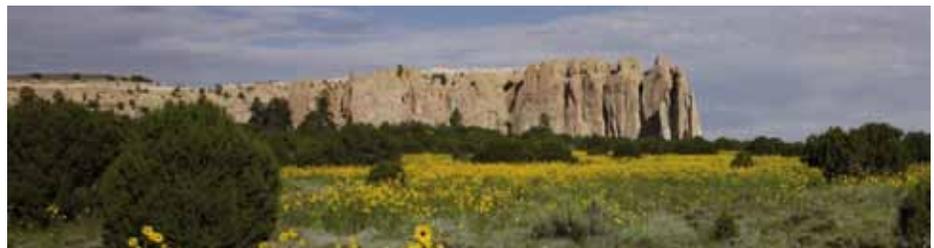
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Division at El Malpais and El Morro and serves on its management team as the key cultural resource advisor.

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*The sandstone bluff known as El Morro.
Photo: Courtesy El Morro National Monument*

Grappling with Climate Change: Impacts to Heritage Resources

Lauren Meyer

with Pei-Lin Yu, Randall Skeirik, and Virginia Salazar-Halfmoon

17th century adobe walls collapsing at Tumacácori; historic inscriptions rapidly eroding at El Morro; ancestral pueblo field houses at Bandelier impacted by significant soil erosion. Is this deterioration and loss the result of a lack of proper maintenance, a misunderstanding of the needs of fragile site materials, the cumulative effects of ‘normal’ deterioration, or the result of random and unpredictable natural events and material failures? Could any (or all) of it be related to climate change? As a cultural resource manager, climate change is a difficult matter to grapple with. Can one comfortably say that a wall collapse is the *direct* result of climate change, rather than a lack of timely maintenance? Are aging resources eroding at a *faster* rate because of gradually changing climatic conditions? With natural systems, the impacts of climate change are direct and measurable – increased air temperatures result in: ice cap and glacial shrinkage that then lead to increases in sea level; decreases in snowpack that lead to decreased river flows and lake levels; faster evaporation of terrestrial water that leads to decreases in surface water supplies; and floral and faunal habitat migration and species loss that occur due to changing conditions. The effects of these predicted climatic changes on human systems are also direct, and include impacts related to personal comfort, health, energy consumption, water usage, and general resource availability. As for cultural resources, while we have a general idea of how a changing climate could affect these non-renewable resources, there have been few studies aimed at clearly identifying risks and determining potential and actual impacts from changing conditions. As climate scientists and natural resource specialists continue to develop and present projections for changes ahead, cultural resource professionals can begin to develop strategies for response and mitigation.

What is Climate Change?

Climate refers to prevailing weather conditions over long periods of time, while weather is the state of the atmosphere, including temperature, moisture, wind velocity, and barometric pressure, at a given time in a given place. Climate change, as

defined by the Intergovernmental Council on Climate Change (IPCC), is “any change in climate over time, whether due to natural variability or as a result of human activity.”¹ While it is understood that the earth’s climate is variable, and has gone through both minor and significant shifts throughout the planet’s history, the changes documented over the last 50 years have more to do with human effects than natural cycles. The primary cause of this change is the increase in greenhouse, or heat-trapping, gases (i.e. carbon dioxide – CO₂, methane – CH₄, nitrous oxide – N₂O, and synthetic fluorinated gases such as hydrofluorocarbons) in the atmosphere. Observed global changes in climate that have resulted from the increase in greenhouse gas concentrations include increased surface and atmospheric temperatures, changes in precipitation patterns, sea level rise, ocean acidification, and an increase in extreme weather events (droughts, precipitation, wind events, etc.). In fact, the earth’s average temperature has increased by 1.5 degrees Fahrenheit (F) in the last century, with much of the warming occurring in the last 50 years.^{2,3} According to climate scientists, “Global average surface and lower-troposphere temperatures during the last three decades have been progressively warmer than all earlier decades, and the first decade of the 21st century (2000–09) was the warmest in the instrumental record.”⁴ In fact, 2009 and 2010 are included in the ten warmest years, globally, and 2010 tied 2005 as the warmest year of the global surface temperature record.^{5,6}

And the future? Obviously there is some level of uncertainty, but current climate models make use of the best, and most current data available, including plausible emissions scenarios (based on assumptions about human activity, energy use, etc.) to account for this. There is a high degree of confidence that by the end of this century: global temperatures will increase an additional 3 to 7 degrees F, with the most warming occurring over land and in the northernmost latitudes; sea levels will rise between .2 meters (m) and .5m; there will be substantial shifts in precipitation patterns; snow cover, sea ice and permafrost regions will be greatly impacted; extreme events (heat extremes, heat waves and heavy precipitation events) will increase; and tropical storm systems will intensify and move poleward.⁷ These changes will, no doubt, have serious consequences for ecosystems and human sectors throughout the world.



A wooden artifact that has been embedded and preserved in ice for centuries slowly emerges from the ice as regional temperatures rise.

Photo: Craig Lee

What are We Seeing in the Arid Southwest?

The arid Southwest is home to some of the most varied and iconic landscapes, biota, and cultural artifacts in the nation. The area encompasses the Sonoran, Chihuahuan, Mojave and Great Basin deserts, the river basins of the Colorado and the Rio Grande, and numerous mountain ranges. Elevations range from some of the highest peaks in the U.S. (including several 14,000+ foot peaks in Southern Colorado), to the lowest point in the lower 48 states (Death Valley National Park, CA). Within this landscape of extremes, unique flora and fauna, iconic geologic and hydrologic features, and ancient cultures and traditions coexist alongside massive industrial sites, and modern urban centers. These regional features exist in a harsh and challenging environment that is exceedingly dry and drought-prone, with extreme temperature fluctuations (both from day to night, and seasonally) and intense winds. Wildfire is a constant threat, as is flooding due to heavy monsoonal rains.

The Southwest is seeing a greater number of significant effects from climate change than are other parts of the United States and these effects are expected to continue. In fact, the Southwest is being included with the Arctic as one of the indicator regions for climate change. Climate projections for the Southwest are discouraging – increases in temperature (particularly summer temperatures) that will exceed the global mean; precipitation likely to fall below the annual mean; an increase in intense weather events (heat waves, flooding, etc.); northward movement of winter storm tracks and shortening of the snow season; changes in river flow; and an increase in drought frequency and duration.⁸

In the region, average annual temperatures have already increased approximately 1.5 degrees F when compared to a baseline period between 1960 and 1979. In fact, since 1976, the average annual temperature in Arizona has increased by 2.5 degrees F, and by 1.8 degrees F in New Mexico.⁹ Predictions show these average temperatures increasing an additional 4 to 10 degrees F from this baseline by the end of the century.¹⁰ Additionally, precipitation is expected to decrease by approximately 5% across the region by the end of the century (as compared to the average precipitation in the region over the last three decades).¹¹

In the last decade, the region has been subject to devastating wildfires in both urban and wildland areas as a result of changing precipitation patterns, earlier spring snowmelt, increasing temperatures, and rapid drying of vegetation; changing landscapes caused by tree mortality, invasive plants, floral and faunal species shifting their ranges, and increased erosion due to soil moisture changes and vegetation mortality; and significant flooding due to increases in extreme precipitation events and changes in soil character. In the national parks of the arid west snow-pack decreased up to 35% from 1950 to 1999 at weather stations and snow courses in 53 National Parks and other areas in the western U.S.; spring stream flow advanced by up to 8 days between 1950 and 1999; and conifer tree mortality has increased across the western U.S. by approximately 4% per century since the 1950s.¹² In fact at Bandelier National Monument and Mesa Verde National Park, drought has brought about a massive die-off of Piñon pine (*Pinus edulis*), with 90% mortality rates recorded at some sites.¹³

How does all of this relate to cultural resources?

We know from experience that the environment is the greatest threat to fragile site materials such as adobe, wood, and stone masonry. Water, wind, salts, soil chemistry, fire, floods, extreme temperatures, fluctuations in humidity, and freeze/thaw and wet/dry cycling are the primary threats to the heritage resources protected and preserved by the National Park Service (NPS). Predicted climatic changes include changes in the frequency, duration, and intensity of all of the above, and these changes, where they occur, will impact preservation planning and the active conservation of heritage sites.

Natural resource managers have been studying climate models, risk factors and

impacts of climate change to natural systems for decades. The effects of climate change on cultural resources have not received the same focus and attention and NPS cultural resources managers are currently working to develop policy, and provide leadership and support. In addition to the NPS, individuals and large heritage conservation organizations including the International Council on Monuments and Sites (ICOMOS), United Nations Educational, Scientific and Cultural Organization (UNESCO), the Getty Conservation Institute, English Heritage, and a number of European governments and non-governmental organizations are investing time and expertise into research on the potential impacts of climate change on heritage resources, and the development of strategies for adapting and responding to changing environmental conditions. Using climate models and risks identified for natu-



This rock face, containing pictographs, has spalled as a result of the heat from a wildfire.

Photo: Kevin Ryan

ral systems, actual and potential impacts to cultural resources are being identified (see Table 1). As a result of this work, it is now recognized that all types of cultural and heritage resources and values are at risk from climate-change related impacts: from archives and archeological sites to traditional cultural properties and architecture, both historic and prehistoric.

What does this mean for the physical remnants of heritage architecture in the parks of the arid west?

In the western regions of the United States, as throughout the nation and the world, architecture is a direct expression of culture, tradition, and history. Throughout much of the past, building materials, construction techniques, and architectural styles were determined by geographic location, access to locally available and abundant resources, space concepts held by the group, traditional knowledge that was passed from generation to generation, and, per-

haps most significantly, climate. This local focus brought about truly indigenous, well-adapted building traditions that are still evident throughout the world. These locally-derived building traditions had inherent characteristics that were adapted to very specific climatic conditions. For example, adobe structures with flat, mud roofs perform well in a dry climate like the Southwest, whereas structures in wetter climates require sloped roofs and more durable roofing materials to withstand more frequent rains. The preservation of the remains of locally developed building styles will likely become more difficult as the climatic conditions that these structures were designed to withstand change around them.

While it is true that many sites in the Southwest have survived hundreds of years of climatic fluctuations, much of what remains is quite fragile, and the majority of these sites remain viable only because of the priority placed on maintaining them. It is feasible that a dryer climate in the Southwest may, to some degree, have positive impacts on the preservation of the remaining archeological architecture in the region, since rainfall is a major agent in the deterioration of these structures. But changes in precipitation and wind patterns, soil characteristics, and temperature extremes will make it more difficult to predict failures, and may result in more accelerated and catastrophic losses than we have seen in the past. Additionally, preservation treatments that have worked well in the past may no longer be up to the task, or may prove counterproductive under changing weather conditions.

Preservation of vulnerable materials is difficult even in a predictable and stable environment. When conditions become unpredictable or change from the established norm, planning for long-term preservation becomes increasingly complex. In order to manage this unpredictability, cultural resource managers in the parks of the arid west must begin to think strategically about preserving these fragile materials in a future that includes climate change. Climate models can tell us what to expect in the way of temperature increases, precipitation patterns, etc. at a regional level, but down-scaling these predictions to specific locations and anticipating the implications for individual sites will require collaboration with natural resources experts who are working on the ecological aspects of this problem. Developing a better understanding of the materials that comprise

Climate Indicator	Climate Change Risk	Physical, Social, and Cultural Impacts on Cultural Heritage
Atmospheric Moisture Change	<ul style="list-style-type: none"> - Flooding (sea, river) - Intense Rainfall - Changes in Water table Levels - Changes in Soil Chemistry - Ground Water Changes - Changes in Humidity Cycles - Increase in Time of Wetness - Sea Salt Chlorides 	<ul style="list-style-type: none"> - Ph Changes to Buried Archeological Evidence - Loss of Stratigraphic Integrity caused by Cracking and Heaving from Changes in Sediment Moisture - Loss of Data Preserved in Waterlogged / Anaerobic / Anoxic Conditions - Eutrophication Accelerating Microbial Decomposition of Organics - Physical Changes to Porous Building Materials and Finishes from Rising Damp - Damage from Faulty Or Inadequate Water Disposal Systems; Historic Rainwater Goods Not Capable of Handling Heavy Rain, and Often Difficult to Access, Maintain, and Adjust - Crystallisation and Dissolution of Salts Caused by Wetting and Drying Affecting Standing Structures, Archeology, Wall Paintings, Frescos and Other Decorated Surfaces - Erosion of Inorganic and Organic Materials from Flood Waters - Biological Attack on Organic Materials by Insects, Moulds, Fungi, or Invasive Species Such As Termites - Subsoil Instability, Ground Heave, and Subsidence - Relative Humidity Cycles/Shock Causing Splitting, Cracking, Flaking ,and Dusting of Materials and Surfaces - Corrosion of Metals - Other Combined Effects e.g.: Increase in Moisture Combined with Fertilizers and Pesticides
Temperature Change	<ul style="list-style-type: none"> - Diurnal, Seasonal, Extreme Events (Heat Waves, Snow Loading) - Changes in Freeze-Thaw and Ice Storms, and Increase in Wet Frost 	<ul style="list-style-type: none"> - Deterioration of Facades from Thermal Stress - Freeze-Thaw/Frost Damage - Damage Inside Brick, Stone, and Ceramics that were Wetted then Had Water Freeze Inside - Biochemical Deterioration - Changes in 'Fitness for Purpose' of Some Structures: For Example Overheating of the Interior of Buildings Can Lead to Inappropriate Alterations to the Historic Fabric from the Introduction of Engineered Solutions - Inappropriate Adaptations to Allow Structures to Remain In Use
Sea Level Rises	<ul style="list-style-type: none"> - Coastal Flooding - Sea Water Incursion 	<ul style="list-style-type: none"> - Coastal Erosion/Loss - Intermittent Introduction of Large Masses of 'Strange' Water to the Site, Which May Disturb the Metastable Equilibrium Between Artifacts and Soil - Permanent Submersion of Low Lying Areas - Population Migration - Disruption of Communities - Loss of Rituals and Breakdown of Social Interactions
Wind	<ul style="list-style-type: none"> - Wind-Driven Rain - Wind-Transported Salt - Wind-Driven Sand - Winds, Gusts and Changes in Direction 	<ul style="list-style-type: none"> - Penetration of Moisture into Porous Cultural Heritage Materials - Static and Dynamic Loading of Historic or Archeological Structures - Structural Damage and Collapse - Deterioration of Surfaces Due to Erosion
Desertification	<ul style="list-style-type: none"> - Drought - Heat Waves - Fall in Water Table 	<ul style="list-style-type: none"> - Erosion - Salt Weathering - Impact on Health of Population - Abandonment and Collapse - Loss of Cultural Memory
Climate and Pollution Acting Together	<ul style="list-style-type: none"> - pH Precipitation - Changes in Deposition of Pollutants 	<ul style="list-style-type: none"> - Stone Recession by Dissolution Of Carbonates - Blackening of Materials - Corrosion of Metals - Influence of Bio-colonization
Climate and Biological Effects	<ul style="list-style-type: none"> - Proliferation of Invasive Species - Spread of Existing and New Species of Insects (eg. Termites) - Increase in Mould Growth - Changes to Lichen Colonies on Buildings - Decline of Original Plant Materials 	<ul style="list-style-type: none"> - Collapse of Structural Timber and Timber Finishes - Reduction in Availability of Native Species for Repair And Maintenance of Buildings - Changes in the Natural Heritage Values of Cultural Heritage Sites - Changes in Appearance of Landscapes - Transformation of Communities - Changes the Livelihood of Traditional Settlements - Changes in Family Structures as Sources of Livelihoods Become More Dispersed and Distant

Table 1: Principal climate change risks and impacts on cultural heritage resources. ¹⁵

our heritage resources, their thresholds for deterioration and failure, and the effects of our (well intentioned) preservation treatments will allow managers to look at climate models and anticipate the risks to individual sites and site components. Once these risks are identified, planning can occur that takes into account the potential for damage and loss as a result of changes in

climatic variables, whether they are temperature-, water- (precipitation amounts, extreme events, humidity, etc.), wind-, or pollution-derived.¹⁴ Because much of our preservation knowledge, especially about the fragile structures of the arid Southwest, is empirically derived, gained after decades of trial-and-error, our preparations should include the development and testing of al-

ternate preservation treatments that may be required by anticipated changes in climatic conditions.

Conclusion

At present, it is difficult to attribute deterioration and loss of architectural materials, such as the wall failures at Tumacácori, the eroding inscriptions at El Morro, and

archeological site erosion at Bandelier, to climate change. Changing conditions over the last several decades may not be the sole cause of structural failures, but they certainly have, and will continue to influence the stability and condition of the significant, yet fragile heritage sites extant in the region. Climate change is likely to exacerbate or accelerate rates of deterioration and loss, and regular maintenance and monitoring will be the key to the survival of the non-renewable heritage resources that remain in the Southwestern parks. Utilizing climate models, site plans, and analyses of architectural materials that identify their limits will allow those who participate in the preservation of these resources to develop strategies for adaptation and response. Becoming aware of projected changes, and understanding the response of historic building materials to a variety of likely environmental parameters, will enable preservation specialists to be proactive in their efforts to prepare for the future. Participation in the multi-disciplinary global discussion regarding climate change and its impacts to cultural resources will help the NPS to understand the interactions between nature and cultural resources, and the application of the best possible science and scholarship available will allow us to more effectively work in consultation with the many stakeholders who rely on our good stewardship to preserve these heritage resources for future generations.

Lauren Meyer is the Exhibit Specialist/ Materials Conservator for the Vanishing Treasures Program and is stationed at the Intermountain Regional Office in Santa Fe, New Mexico.

For further information on cultural resources and climate change, see the following publications and websites:

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UNESCO, Activities: Climate Change, http://whc.unesco.org/en/activities/search_theme=23&pattern

UNESCO. Case Studies on Climate Change and World Heritage. UNESCO World Heritage Center, Paris, France: 2007.

(<http://whc.unesco.org/uploads/activities/documents/activity-473-1.pdf>)

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¹ Intergovernmental Panel on Climate Change (IPCC), *Climate Change 2007: Synthesis Report. Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, Core Writing Team, Pachauri, R.K and Reisinger, A.(eds.), (IPCC, Geneva, Switzerland), 30.

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⁴ Arndt, D. S., M. O. Baringer, and M. R. Johnson, Eds., 2010: State of the Climate in 2009. *Bulletin of the American Meteorological Society*, 91 (7), S12.

⁵ Arndt, S19

⁶ http://www.noaanews.noaa.gov/stories2011/20110112_globalstats.html

⁷ Arblaster, J., et al. 2007. Summary for policymakers. In *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on*

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⁸ Christensen, J.H., B. Hewitson, A. Busuioc, A. Chen, X. Gao, I. Held, R. Jones, R.K. Kolli, W.-T. Kwon, R. Laprise, V. Magaña Rueda, L.Mearns, C.G. Menéndez, J. Räisänen, A. Rinke, A. Sarr and P. Whetton, 2007: Regional Climate Projections. In: *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds.), (Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA), 850.

⁹ Lenart, Melanie, *Climate, Temperature Changes*, Southwest Climate Change Network, <http://www.southwestclimatechange.org/climate/southwest/temperature-changes#references>.

¹⁰ USGCRP, 129.

¹¹ Lenart, Melanie, *Climate, Precipitation Changes*, Southwest Climate Change Network, <http://www.southwestclimatechange.org/climate/southwest/precipitation-changes>.

¹² Email communication with Dr. Patrick Gonzalez, NPS Climate Scientist (email dated 5/13/2011).

¹³ *Southern Colorado Plateau Network, Climate Change Resource Brief* (http://www.nps.gov/climatechange/docs/SCPN_CC.pdf)

¹⁴ Brimblecombe, P., C.M. Grossi and I. Harris, 'Climate change critical to cultural heritage,' in *Heritage, Weathering and Conservation, Fort, Alvarez de Buergo, Gomez-Heras & Vazquez-Calvo, Eds.*,

¹⁵ 'Principal climate change risks and impacts on cultural heritage' in *Background Document UNESCO WORLD HERITAGE CENTER in cooperation with the United Kingdom Government 'World Heritage and Climate Change' for the broad working group experts at UNESCO HQ16-17 March 2006 and in Working Document 30 COM 7.1 prepared for the 30th Session of the World Heritage Committee, Vilnius, July 2006* (<http://whc.unesco.org/archive/2006/30com-en.htm>).

V a n i s h i n g T r e a s u r e s

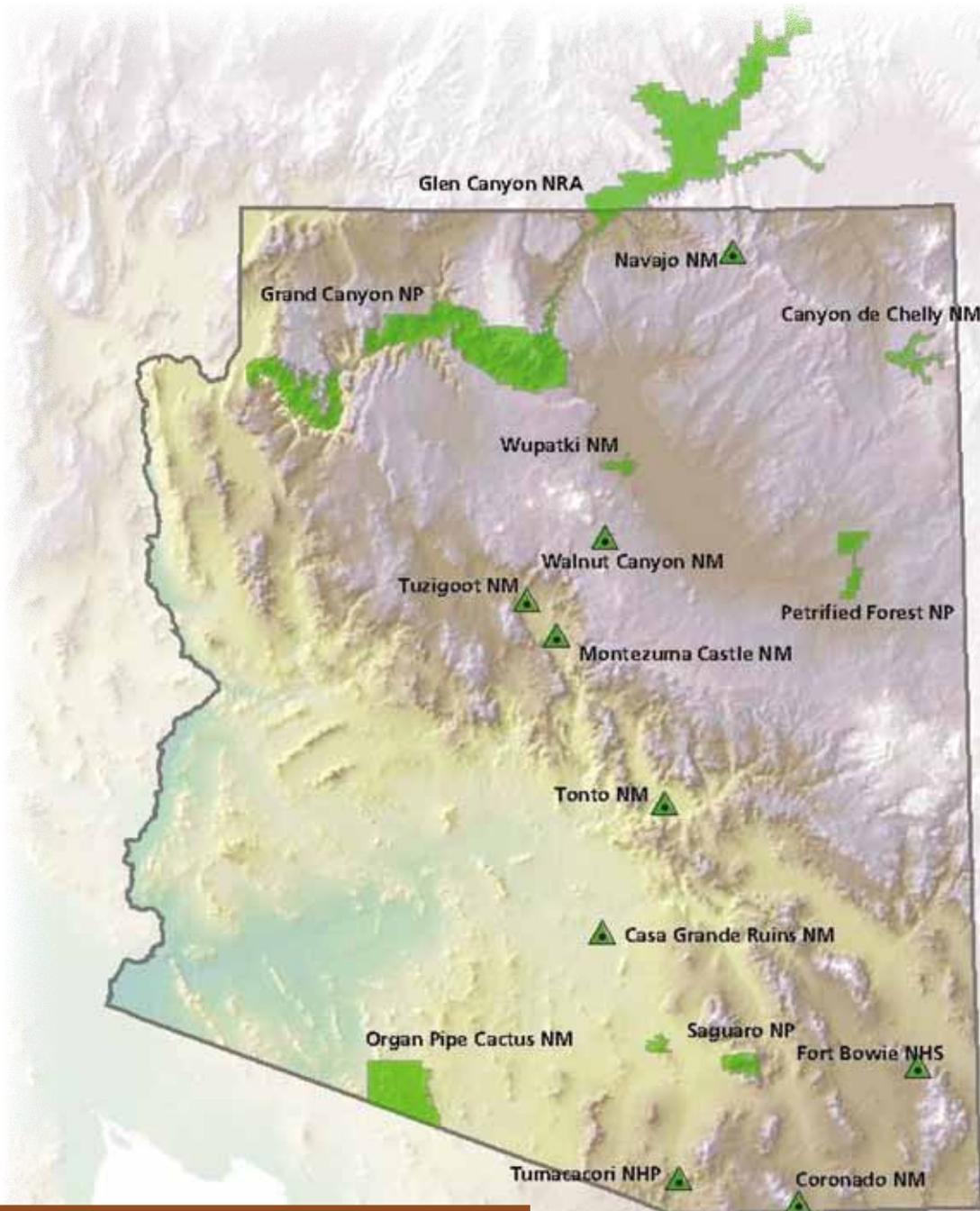
A r i z o n a



Recording wall data at White House Ruin, Canyon de Chelly National Monument

Photo: Keith Lyons

- ◆ Canyon de Chelly National Monument ◆ Casa Grande Ruins National Monument ◆
- ◆ Coronado National Memorial ◆ Fort Bowie National Historic Site ◆
- ◆ Grand Canyon National Park ◆ Montezuma Castle National Monument ◆
- ◆ Navajo National Monument ◆ Organ Pipe Cactus National Monument ◆
- ◆ Petrified Forest National Park ◆ Saguaro National Park ◆ Tonto National Monument ◆
- ◆ Tumacácori National Historical Park ◆ Tuzigoot National Monument ◆
- ◆ Walnut Canyon National Monument ◆ Wupatki National Monument ◆



Arizona Fiscal Year 2010 Project Funding Summary

Funded Projects:

Casa Grande Ruins National Monument \$ 83,250
Grand Canyon National Park \$ 76,300
Montezuma Castle National Monument \$ 50,400
Tonto National Monument \$ 101,492
Walnut Canyon National Monument \$ 111,184
Wupatki National Monument \$ 118,000

Canyon de Chelly National Monument

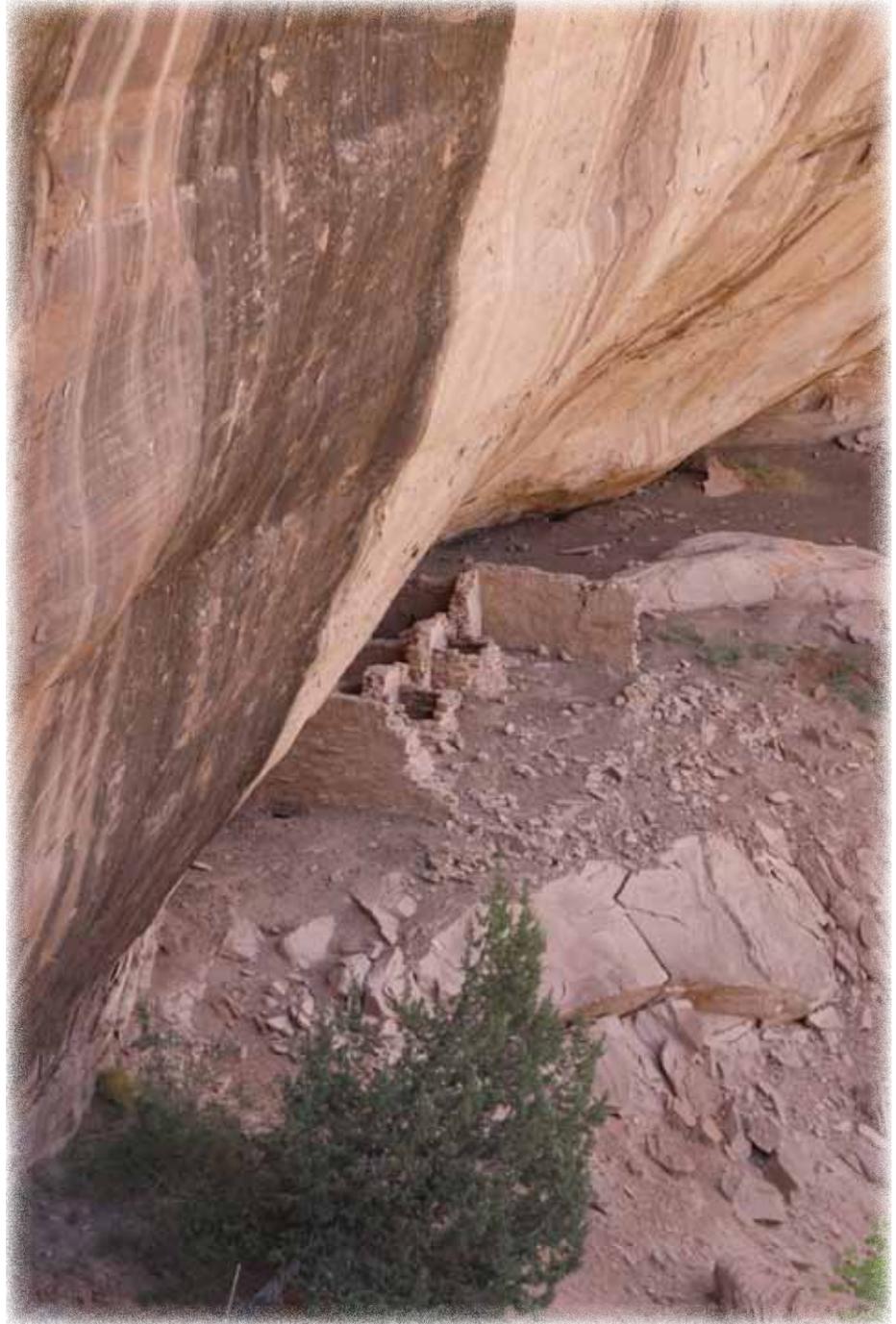
Canyon de Chelly National Monument is part of the Southern Four Corners Group, which also includes Navajo National Monument and Hubbell Trading Post National Historic Site.

VANISHING TREASURES ACCOMPLISHMENTS AND CHALLENGES

VT Challenges and Successes: In 2009, Canyon de Chelly National Monument (CACH) was incorporated into the Southern Four Corners Group (SOFO), which is comprised of Hubbell Trading Post National Historic Site (HUTR), Navajo National Monument (NAVA), and Canyon de Chelly. Also in FY 2009, VT archeologist Ellen Brennan was hired as the Chief of Cultural Resources for SOFO stationed at NAVA. In July, 2010 Ellen accepted a new position as the Cultural Resources Program Manager for Grand Canyon National Park, and Flagstaff Area Monuments (FLAG) archeologist Lloyd Masayumtewa was detailed into the vacant SOFO position at NAVA.

Meanwhile, at CACH, Phase I of the Watershed Project Archeological Survey (WPAS) continued through this year. This project is designed to inventory archeological sites on the floor of Canyon de Chelly's southern canyon system that may potentially be affected by the removal of exotic woody species. These trees and shrubs are being cleared through the ongoing park-wide Canyon Farms-Watershed Restoration Project and this project has a high potential to impact VT resources in treatment areas. While Canyon Del Muerto had been comprehensively inventoried in the 1990s, providing reliable baseline maps and data to assist in management efforts there, the southern canyon system has never been systematically inventoried. WPAS survey efforts commenced at the mouth of Canyon de Chelly in 2008 and are proceeding eastward toward Spider Rock.

In FY 2010, Phase I survey work was performed by a five-person field crew comprised of two full-time VT NPS archeologists, one student temporary employment program (STEP) archeologist, one seasonal NPS archeological technician, and one Student Conservation Association (SCA) intern. The Park archeologist served as Crew Chief, while all others served as crew members working in varying capacities documenting resources with notes, photo-



White Sands Ruin, Canyon de Chelly National Monument.

Photo: Tovë Smith

graphs, and maps.

The WPAS survey will allow a rapid and systematic survey of the canyon floor to identify and document each cultural resource for inclusion in the archeological site management information system (ASMIS) database and park archives. Phase II, slated to begin FY 2011, will include the enhanced documentation of each recorded site to more detailed park

and VT standards. It is expected that the two phases will run concurrently for the rest of the project.

In FY 2010, the WPAS survey resulted in the documentation and condition assessment of 12 new archeological sites plus the documentation of one previously recorded archeological site, all to federal standards. A total of 46 acres were inventoried, and four of the 12 surveyed

sites contained prehistoric and/or historic architectural components. Management recommendations for these sites were provided to the park Natural Resources Division, which uses the data to develop plant removal strategies that protect cultural resources. Enhanced documentation and additional preservation strategies for these sites will be developed in Phase II of the project.

In March, 2010, the park completed a Phase I right-of-way (ROW) survey along the South Rim Road (NPS 10) in advance of road rehabilitation and improvements to both the Visitor Center and White

House Overlook parking areas. In 2004, specific portions of the NPS 10 ROW were surveyed by an independent contractor, but changing plans made additional survey necessary. The FY 2010 South Rim Road Archeological Survey (SORRAS) inventoried all of the unsurveyed portions of NPS 10 and documented archeological resources within the 30-meter ROW that may potentially be affected by the scheduled road work (June 2010 to May 2011). This survey was completed with two park archeologists, one STEP archeologist, and one SCA intern. This project has the potential to impact VT resources located

adjacent to the existing road.

A total of 344 acres were inventoried, resulting in the documentation and condition assessment of 26 new archeological sites to federal standards. Six of these newly identified sites contained prehistoric and/or historic architectural components. Management recommendations for these sites were developed and implemented prior to roadwork activities. Enhanced documentation and preservation strategies for these sites will be developed in 2011.

Between December, 2009 and February, 2010, the park designed, implemented, and completed a testing project for the installation a grease trap adjacent to the park concessioner-operated Thunderbird Cafeteria, which was originally part of the historic Thunderbird Lodge Trading Post. Data analysis and report preparation is ongoing with data synthesis and analysis to be completed in FY 2011. The investigation revealed turn-of-the-century refuse related to the early years of the Trading Post. A remnant of a single-course linear rock alignment was documented that may be related to a fodder barn that, according to historic photographs, was located in the area.

In July, 2010, the park completed an architectural condition assessment of Lower White House Ruin, which was implemented through a Colorado Plateau-Cooperative Ecosystems Study Unit agreement between the NPS and Ft. Lewis College. Former NPS archeologist Larry Nordby led the room-by-room architectural condition assessment of Lower White House with the assistance three Ft. Lewis college students. NPS provided project oversight, logistical support, and field assistance. NAVA archeologists Susan Brier and Paul Leatherbury also provided on-the-ground field support.

Technical products from this assessment will be received by the NPS in FY 2011. This information will contribute to the development of detailed preservation strategies for White House, one of the most significant cultural resources in the park. An attempt was made to document the upper White House Ruin to complete 3-D laser scanning work; however, access difficulties emerged and the condition assessment and 3-D laser scanning of the upper ruin were postponed pending further planning.

Park archeologists Keith Lyons and Jennifer



Keith Lyons, and Martha Pennington, record historic Navajo storage structures at Standing Cow Ruin, Canyon de Chelly National Monument.

Photo: Jennifer Lavris

Lavris presented several programs on the park's current and historical archeological work and its rock art to Northern Arizona University's Exploritas program and at annual NPS-led guide and interpretation staff training.

Consultation: Canyon de Chelly consulted with the Navajo Nation's Historic Preservation Department on a periodic basis and has kept the tribe informed of projects and activities as they relate to park cultural resources.

Because a living community continues to occupy the land within the park, we are managing a living landscape that was previously utilized by a different native culture, making our VT resources unique. One of the biggest challenges in the management of park resources is balancing the needs of the living Navajo community with the requirements of a sustainable, effective cultural resources management program. As a result, we are involved in a variety of compliance projects related to Navajo home site, business, and farmstead-related development within the park. We are also involved in park-initiated compliance efforts for the Canyon Farms-Watershed Restoration Project, the South Rim Road Repaving Project, the Hazardous Fuels Reduction/Annual Prescribed Burn Project, and various other NPS-initiated projects which potentially affect VT resources.

Safety: In FY 2010, the Cultural Resources Division maintained an effective safety program. Job Hazard Analyses (JHAs) were prepared for all field projects, as well as for office and front-country duties. Weekly divisional safety meetings were held during the field season, and monthly during the offseason.

VANISHING TREASURES STAFF

Jennifer Lavris, Archeologist FY 2002 Position

Skills: Jennifer specializes in North American archeology, historic and prehistoric architecture, rock art, site preservation, research design, human osteology, database management, digital imaging, and Egyptology.

Accomplishments: This year, Jennifer co-managed the park Cultural Resources Program with Keith Lyons (see below). Her primary duties included archeological database management, Section 106/110 compliance, Native American Graves and Repatriation Act (NAGPRA) work,

archeological site monitoring, the development of project and research designs, and management of the program's budget. She served as the database manager for the Watershed Project Archeological Survey, the South Rim Road Archeological Survey, and the Archeological Site Monitoring Project (ASMIS-2010). Jennifer also designed and supervised the "Archeological Evaluation Testing Plan for Installation of a Subterranean Grease/Sand Trap and Associated Manhole, Thunderbird Lodge Cafeteria, Canyon de Chelly National Monument, Arizona." In FY 2010, she supervised one STEP archeologist, two seasonal archeological technicians, and two SCA interns.

Training: In October, Jennifer participated in a Washington Support Office (WASO) sponsored NAGPRA webinar. In July, she also participated in park-wide fire extinguisher training.

Keith Lyons, Archeologist FY 2003 Position

Skills: Keith is an archeologist, specializing in North American archeology, historic and prehistoric architecture, rock art, site preservation, cultural landscapes, human osteology, and archival/museum management.

Accomplishments: In FY 2010, Keith along with Jennifer Lavris co-managed the park Cultural Resources Program. His primary duties included archeological site monitoring, field supervision, Section

106/110 and NAGPRA compliance, archeological survey, and overall program development. Keith also continued to manage park collections this year, which included managing the park museum database. Keith served as the field supervisor for the White House Condition Assessment, WPAS, SORRAS, and annual Archeological Site Monitoring (ASMIS-2010). In that capacity he supervised one STEP archeologist, two seasonal archeological technicians, and two SCA interns. Keith is currently responsible for entering park projects into the Planning, Environment, and Public Comment (PEPC) database/website. He also maintained his role as Park Research Coordinator, facilitating a broad range of park research that includes both natural and cultural resources.

Training: In October, Keith participated in a WASO sponsored NAGPRA webinar. In March, he attended mandatory 40-hour supervisory training hosted by DOI University that was held in Albuquerque, New Mexico. In April, he attended additional NAGPRA training in Lakewood, Colorado; and in July, he participated in park-wide fire extinguisher training.

VANISHING TREASURES PROJECT FUNDING

Canyon de Chelly National Monument did not receive Vanishing Treasures project funding in FY 2010.



*Spring Canyon, Canyon de Chelly National Monument.
Photo: Tovè Smith*

Casa Grande Ruins National Monument

VANISHING TREASURES ACCOMPLISHMENTS AND CHALLENGES

VT Challenges and Successes: In FY 2010, our high-priority challenge was to address visitor, animal, and site erosion impacts to previously excavated archeological sites. Another high priority was to bring Casa Grande Ruins National Monument (CAGR) into compliance with the Native American Graves Protection and Repatriation Act (NAGPRA) and much effort was focused on Native American consultation in 2010. Accomplishments included an agreement with the Bureau of Indian Affairs to utilize solar energy for powering park operations, a study of animal impacts to archeological resources, and archeological testing in preparation for the upcoming Visitor Center Expansion.

Compound A Site Drainage and Animal Impacts: Movement toward the completion of a contract between Desert Archaeology, Inc. and CAGR to address erosional problems, animal impacts, and drainage issues within Compound A continued through FY 2010. The objective of this project was to protect original wall tops that had eroded to the surface of Compound A from further damage. Heavy rains in January and February posed a challenge for project scheduling but also aided in the compaction of newly placed soils and provided a method of field checking how the new site grading shed water. The archeological documentation and fill replacement were both completed in time to provide protection to the site during the park's Second Annual Native American Music Festival.

A Natural Resource intern position was established in FY 2010 and filled by

Christopher Frost. Christopher's primary responsibility was to test and evaluate various animal exclusion methods that were already in place in Compound A at CAGR and to test other methods planned for implementation in 2011. This work included research, project design, and field testing of various commercial products and a statistical analysis of the success of each device. Chris worked closely with Biological Science technician Ashley McCabe to incorporate the results of this research into an Environmental Assessment and updated Integrated Pest Management Plan for CAGR.

Fill Replacement and Site Drainage at Compounds B, C, D, G and a prehistoric ball court: Stabilization of exposed wall tops in Compound B was initiated in 2010. Guidance for this project was provided by Gary Brown, Supervisory Archeologist at Aztec Ruins National Monument (AZRU) with field assistance from AZRU staff members Earnest Harrison and Gregg Kleppinger. Sheldon Baker led this effort in the field. Some of these sites, especially Compound B, had been heavily stabilized in the mid-20th century when many walls were coated with a Portland cement stucco. When feasible, these concrete and masonry cement coatings were removed from original walls. Structural voids were patched using unamended adobe, and walls were protected with a layer of geotextile prior to fill replacement. This project is ongoing and will be completed in 2011 under contract with Desert Archaeology.

Fill replacement in Compound C also began in FY 2010 to address preservation issues associated with eroding wall tops, historically exposed excavation trenches, and recently exposed human remains. Native American consultation and fill replacement at Compound C will continue in 2011. Fill replacement and

site drainage in Compounds D and G and the prehistoric ball court were completed in FY 2010 under contract with Desert Archaeology, Inc.

Adobe Wall Preservation Treatments: In 2009, exposed walls within Compound A had been treated with two layers of unamended earth and a third layer of sprinkle coat capping made with 5% Rhoplex E-330 diluted in water. This treatment was designed to protect underlying, original wall material from washing away during heavy monsoon rains without trapping moisture in the walls where it could accelerate wall deterioration. This treatment was designed to be weaker than the strength of original wall materials to allow this surficial treatment to slowly erode away rather than contribute to structural failures the way that other inappropriate historical treatments had. The 2009 treatment approach was designed to require re-treatment every 1-2 years. As a result, in 2010 the need for wall treatment work within Compound A was significantly reduced and conditions will be reassessed in early 2011 to identify when follow-up treatments are required. Conservation intern Caroline Miller was instrumental in the annual documentation, drain cleaning, and other preservation treatments in Compounds A and B in 2010.

Archeological Investigations in Preparation for the Proposed Visitor Center Expansion: In FY 2009, Phase I archeological testing was conducted to identify subsurface deposits within three areas proposed for the construction of an addition to the existing Visitor Center. Based on the data provided from that survey, a project area was selected immediately South of the current Visitor Center. In FY 2010, CAGR contracted with the Gila River Cultural Resource Management Program to conduct Phase II



Compound B, Casa Grande Ruins National Monument.
Photo: Randall Skeirik

Data Recovery within this project area.

Consultation: In FY 2010, Casa Grande Ruins continued consultation with six Native American communities: Gila River Indian Community, Salt River Pima-Maricopa Indian Community, Ak-Chin Indian Community, Tohono O’odham Nation, Hopi Tribe, and the Pueblo of Zuni. Following up on the NAGPRA consultations initiated in 2009, several meetings were held at the park with each of these tribes, to identify possible unassociated funerary objects, items of cultural patrimony, and sacred objects within our Visitor Center exhibits. A full month of consultation with each of these communities was also conducted to visit and discuss the collections being cared for at the Western Archeological Conservation Center in Tucson. Osteology work for items being cared for as part of the legally defined CAGR collections was contracted to Kimberly Spur, with additional survey work conducted by Archeologist Sheldon Baker, osteology intern Laura Ramos, and curation intern Lisa Mendoza. This work was geared toward the identification of additional items in the CAGR collections, and in eroded portions of archeological sites, that should be brought forth for Native American consultation. Consultation work associated with this project will continue in 2011 and will expand to include items excavated from Compound F in the 1930s and now at the Los Angeles County Museum of Natural History.

Safety: CAGR staff were working to document the extent of rabies infestation in a resident population of Little Brown Bats (*Myotis lucifugus*) when the bat population residing within the Casa Grande Great House increased from less than 100 individuals to more than 1000. This larger colony included Brazilian Free-tail (*Tadarida brasiliensis*) and Western Pipistrelle (*Pipistrellus hesperus*) bats. The Great House was closed until park staff were inoculated for rabies and trained in how to handle potentially diseased animals.

VANISHING TREASURES STAFF

**Rebecca Carr, Archeologist & Chief of Resources
FY 2005 Position**

This position was originally filled as a Archeologist GS-9 but was converted to an Archeologist GS-11 in 2008.

Although Rebecca resigned her position at CAGR to accept a position with the Of-

fice of Planning and Compliance at Grand Canyon National Park, she stayed at CAGR until the end of the fiscal year, so there was no lapse salary.

Skills: Rebecca’s education includes an M.S. in Historic Preservation from the University of Pennsylvania and a B.A. with a double major in anthropology and art with a certificate in museum studies from the University of Delaware. Her work has focused on the documentation and conservation of earthen architecture and stone masonry. She has worked on projects including Ancestral Puebloan cliff dwellings, Hohokam Classic Period architectural compounds, and historic buildings such as hospitals, churches, and residences. She has periodically taught, published, consulted, and presented on the subjects of site documentation, condition assessment, materials analysis, and treatment techniques for the preservation of earthen buildings. During her career, Rebecca has worked as a resource manager, archeologist, exhibit specialist, architectural conservator, museum curator, and museum director. She also has experience with not-for-profit management and with private-sector fundraising. Rebecca recently accepted a position at Grand Canyon National Park, where she will be working as an Environmental Protection Specialist for the Office of Planning and Compliance.

Accomplishments: In 2010, Rebecca hired, trained, and supervised the work of 10 specialists plus a number of volunteers who worked on a wide range of resource management projects.

Training: Rebecca did attend any VT-related training in FY 2010.

**Vacant, Masonry Worker
FY 2001 Position**

This position was vacant for all of FY 2010. Lapse salary was used to supplement the Monument’s Facilities Division in the upkeep and maintenance of historic structures, including Buildings 8, 9, 10 and 11 (Maintenance Compound) and Building 12 (Visitor Center). In addition, it was used to assist the Resource staff in the stabilization and preservation of pre-historic structures. Funds were also used for supplies and materials and for utility costs for Building 6, which is occupied by Resources staff.

Additionally, some funds were used to cover the travel costs of a detail, Derek

Toms, who will replace Rebecca Carr after she transfers to Grand Canyon National Park.

VANISHING TREASURES PROJECT FUNDING

Project Name: Implement Backfill and Drainage Plan for Compound B

PMIS Number: 116814

Project Summary: The objective of this project is to preserve the archeological resources in Compound B, a highly significant Classic Period Hohokam site. It is located north of Compound A, northwest of the prehistoric ball court, and is centered between Compounds C and D. In the spring of 2010, 90% of the planned ruins stabilization treatments were completed by NPS personnel. The final 10% will be completed in fall of 2011 under contract with Desert Archaeology.

The FY 2010 work began with detailed, systematic photo documentation of the exposed architecture within Compound B. After documentation, the concrete and masonry cement capping was removed from the original walls wherever feasible. Historic treatments that could not be removed without causing damage to original architectural features were left in place. Structural voids were patched using unamended adobe, and walls were protected with a layer of geotextile prior to fill replacement.

Project Budget:

Total VT Project Funding:	\$83,250
Personnel:	\$16,016
Vehicles:	\$0
Travel/Training:	\$4,122
Supplies/Materials:	\$25,070
Equipment:	\$2,432
Services/Contracts:	\$35,622
Other:	\$0

Project Accomplishments: Major accomplishments of this project include the removal of detrimental historic treatments; stabilization of original walls; complete replacement of fill within Room 3 and Room 4; and fill replacement in the North, South, Southeast, Southwest and Middle Plazas. The west interior slope and east interior slope of Mound/Pyramid A were also addressed. Additionally a supplemental drain was constructed immediately west of Mound/Pyramid A to drain excess rain water.

Flagstaff Area Monuments

The Flagstaff Area Monuments include Wupatki, Walnut Canyon, and Sunset Crater National Monuments

VANISHING TREASURES ACCOMPLISHMENTS AND CHALLENGES

VT Challenges and Successes: The Flagstaff Area Monument's (FLAG) biggest challenge this year was completing our projects with a reduced workforce. FLAG had several crew members on detail to other parks during the field season.

Consultation: FLAG continues to work effectively with our culturally affiliated tribes and the Arizona State Historic Preservation Office (AZSHPO).

Safety: No DART (days away, restricted, or transferred) injuries or other accidents occurred during FY 2010 for the cultural resource staff.

VANISHING TREASURES STAFF

Lloyd Masayumtewa, Supervisory Archeologist FY 1998 Position

This position was vacant during part of FY 2010. Lapse salary was returned to general park use.

Accomplishments: Lloyd was hired in May, 2007 to fill the VT Supervisory Archeologist position for the Flagstaff Area National Monuments that Al Remley vacated in August, 2006. Prior to that, Lloyd held a VT Project Leader position at FLAG. With Lyle Balenquah's and Ian Hough's positions remaining vacant through FY

2010, he and Lisa Baldwin, who has filled Lloyd's previous position, worked with term, Student Temporary Employment Program (STEP), and seasonal hires to complete projects for the FLAG Area Monuments. The crew, under Lloyd's direction, was actively involved in a number of preservation projects and assignments related to VT resources including work at both Wupatki (WUPA) and Walnut Canyon (WACA) National Monuments. Lloyd was responsible for contracting and implementing preservation activities in both monuments with assistance from his crew. Lloyd, Lisa Baldwin, and the preservation crew successfully completed five Cultural-Cyclic-funded projects, and two VT projects.

In mid-July, Lloyd accepted a temporary promotion detail to Navajo National Monument (NAVA), as the Acting Chief of Cultural Resources, working at NAVA through the end of FY 2010. After the end of the temporary promotion detail, he continued to work at NAVA. As time permitted, he provided assistance to the FLAG office during his detail.

Training: Lloyd did not participate in any VT-related training in FY 2010.

Lisa Baldwin, Archeologist FY 2000 Position

This position was vacant during part of FY 2010. Lapse salary was returned to general park use.

Accomplishments: In FY 2010, Lisa oversaw the completion of the Wupatki Pueblo backfilling project. This project was a multi-phase two-year project

funded by Vanishing Treasures and American Recovery and Reinvestment Act funds. In addition, Lisa was actively involved in a number of preservation projects and assignments related to other VT resources including work at both Wupatki and Walnut Canyon National Monuments. Lisa's other duties included producing, and supervising the production of, stabilization, documentation, and monitoring reports. Lisa also had several opportunities for public outreach and education, leading several site tours at Walnut Canyon and Wupatki for Arizona Archeology Month and the annual Flagstaff Festival of Science. In addition, Lisa provided site tours for other groups including the Northern Arizona University Ranger Academy.

Lisa also served as the Acting Archeology Program Manager while Lloyd Masayumtewa was on a detail to Navajo National Monument. During this time, Lisa was responsible for closing out the VT Program's budget, implementing and overseeing all contracts and agreements, training new staff in stabilization techniques, writing year-end reports, writing project proposals for the yearly Servicewide Comprehensive Call, submitting the Flagstaff Area National Monuments annual end-of-year reports, and other related administrative tasks.

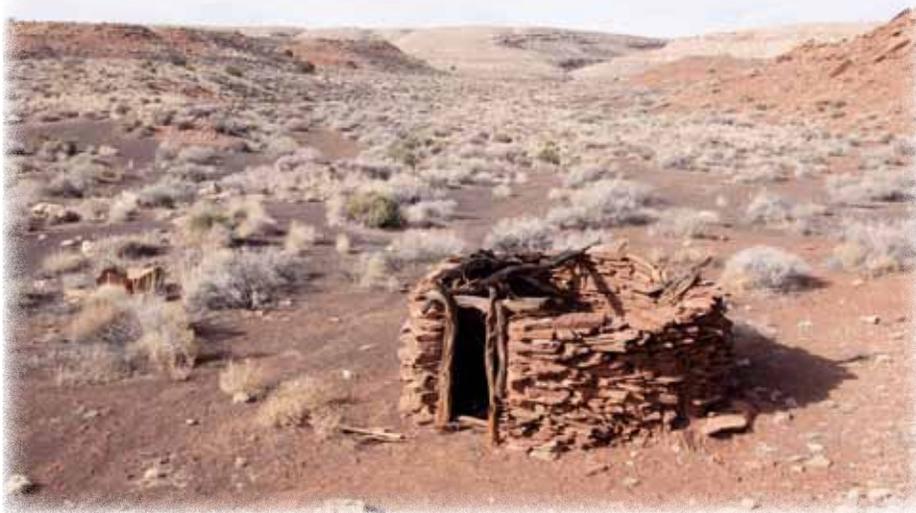
Training: Lisa attended Archeological Resource Protection Act training with the Federal Law Enforcement Center (FLETC) at Glen Canyon, a Human Skeletal Identification workshop at FLAG, and NPS Fundamentals V in Washington D.C. Lisa also participated in numerous safety training sessions pertaining to field projects as well as additional seminars dealing with leadership. Lisa presented a paper at the Arizona Preservation Conference hosted by AZSHPO and attended the 75th Annual meeting of the Society for American Archeology (SAA) in St. Louis, MO.

Vacant, Archeologist FY 2000 Position

This position, which was previously filled by Lyle Balenquah, was vacant for all of FY 2010. Lapse salary has been returned to general park use.

Vacant, Archeologist FY 2003 Position

This position was vacant during part of FY 2010. Lapse salary has been returned to general park use.



*Historic-era Navajo structure, Wupatki National Monument.
Photo: Courtesy Wupatki National Monument*

Vacant, Geographer/Geographical Information System (GIS) Specialist FY 2004 Position

This position, which was jointly funded through VT and the Natural Resource Challenge, was vacant for part of FY 2010 and has subsequently been moved to the Natural Resource Division.

VANISHING TREASURES PROJECT FUNDING- Walnut Canyon

Project Name: Condition Assessment of five Previously Stabilized Cliff Dwellings at Walnut Canyon

PMIS Number: 116763

Project Summary: In FY 2010, the Flagstaff Area National Monuments received VT funding to conduct detailed wall-by-wall condition assessments on five previously stabilized cliff dwellings located in Walnut Canyon. These five sites, all located in the eastern section of Walnut Canyon National Monument, date to the Elden Phase (A.D. 1125-1250) of the Sinagua Culture. Although the sites were recorded in 1985 as part of an archeological survey of the park, the survey information did not provide enough detail for use in long-term preservation planning. In addition, the maps and photos that were produced were not comprehensive and did not capture necessary information to document the condition of these sites. The sites had also been subjected to a policy of benign neglect for a number of years.

Project Budget:

Total VT Project Funding: \$111,184
 Personnel: \$69,297
 Vehicles: \$0
 Travel/Training: \$1,668
 Supplies/Materials: \$11,977
 Equipment: \$1,800
 Services/Contracts: \$15,720
 Other: \$10,722

Project Accomplishments: This project addressed the lack of information on the integrity (amount of original intact architecture remaining), condition (stability, types and rate of deterioration, and threats), and preservation treatment plans for each site that will allow the architecture to be maintained in a good, safe, and stable condition. The information collected will serve as a baseline for establishing a cyclical monitoring program at each site. This will allow for the development of detailed site preservation plans that will identify documentation and treatment priorities for future projects.

Specific analysis of the five sites included detailed photography, description of condition, agents of deterioration, possible rates of deterioration, and treatment/documentation recommendations for every standing wall. The sites also received intensive architectural documentation including tabular and narrative data sheets recording the attributes and condition of the architecture and scaled wall elevation photography by FLAG archeologists. In addition, the FLAG monuments contracted with EnviroSystems Management, a local cultural resource management company, to produce AutoCAD wall drawings that are layered to show façade outline, wall stones, stabilization episodes, and current impacts. The AutoCAD files will be linked through ArcGIS software for retrieval of visual representations of the stabilization histories of each wall. A final report will be produced that will summarize the condition of the sites and provide recommendations for future preservation treatments.

VANISHING TREASURES PROJECT FUNDING- Wupatki

Project Name: Condition Assessment of Abandoned and Ruined Historic Navajo Sites at Wupatki National Monument.

PMIS Number: 123718

Project Summary: In FY 2010, the Flagstaff Area National Monuments (FLAG) received VT funding to conduct detailed wall-by-wall condition assessments on 40 abandoned and ruined historic Navajo architectural sites in the Preservation and Guided Adventure management zones of Wupatki National Monument. These areas surround some of the most heavily visited areas of the park. All of the sites addressed by this project are Historic Navajo cultural sites, ranging from single structures to homesteads that include habitation structures, corrals, sweat lodges, check dams, and storage cists. The sites range in date from the 1860s to the 1930s.

Project Budget:

Total VT Project Funding: \$118,000
 Personnel: \$58,363
 Vehicles: \$0
 Travel/Training: \$0
 Supplies/Materials: \$133
 Equipment: \$0
 Services/Contracts: \$6,000
 Other: \$53,500

Project Accomplishments: Specific analysis of the 40 sites included detailed

photography, description of condition, agents of deterioration, possible rates of deterioration, and treatment/documentation recommendations for every standing wall. The information collected will provide a baseline for establishing cyclical monitoring plans for each site as well as identifying areas of concern, and, where necessary, establishing photo monitoring points and structural monitoring instrumentation. The information will also be used to develop detailed site preservation plans that identify documentation and treatment priorities that will be targeted in future projects. Finally, this information will be used in existing VERP (Visitor Experience Resource Protection) protocols by park management to assess future management decisions regarding visitor use.

Prior to this work, the most recent work on 26 of these sites (WS 306, 314, 684, 686-689, 745, 766-767, 773-774, 1394, 1780, 1789, 1836-1837, 1839, 2269, 2275, 2283-2284, 2290, 2293, 2298, and 2440) was archeological survey-level site recording, conducted in the 1980s. Nine additional sites (WS 347, 769, 780, 815, 816, 1030, 1725, 1783, and 1813), which are located in the "Guided Adventure Zone" where visitors participate in off-trail guided hikes, are routinely monitored (most recently in April, 2009). FLAG has entered into a Cooperative Ecosystem Study Unit agreement with Northern Arizona University to complete the condition assessments on these 35 sites.

Current monitoring data indicate that five of the sites are currently experiencing impacts affecting the integrity of the resource. Three of these sites (WS 1028, 1815, and 2423) are located within the "Guided Adventure Zone" and are regularly impacted by visitors, while the other two sites (WS 303 and 743) are being impacted by natural forces such as active arroyo cutting. These five sites, in addition to condition assessments, received intensive architectural documentation, including tabular and narrative data sheets recording the attributes and condition of the architecture; detailed, scaled hand-drawn planimetric and cross-section maps; and scaled wall elevation photography by FLAG archeologists. In addition, FLAG has contracted with Roundhouse Productions, Inc. to produce virtual reality photography and video of these sites that will be used for an interactive exhibit at the Wupatki Visitor Center.

Fort Bowie National Historic Site

VANISHING TREASURES ACCOMPLISHMENTS AND CHALLENGES

VT Challenges and Successes: Our biggest challenge for FY 2010 was hiring seasonal employees to assist with this year's stabilization work. As the result of a series of unforeseen problems, we were only able to bring on one emergency hire and one rehire for a two-month period. Although only here for a short period of time, Cameron Mower and Andrew Ludwig stepped up to the task, and provided excellent service. In August we were able to hire Phil Tapia, Jr. as a 1039 seasonal. Phil had worked for us for four previous seasons and came to Fort Bowie with a strong preservation background. The lack of more seasonals, coupled with the retirement of VT staff member Phil Tapia, Sr., really slowed down the ruins stabilization efforts for the year. Despite these issues we were able to complete emergency repairs on the Post Trader's Store (LCS 14062), Cavalry Barracks (LCS 14038), Officer's Quarters (LCS 14036), and Officer's Quarters (LCS 14034). A wet monsoon season caused large sections of the protective lime plaster to fall off, exposing the historic adobes underneath. In addition to repairing damaged lime plaster our stabilization crew performed

rock pointing on foundations, removal of vegetation, and repairs to site drainage features.

Safety: Safety is always a foremost concern and our work was accomplished with no accidents or injuries. As in previous years, our safety concerns remained the same: heat, sun, lightning, wasps, and snakes. Small holes in the stone foundations provide an excellent place for wasps to nest, and the cool shade of the ruin walls provides a haven for rattlesnakes. In the same way as last year, our Polaris Ranger continued to handle the heavy loads of materials and equipment that were transported out to the work sites.

VANISHING TREASURES STAFF

Fernie Nunez, Masonry Worker FY 1998 Position

Skills: Fernie is skilled in adobe work, plastering, and repointing stone masonry. He is instrumental in our annual ruins stabilization program and is good with small engines and maintaining equipment in good operating condition.

Accomplishments: Considering the many setbacks at Fort Bowie this year, Fernie and the stabilization crew still had a productive year. They completed emergency repairs to four structures (Post Trader's Store, Cavalry Barracks and two Officer's Quarters); and they repointed, removed vegetation, and repaired drainage on three other structures.

Training: Fernie did not complete any training related to his VT work this year.

Phil Tapia, Sr., Masonry Worker FY 1999 Position

This position was vacant during part of FY 2010. Lapse salary was absorbed in the park budget.

Skills: Phil is skilled in adobe work, plastering, and repointing stone masonry. Phil was the lead person for our annual ruins stabilization program and his duties included monitoring and documenting the work performed.

Accomplishments: After performing VT duties for over 11 years, Phil retired in August. As lead person on the stabilization crew, Phil procured materials, scheduled stabilization work, documented techniques, and assisted the crew with the actual field work. This year, Phil worked on emergency repairs to the Post Trader's Store and Cavalry Barracks, procured materials, and assisted with drainage work on several structures before his retirement. Phil's expertise will be missed. We are in the process of hiring his replacement.

Training: Phil did not complete any training related to his VT work this year.

VANISHING TREASURES PROJECT FUNDING

Fort Bowie National Historic Site did not receive Vanishing Treasures project funding this year.



*Phil Tapia Jr. and Fernie Nunez repair the post trader's store, Fort Bowie National Historic Site.
Photo: Karen Weston Gonzales*

Grand Canyon National Park

VANISHING TREASURES ACCOMPLISHMENTS AND CHALLENGES

VT Challenges and Successes: In FY 2010, Grand Canyon National Park (GRCA) was successful in maintaining its core Vanishing Treasures (VT) staff, recruiting seasonal preservation technicians, time-sharing with another VT park, and completing two preservation projects. In FY 2009, Charlie Webber was brought on as the Vanishing Treasures Archeologist. This year, with Ian Hough serving as acting Cultural Resource Program Manager for much of the year, Charlie continued in his role as field director and VT Program assistant. GRCA archeological technicians Steven Schooler, Shelley Szeghi, and Margi Shaw conducted seasonal work with the VT Program in project planning, preservation maintenance and condition assessment projects, and post-field data processing. The GRCA VT Program was also able to time-share with Glen Canyon National Recreation Area by supporting salary and travel for Thann Baker and Ralph Burrillo to assist us in completing condition assessments in a remote area of the park. In FY 2010, the GRCA VT Program also completed two preservation projects: one at Tusayan Ruin and one at Walhalla Glades Ruin.

Consultation: In FY 2010, the GRCA VT Program consulted with the Arizona State Historic Preservation Office on the preservation project at Walhalla Glades Ruin. The Office of Planning and Compliance at GRCA issued a Letter of Authorization for the project as a programmatic activity identified under a five-year National Environmental Policy Act (NEPA) exclusion. A Scope of Work and an Assessment of Effect (AEF) were completed and reviewed prior to project implementation. Tribal consultation was not completed for the FY 2010 Walhalla Preservation Treatment project but will be completed for the VT Program in 2011.

Safety: As in years past, GRCA's VT projects have focused on completing condition assessments and preservation treatments in remote locations within the park. Multi-day backcountry projects in remote locations pose safety challenges at GRCA. The VT Program staff met those challenges by completing safety training, conducting safety reviews, and working safely with no reported accidents.



*The Grand Canyon from Yaki Point, Grand Canyon National Park.
Photo: Randall Skeirik*

All project work was safely completed without any accidents. Safety training included mandatory first-aid/CPR training for all crew members, Wilderness First Responder training for project leads, and workshops on general backcountry safety, and radio and vehicle use. Annual safety reviews include the development of job hazard analyses (JHAs) for all field projects, safety walk-arounds, and the completion of on-site risk assessments. With over 100 person days involved in remote area projects, the GRCA VT Program is proud that no injuries were reported in FY 2010.

VANISHING TREASURES STAFF

Ian Hough, Archeologist
FY 2000 Position

Skills: In FY 2010, Ian maintained and

improved his skills in architectural documentation, materials testing and analysis, interpretive illustrations, historic period Native American wooden structures, and public education.

Accomplishments: In FY 2010, Ian served as the acting Cultural Resource Program Manager, Fire Archeologist, and Vanishing Treasures Program Manager for Grand Canyon National Park. Completed FY 2010 Vanishing Treasures project work included the application of preservation treatments at Walhalla Glades Pueblo, architectural condition assessment at previously stabilized sites on the North Rim, architectural condition assessment of sites in the Nankoweap Drainage, material testing of soil stabilization mortars, and routine maintenance of Tusayan Ruin.

Training: In 2010, Ian completed 40

hours of training in program management and supervision, and he completed workshops and training in the use of the facility management software system (FMSS). At the 10th Biennial Conference, Ian presented on the architecture of Colorado River sites including the results of a material analysis of soil mortars. In January 2010, Ian co-coordinated a 2-day preservation workshop on standardizing material testing at the Intermountain Region Southern Arizona Support Office. Ian also presented the results of testing an organic amendment for soil stabilization mortars.

Charlie Webber, Archeologist FY 2005 Position

Skills: Charlie has considerable experience conducting condition assessments and architectural documentation at archeological sites. He has also continued to increase his knowledge of databases and computer programs such as ArcGIS and graphics programs such as Adobe Illustrator.

Accomplishments: During FY 2010 Charlie was actively involved throughout Grand Canyon on a variety of cultural resource projects related to site preservation and the acquisition of updated site and condition data including the successful coordination of two backcountry condition assessment trips into the Nankoweap Drainage in eastern Grand Canyon. All project objectives were met, including personnel safety and volunteer involvement, with a total of 4 volunteers joining us over the course of the two trips. He also helped direct a ruins preservation project at Walhalla Glades Pueblo, testing materials prior to the start of the project and giving preservation training to seasonal employees. Charlie was also involved with writing scopes of work for all projects, overseeing data entry, and writing technical reports for stabilization and condition assessment work.

In January, Charlie attended a southern Arizona cultural resource management gathering in Phoenix where he presented findings on the use of an organic amender during stabilization activities the previous year.

Training: In FY 2010 Charlie attended 40 hours of supervisory training at the Albright Training Center. He also completed 2 ESRI ArcGIS trainings and attended a workshop on the ceramics of the Grand Canyon. Additionally, Charlie completed S-130/190 Firefighter training at the Arizona Wildfire Academy and Resource Advisor training at

Rocky Mountain National Park.

VANISHING TREASURES PROJECT FUNDING

Project Name: Condition Assessment of Prehistoric Architectural Sites in the Nankoweap Drainage

PMIS Number: 132394

Project Summary: This project involved completing an assessment of architectural remains at 31 sites and completing comprehensive condition assessments at seven sites (14 structures) in the Nankoweap Drainage. All 31 sites were also recorded with updated site information, mapped and monitored.

Project Budget:

Total VT Project Funding:	\$76,300
Personnel:	\$36,084
Vehicles:	\$263
Travel/Training:	\$7,804
Supplies/Materials:	\$9,087
Equipment:	\$8,236
Services/Contracts:	\$12,326
Other:	\$2,500

Project Accomplishments: Of the 31 sites visited, seven sites (14 single and multi-room structures) contained standing, intact architectural remains that qualify as VT resources. Comprehensive condition assessment work included updating site records with current data, assessing site condition relative to current threats and impacts, and architectural condition assessments including quantification of threats and impacts and treatment recommendations. Twenty-four sites contained self-stabilized architectural remains and consisted of collapsed prehistoric masonry structures dating to the Pueblo II through the early Pueblo III period and affiliated with the Kayenta Branch of the Ancestral Puebloan culture. Three of these sites were well preserved granaries with intact wooden lintels and other perishable artifacts including corn cobs. The majority of the sites visited were open air pueblo sites and while these structures were not as well preserved on the surface, the likelihood of well-preserved subsurface deposits is very high. All 31 sites were monitored to gather data on natural and human caused impacts currently affecting archeological sites in the Nankoweap Drainage.

This project addressed VT archeological condition assessments conducted during the summer of 2010 in the Nankoweap Drainage of GRCA. The 2010 condition assessment project involved two field

sessions - the first between March 9 and 15, and the second between September 8 and 12, 2010. During these two field sessions project personnel focused on three elements of data gathering: 1) to rectify some of the larger sites that were recorded by previous survey projects dating back as far as 1935 (22 sites were recorded and given new Grand Canyon Archeology site numbers); 2) to complete archeological site monitoring forms at nine previously recorded sites; and 3) to more intensively study seven of the 31 sites visited that were found to contain one or more structures with original, intact standing architecture (three or more intact above ground courses or intact wooden structural elements) using GRCA VT Condition Assessment forms. At these seven sites a total of 14 structures received VT Condition Assessments. The ASMIS site records for all sites visited during this project were updated with current condition and location information and are now considered complete, accurate and reliable.

Project members accomplished all project goals, often exceeding those goals, by assessing each site for ASMIS reporting and updating site record information when needed. All project fieldwork was completed in FY 2010, however, data entry will continue in FY 2011. Project tasks were completed by a combination of four volunteers, Glen Canyon National Recreation Area VT Archeologist Thann Baker, and GRCA VT Archeologists Ian Hough, Charlie Webber, and Shelley Szeghi.

The final site visited was a rock art site. This rock art panel includes figures of footprints, bighorn sheep, geometric designs (interlocking rectilinear and curvilinear motifs), scrolls, an anthropomorphic figure, a lizard, and a scorpion-like figure displayed across the boulder's southwestern face.

The total cost of the project was \$76,300, all of which was funded through the National Park Service Vanishing Treasures Program and was obligated in FY 2010. A technical report of the project will be prepared once the project is complete and the project activities will be published to the park's Web site.

Montezuma Castle National Monument

VANISHING TREASURES ACCOMPLISHMENTS AND CHALLENGES

VT Challenges and Successes: Tuzigoot and Montezuma Castle National Monuments (MOCA/TUZI) continue to collect baseline condition information for the VT archeological sites in all three of our units. In FY 2010, Montezuma Castle completed a VT funded project for stabilization treatment at 4 cliff dwellings within the Montezuma Well Unit. Additionally, MOCA began a documentation and testing project that will inventory and sample prehistoric wood at the Montezuma Castle cliff dwelling. The results of this study will provide the park with both tree-ring dates and condition information.

MOCA/TUZI has also begun several projects to document historic resources within park boundaries. These projects include the Light Detection and Ranging (LiDAR) mapping of a historic dugout, as well as a National Register of Historic Places nomination for an early homesteading cabin at Montezuma Well.

Consultation: Montezuma Castle and Tuzigoot continue to work successfully with the park's eight associated Native American tribes and the Arizona State Historic Preservation Office to meet our obligations for consultation on proposed projects.

Safety: Despite the continued use of safety equipment and standard operating procedures, our VT Mason aggravated an existing back problem while working at TUZI, resulting in a number of DART (days away, restricted, or transferred) work days.

VANISHING TREASURES STAFF

Matt Guebard, Archeologist
FY 1999 Position

This position was originally filled as a Mason but was converted to an Archeologist in 2004.

Skills: Ruins preservation, architectural analysis, compliance.

Accomplishments: In FY 2010, Matt completed condition assessments, architectural documentation, and stabilization at historic and prehistoric archeological sites located within the Tuzigoot and Montezu-



Montezuma Castle seen from near Beaver Creek, Montezuma Castle National Monument.

Photo: Randall Skeirik

ma Castle National Monument boundaries. Over the course of the FY 2010 field season, Matt was also responsible for archeological site monitoring, project planning and the creation of all project-specific scopes-of-work and completion reports, as well as for completing cultural compliance for all resource and facilities projects within the parks. Matt also participated in several interpretive programs and assisted with the creation of interpretive exhibits at Tuzigoot and Montezuma Castle.

Training: Matt participated in National Environmental Policy Act (NEPA) and Section 106 training in FY 2010.

Stefan Sloper, Mason

FY 1999 Position

This position was vacant during part of FY 2010. Lapse salary was used by the park's Resource Division.

Skills: Stefan has considerable experience in the stabilization of prehistoric masonry structures using soil cement.

Accomplishments: As in previous years, Stefan continued to remove and replace incompatible historic mortars from the TUZI ruin. Stefan also assisted with project planning, condition assessment, and the testing of amended and unamended mortar. After aggravating an existing back injury, Stefan left MOCA/TUZI in



*Melissa Philibeck and researcher Thomas Windes extract a tree-ring core in room 3-4 of Montezuma Castle, Montezuma Castle National Monument.
Photo: Courtesy Montezuma Castle National Monument*

September, 2010. The position is currently vacant.

VANISHING TREASURES PROJECT FUNDING

Project Name: Documentation and Stabilization of 14 Archeological Sites at the Montezuma Well Unit, Montezuma Castle National Monument

PMIS Number: 134753

Project Summary: This was the second phase of the effort to document and stabilize standing architecture at Montezuma Well. Documentation and condition assessment of Montezuma Well (a detached unit of MOCA) sites conducted in Phase 1 (FY 2009) indicated that only four sites required additional stabilization treatment. In Phase 2, they were treated using various techniques and materials designed to be compatible with each site's specific location and preservation problems. Project materials included natural unamended soils, synthetic amended soils (using Rhoplex E-330), and soil cement. The location, amount, and appearance of each treatment was extensively recorded using field forms, digital photographs, and medium format film photography.

Project work was completed by the Park Archeologist Matt Guebard; two term archeological technicians, Josh Kleinman and Melissa Philibeck; a Student Temporary Employment Program (STEP) archeological technician Ashlee Bailey; and our VT mason, Stefan Sloper. Approximately 1,690 labor hours were expended to complete all of the project goals. In addition

to stabilization, project work included site documentation, digital annotation, and report writing.

Project Budget:

Total VT Project Funding:	\$50,400
Personnel:	\$47,400
Vehicles:	\$0
Travel/Training:	\$0
Supplies/Materials:	\$3,000
Equipment:	\$0
Services/Contracts:	\$0
Other:	\$0

Project Accomplishments: Project work included repointing, resetting loose/detached stone, stabilizing loose plaster, and constructing basal footers. One site, which was initially recorded in poor condition and in danger of imminent collapse, was stabilized, upgrading its overall condition. Project work at the remaining three sites rectified damage caused by years of illicit visitation, erosion, and rodent damage.



*Matt Guebard and Jeremy Navenma inspect the Castle A ruins at Montezuma Castle, Montezuma Castle National Monument.
Photo: Courtesy Montezuma Castle National Monument*

Navajo National Monument

Navajo National Monument is part of the Southern Four Corners Group which also includes Canyon de Chelly National Monument and Hubbell Trading Post National Historic Site.

VANISHING TREASURES ACCOMPLISHMENTS AND CHALLENGES

VT Challenges and Successes: The Navajo National Monument (NAVA) VT program was successful in completing a condition assessment of the 125-room Betatakin Pueblo through a Cooperative Ecosystem Study Unit (CESU) agreement with Northern Arizona University. Field examinations of the architectural features are being used to develop a management and preservation strategy for the site. The condition assessment was supplemented by a structural analysis conducted by Vanishing Treasures Structural Engineer Preston Fisher, who was assisted by NAVA VT staff. In advance of the Betatakin project, a one-day training session covering form completion, digital photo requirements, and photo annotation was provided to NAVA VT and CESU staff by Ellen Brennan.

NAVA staff also assisted Canyon de Chelly National Monument with the completion of a condition assessment and structural analysis of Lower White House Ruin. This project was conducted through a CESU agreement with Ft. Lewis College. Those findings are also being used to develop a long-term management and preservation strategy for this important architectural site.

Western Mapping Company, under a contract with Navajo National Monument, has begun rendering a model of a series of 20 rooms from Keet Seel Pueblo using 3-D data collected at the site in 2004 and 2005.

Consultation: Consultations took place between the Navajo Nation and Southern Four Corners Group staff for the White House ruin condition assessment project. Navajo Nation representatives had no concerns about work proposed for the Lower Ruin (condition assessment and structural analysis) but did have concerns about the Upper Alcove project. While these issues were resolved and the project was allowed to go forward, it had not been successfully implemented at the time of this report. This project reminded involved staff to begin consultations early and to be as responsive as possible to the

needs of traditionally associated tribes.

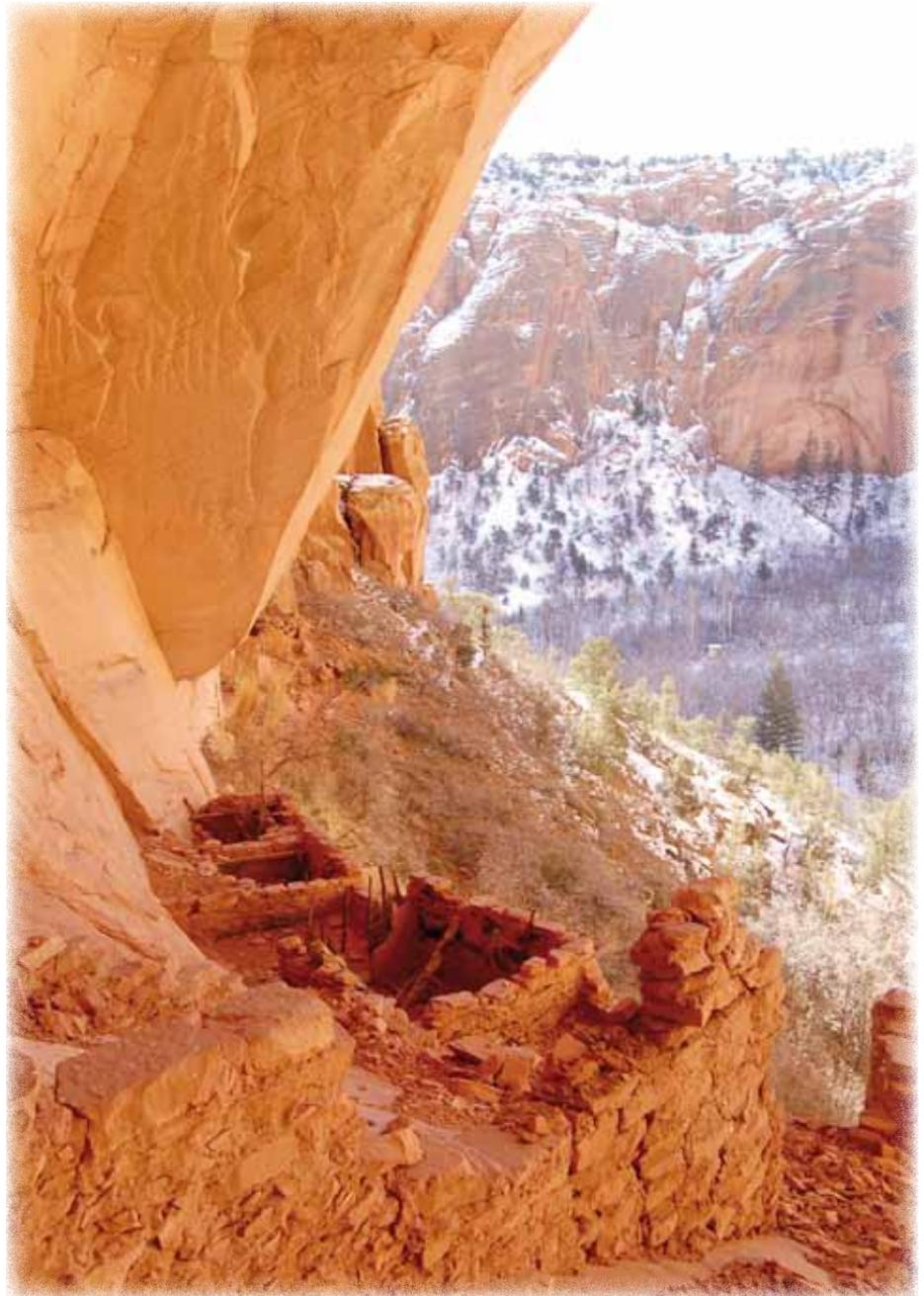
Safety: The Navajo National Monument VT program had no injuries during FY 2010. We developed a safety plan and job hazard analysis (JHA) for implementation of the Betatakin condition assessment project. The JHA and safety plan were provided to, and reviewed with, all project personnel prior to the start of the project. Daily safety reminders were given to project staff during the project and situational safety reviews were conducted as the project moved forward.

VANISHING TREASURES STAFF

**Ellen Brennan, Cultural Resources Program Manager, Southern Four Corners Group
FY 2000 Position**

This position was originally filled as an Archeologist but has been converted to a Cultural Resources Program Manager.

This position was vacant for the last three months of FY 2010, after Ellen left the position to take the Cultural Resources Program Manager position at Grand



Keet Seel, Navajo National Monument.

Photo: Courtesy Navajo National Monument



Looking down the valley toward the site of Inscription House, Navajo National Monument.

Photo: Randall Skeirik

Canyon. Lapse salary was used to cover salary and per diem costs for Lloyd Masayumtewa, who detailed into the position.

Skills: Ellen is skilled in condition assessments and architectural documentation, architectural typologies, data management, AutoCAD, Adobe Illustrator and Photoshop for graphic illustration and mapping, and geographic information systems (GIS) for data analysis and mapping.

Accomplishments: During FY 2010, Ellen was the NPS key official for the Betatakin, Keet Seel, and White House Lower Ruin projects and for the Canyon de Chelly trail survey and mapping project. Ellen served as the acting superintendent for Navajo National Monument during the late spring and early summer of the year. Ellen transferred to the Grand Canyon in July, 2010.

Training: Ellen attended Agreements Technical Representative training in June, 2010.

Susan Bierer, Archeological Technician (Term)

FY 2005 Position

Skills: Susan has experience as a site monitor, has conducted condition assessments

and site documentation, has edited and rendered archival maps using Adobe Illustrator, and has experience with GIS data management.

Accomplishments: Susan continued to make great progress on the stabilization history report for Keet Seel. Her research has filled gaps in our knowledge of past activities at the site and, when complete, it will provide a comprehensive, synthetic assessment of the site and its archeological history.

Susan was involved with the condition assessment and structural analysis work at Betatakin and White House (Lower Ruin). She worked as a site monitor at Keet Seel, Betatakin, and Inscription House Ruins at NAVA, assisted VT structural engineer Preston Fisher at Betatakin Ruin and Lower White House Ruin at Canyon de Chelly National Monument, conducted condition assessment and documentation activities at Kiva Cave, and edited and rendered archival maps in Adobe Illustrator.

Training: Susan attended a one day-training session on completing architectural condition assessments and also attended NPS Fundamentals, National Environmental Policy Act (NEPA)/Section 106, and Native American Grave Protection

and Repatriation Act (NAGPRA) training this year.

Joshua Ramsey/Paul Leatherbury, Archeological Technician/Archeologist FY 1998 Position

This position was vacant during part of FY 2010. Lapse salary was used to cover payroll for Joshua Ramsey, a student temporary employment program (STEP) employee. In June, Paul Leatherbury was hired as a permanent archeologist and Joshua transferred to Canyon de Chelly as a Student Career Experience Program (SCEP) hire working for their watershed restoration project as an archeological technician.

Accomplishments: Paul was the NPS field lead for the White House Lower Ruin condition assessment project.

Training: Paul had no VT-related training in FY 2010.

VANISHING TREASURES PROJECT FUNDING

Navajo National Monument did not receive Vanishing Treasures project funding in FY 2010.

Organ Pipe National Monument

VANISHING TREASURES ACCOMPLISHMENTS AND CHALLENGES

VT Challenges and Successes: The cultural resource challenges facing Organ Pipe Cactus National Monument Cultural Resource Office are many and varied in scope. We are working to preserve valuable heritage resources in an environment that is at times dangerous, but always exciting, wild, and beautiful. Our successes are considerable, given the challenges we face working in the 330,000 acres of wilderness with more than 1000 archeological sites (of which only 300 have been documented or minimally recorded). Located in southwestern Arizona on the international border between the U.S. and Mexico, many of our cultural resources are Vanishing Treasures resources that are significant in the context of early ranching and mining. Lately, the staff has begun the re-evaluation of our extensive prehistoric earthen architectural features in terms of their significance and qualification for consideration as Vanishing Treasures resources.

One of our successes this past year was at prehistoric village site, AZ Z:13:1 (ASM), also known as the Reservoir Site or

Kuakatch Village. This site encompasses more than 260 acres and its primary feature is a walk-in well (or reservoir) believed to be one of the earliest architectural features found in the region. It is significant because evidence of water collection and storage signifies year-round residence and a sedentary village culture. The well is known to have contained cattails and other year-round plants, and it consisted of a well dug out with the backdirt mounded into a U-shaped berm, forming a feature that resembles a walk-in well. Cultural resource staff took a charcoal sample from a hearth protruding from an eroded cut bank in association with numerous artifacts on the site and had a radiocarbon assay performed. The results were exciting, with the site dating to ca. A. D. 1170 800-years before present (B.P.) (plus or minus 40 years). We are beginning to evaluate other earthen architecture throughout the park, which contains extensive akchin floodwater farming fields with berms and channels, as well as numerous repesos (earthen dams), charcos (earthen water tanks), and canals. Such prehistoric architectural features are being looked at more closely by researchers in terms of desert water use and water control.

In conjunction with the increased importance placed on prehistoric water control devices, the Organ Pipe Cultural Resource Office is redirecting its attention

to archeological sites spread across the landscape for which no definitive site boundaries are known, which may contain water control features and may be considered Vanishing Treasures resources. Many sites were recorded before the advent of the global positioning system (GPS)--therefore no shape files exist for their boundaries--and new archeological sites are being discovered by the staff each week. We have made great strides in collecting GPS coordinates, producing maps, and creating shape files of our most important sites, including the Kuakatch Village site. We are formulating new GIS layers of recorded site boundaries and areas surveyed for cultural resources throughout the park.

Another project soon to be entered into the Project Management Information System (PMIS) deals with an ethnographic study of the Organ Pipe Cactus park lands, emphasizing traditional plant uses and crops grown using the floodwater farming (akchin) techniques, since Organ Pipe contains extensive akchin fields and canals. These fields are important because they appear in the literature and oral traditions of nearby tribes, who practiced temporal farming with dual residences--one in the floodplains, used until harvest time, and one in the mountains used in the winter. We believe that the constructed water control devices and earthen features can be



*Sunset on the Ajo Mountains, Organ Pipe Cactus National Monument.
Photo: Courtesy Organ Pipe Cactus National Monument*

considered Vanishing Treasures resources because they are, without exception, in a 'ruined' state, have exposed intact fabric (earthen berms, constructed dams/represos/charcos, canals, channels), are not being used for their original function, have had occupation and utilization interrupted and discontinued for an extended period of time, are located in the arid West, and are considered to be eligible resources to the National Register by both park management and the State Historic Preservation Officer (SHPO).

We have completed the first step in writing a new Cultural Resource Management Plan (CRMP), which consisted of establishing a Cultural Chronology for the Organ Pipe area and compiling a general Culture History to use in our original reports. In reviewing the 1994 Cultural Resource Management Plan, it seems probable that the new plan will incorporate almost every objective of the 1994 plan, since virtually none of those goals were ever realized. It will also feature a new emphasis on desert water control devices and historic mining, which are the bases for early settlement of the region. Miners' demand for beef led to the establishment of cattle ranching in the area, another important cultural context for this region.

The Vanishing Treasures Program, in conjunction with the Desert Southwest Cooperative Ecosystem Study Unit (DS CESU), the University of Arizona and Cornerstones Community Partnerships, was integral in allowing the Organ Pipe Cactus National Monument Cultural Resource Office to hold successful ruins preservation workshops in January and March, 2010 which stabilized and repaired structures at Bates Well Ranch. In FY 2011, we will again partner with Vanishing Treasures, the University of Arizona, and Cornerstones to stabilize and repair structures at Gachado Well and Line Camp and Armenta Ranch, and to conduct additional work at Bates Well. Gachado is an early 20th-century adobe ranching structure located directly on the border with Mexico, and Armenta is an example of an early Sonoran Desert small-time truck farming operation with a historic wood, brick and adobe house and a traditionally-constructed ramada. While Armenta is not eligible for the National Register, (and is therefore not considered a Vanishing Treasures resource), Gachado Line Camp is listed among our Vanishing Treasures and was listed on the National Register in 1978.

This year, the National Register nomination form and Cultural Landscape Inventory (CLI) for the Victoria Historic Mining District were completed. The Cultural Resource Office at ORPI has collected GPS coordinates, mapped, and recorded the new district in the Arizona Archeological Site and Survey Database (AZSITE). The new district contains nearly 95.5 acres, and several new important features were documented and added to the park's inventory. Additionally, through an earlier CESU project, the Dos Lomitas and Gachado Line Camp project, the "Organ Pipe Cactus National Monument Historic Ranching Thematic Context Statement" was completed and accepted into the Organ Pipe Cultural Resource Research Library. A CLI and new National Register nomination form are in progress for the Quitobaquito resource area.

Consultation: In early April we held consultation meetings with several Hia C'ed O'odham representatives concerning grave sites at the Quitobaquito Cemetery. In addition, the park Superintendent, the Chief of Resources, and the Archeologist all met with the Tohono O'odham Tribal Historic Preservation Office and with tribal elders concerning the discovery of pictographs at the Wild Horse Tanks tinajas and rock shelter, which may be considered a Vanishing Treasures resource based on the historic dam that was constructed above the rock shelter there. Water retained by the dam is seeping into the rock shelter, threatening to destroy the pictographs.

We provided the tribe with a copy of a hydrology report prepared by the NPS, and talks are continuing on how best to mitigate damage and conserve the site. The Tohono O'odham will also be invited to comment on the report of the comprehensive Class III intensive archeological survey of the rock shelter and adjacent bajada performed by Organ Pipe staff that will be published shortly. The park consults with the tribes periodically on park projects, including the Ruins Preservation field schools, which have included the participation of at least one tribal member, along with any other matters that might be of tribal concern. We will be holding Native American Graves Protection and Repatriation Act (NAGPRA) consultation meetings shortly for the repatriation of a cremation found on park lands in 1951.

Safety: Because of safety concerns related to illegal border activities in the park, the Cultural Resource staff is not given free access to many of our important

resources that are located in the 60 percent of the park that is currently closed to the public. These parts of the park cannot be accessed by park staff without an armed law-enforcement escort, and all park staff members who are out in the field are required to call in their status hourly. These safety procedures have helped to minimize the danger associated with fieldwork in the park.

VANISHING TREASURES STAFF

Connie Thompson Gibson, Archeologist & Cultural Resources Program Manager FY 2005 Position

Skills: Connie has been certified as a Registered Professional Archeologist since 2003. She has a B.A. and M.A. in Anthropology from the University of Texas at San Antonio (UTSA) with an archeology concentration. She also has an A.A.S. in Computer Information Systems from Germanna Community College, Virginia. Connie has 16 years of progressively responsible experience in all aspects of archeology including fieldwork, laboratory work, materials classification and analysis, supervision of students and employees, and writing/editing technical cultural resource management (CRM) reports. She was Laboratory Director for the Southern Texas Archeological Association for five years, Research Scientist Assistant at the Center for Archeological Research at UTSA for six years, was recruited to set up the archeology laboratory at the Center for Archeological Studies at Texas State University, and served as the Curator of Archeological Research Collections and the Technical Editor of CRM reports. Her specialties include lithic technologies (prehistoric chipped and ground stone) and historic ceramics. Connie has fieldwork experience in Arizona, New Mexico, Texas, Montana, and Louisiana, as well as in Chihuahua, Mexico and Belize in Central America.

Accomplishments: Over the past year, as the Organ Pipe Vanishing Treasures Archeologist, Connie has completed Section 106 compliance for 16 projects on the Planning, Environment, and Public Comment Web site, including archeological surveys, mapping, NPS Assessment of Effect forms, and cultural resource reports for submission to the Arizona SHPO. Additionally, at least 400 acres of previously unsurveyed federal acreage was intensively surveyed for cultural resources under the National Historic



Pat Taylor works with field school participants to document the one remaining water tank during the Bates Well field school, Organ Pipe Cactus National Monument

Photo: Courtesy Organ Pipe Cactus National Monument

Preservation Act Section 110 mandate, as well as for Section 106 compliance, in partnership with the University of Arizona Anthropology Department. This included several exploratory transects through wilderness areas in the closed sections of the park (red zones), and the new site for a Border Patrol Forward Operating Base.

Under Connie's direction, the Cultural Resource Office conducted original research at the Wild Horse Tanks rock shelter to systematically record and collect surface artifacts in danger of being trampled or collected by visitors. We also wanted to assess the damage occurring to the rock art beneath the tank. The rock art motifs in the rock shelter are being damaged by salts carried by water leaching from the tank above: an NPS hydrologist has assessed the tinajas and cement dam for alternative mitigation or treatment strategies. Several valuable artifacts have been discovered, including a dart point

typed as a Cortaro point, which dates to the Middle Archaic period (approximately 4,500 to 4,000 years B.P.), and portions of an obsidian dart point as well as painted ceramics typed as Hohokam Red-on-Buff.

The Kuakatch Village Site (AZ Z:13:1), which contains an earthen architectural feature (a well or reservoir), received a reconnaissance survey, its site boundaries were mapped, and a radiocarbon sample was taken from an exposed hearth. The site was found to date to A. D. 1170, plus or minus 40 years. This site is under consideration for inclusion as a Vanishing Treasures resource.

An exciting new archeological site named the Glory Site was discovered and is in the process of being recorded. It too may contain features that will qualify it as a prehistoric Vanishing Treasures site. It appears to be a large (75 to 100-acre) Archaic to Late Prehistoric village site with several huge metates; at least 20 diagnostic

projectile points in various styles; and multiple biface, uniface, and utilized flakes. A circular rock alignment resembling a shrine or community hearth is present, and additional features may be discovered during the planned intensive survey.

Training: In the past year Connie attended NPS Fundamentals II: Introduction to NPS Operations at the Grand Canyon, Contracting Training for Customers, Foundation of Asset Management, Introduction to the Facility Management Software System, Assistance Agreements for Agreement Technical Representatives, and various other required NPS training courses.

VANISHING TREASURES PROJECT FUNDING

Organ Pipe Cactus National Monument did not receive Vanishing Treasures project funding in FY 2010.

Tonto National Monument

VANISHING TREASURES ACCOMPLISHMENTS AND CHALLENGES

VT Challenges and Successes: Challenges in FY 2010 included the dangers of Africanized bee hives within and around the primary cliff dwellings and addressing visitor-related and rodent impacts to original fabric.

Consultation: Tonto National Monument (TONT) staff had productive meetings with the Arizona State Historic Preservation Office (AZSHPO) staff regarding the use of the new Programmatic Agreement and cultural resource projects that required Section 106 compliance.

Safety: Ruins preservation projects at TONT in FY 2010 were a success with no reported safety incidents.

VANISHING TREASURES STAFF

Duane C. Hubbard, Chief, Resource Management
FY 1998 Position

This position was originally filled as an Exhibit Specialist but has been converted to an Integrated Resource Manager.

Skills: Duane's skills include condition assessment, architectural documentation, stabilization histories, compliance, and hands-on ruins preservation.

Accomplishments: During FY 2010, Duane supervised a variety of cultural resource projects, including preservation projects at backcountry archeological sites, and continued documentation, preservation, and research at the five primary cliff dwellings in the Monument. Specifically,

the TONT cultural resources staff completed projects related to backcountry site preservation, implementing integrated pest management (IPM), and a retaining wall stabilization project in the primary cliff dwellings. Duane continued to establish relationships with numerous Native American tribes, and he managed the park's archeological research program, curation, consultation, and compliance.

In addition to Duane's regular duties at TONT, he also assisted other VT parks as the Southern Arizona (SOAR) Office's regional archeologist. Several tasks were accomplished in this role that benefited VT parks including assisting with the entry of maintained archeological sites (MAS) into the facility maintenance software system (FMSS), performing in-field condition assessments, and coordinating Arizona cultural resources staff meetings.

Training: Duane had no training related to Vanishing Treasures work.

VANISHING TREASURES PROJECT FUNDING

Project Name: Preserve Three Retaining Walls in Lower Cliff Dwelling, Southern Annex and Upper Cliff Dwelling

PMIS Number: 123561

Project Summary: Tonto National Monument requested funding for a treatment project focused on the Monument's ruins stabilization structures (retaining walls). This project involved preservation treatments to replace eroded mortar at three of the most important stabilization structures in the Monument. Treatments included capping and repointing, repair of rodent damage, and mitigation of basal erosion. Formal

condition assessments performed in FY 2004 and FY 2005 indicated that this work was needed to maintain the integrity of the stabilization structures, the prehistoric dwellings, and their associated cultural deposits.

Project Budget:

Total VT Project Funding:	\$101,492
Personnel:	\$78,268
Vehicles:	\$0
Travel/Training:	\$2,046
Supplies/Materials:	\$0
Equipment:	\$0
Services/Contracts:	\$12,448
Other:	\$8,730

Project Accomplishments: The project began in FY 2010 and field work included documentation, preservation treatments, and reporting--all undertaken by Duane Hubbard, TONT Archeologist and Chief of Resource Management. Also assisting in these tasks were Gavin Gardner (TONT Project Archeologist), Roger Dorr (Flagstaff Area Parks Project Archeologist), Kristin Converse (TONT student temporary employment program (STEP) Archeological Technician), Dave Janson (Maintenance Worker), and staff from the Saguaro National Park Trail Crew who had masonry experience. The majority of preservation treatments on retaining walls were performed at the Upper Cliff Dwelling, which raised the entire site's condition from "fair" to "good".

Preservation crews removed ineffective and eroded mortar throughout the walls. With the joints cleaned, all voids in the wall and mortar joints were repointed with an amended soil and stucco (1:1). The result of the project is that animals can no longer live inside the walls and the walls are stable and preserved. The walls will need cyclic maintenance on a schedule of at least 5-10 years to repair future damage caused by rodents, visitors, and weather. As a result of the project, all the retaining walls at the primary cliff dwellings were raised from "fair" to "good" and the project was a great success.

In addition to the work on the retaining walls, preservation crews completed projects at the Upper, Lower, and North Annex Cliff Dwellings, including preserving prehistoric walls by injecting unamended mortar into areas of insect/animal damage and visitor disturbance, and preserving NPS constructed features (stairs, benches, and doorways) within the dwellings using stucco and stucco/soil mixtures.



*Interior view of the Lower Cliff Dwelling, Tonto National Monument.
Photo: Courtesy Tonto National Monument*

Tumacácori National Historical Park

VANISHING TREASURES ACCOMPLISHMENTS AND CHALLENGES

VT Challenges and Successes: This year's challenges at Tumacácori National Historical Park (TUMA) were related primarily to staffing issues and the need—not once but twice—for emergency preservation treatments on the mission church. It appears that we have been able to address some of the sources of the problems and the damage has been repaired so, with no serious harm done, we are looking at this as a learning experience.

Consultation: A Native American Grave Protection and Repatriation Act (NAG-PRA) repatriation/reburial was completed this year, after three years of consultation. Additional, project-related consultation with affiliated tribes continued as needed.

Safety: We are in the process of purchasing new scaffolding and attending more scaffolding training.

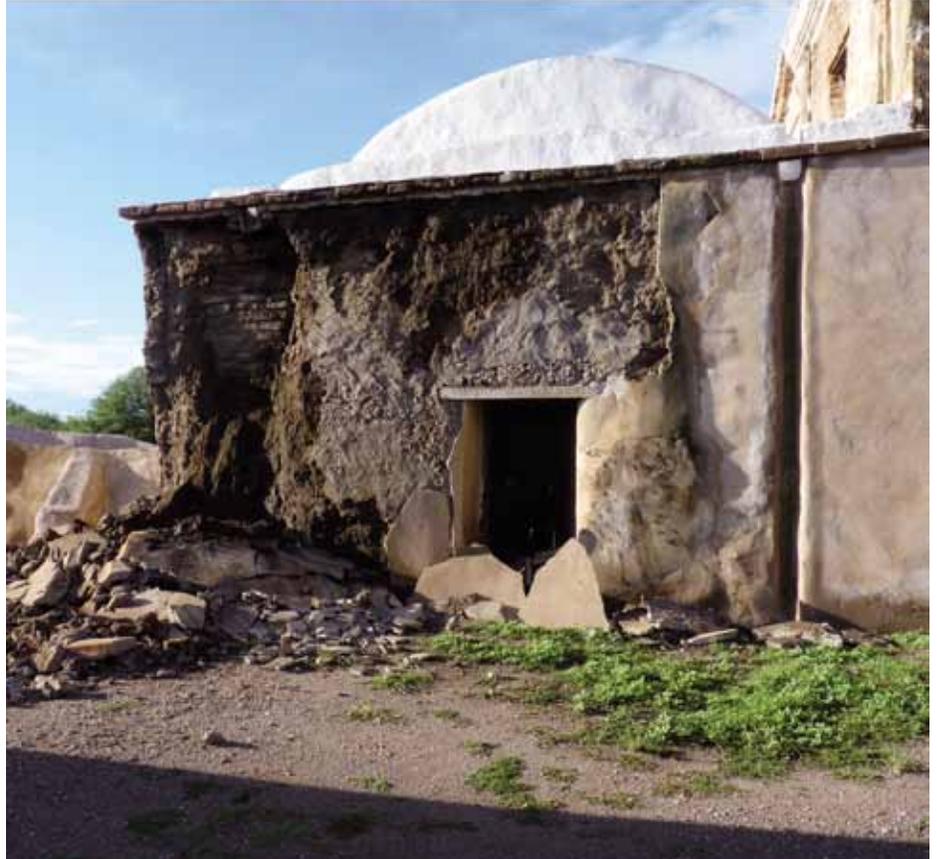
VANISHING TREASURES STAFF

**Jeremy Moss, Chief of Resource Management, Archeologist
FY 2000 Position**

This position was originally filled as an Archeologist but has been converted to a Chief of Resource Management.

Skills: Jeremy's skills include prehistoric/historic archeology and artifact analysis, historic preservation documentation and condition assessments, project development, compliance, and tribal consultation.

Accomplishments: FY 2010 was a challenging year at TUMA. Heavy rains in January and again in August resulted in damage to two areas of the main mission church. In January, five inches of rain fell over two days, resulting in the formation of a large hole in the outer half of the west wall of the sanctuary near the window. Jeremy worked with TUMA staff to assess the damage, determine a course of action, acquire emergency funds, and execute and document the repairs. The hole was filled with new adobes and the outer portion of the lintel was replaced. Site conditions suggested that this problem related to how water was draining off the dome, so drainage was improved and the roof repaired. The area is now being monitored



*Failure of the north wall of the sacristy, Tumacácori National Historical Site.
Photo: Courtesy Tumacácori National Historical Site*

closely.

In August, monsoon rains resulted in the collapse of the outer half of a portion of the north wall of the sacristy adjacent to a canale (drain). This area was a known problem spot that could have been repaired proactively to prevent this damage from occurring. Working with TUMA preservation staff, Jeremy supervised the rebuilding of the failed portion of the wall and the sacristy roof ledge. The repairs were documented with help from Matt Guebard from Montezuma Castle and Tuzigoot National Monuments. VT staff and the regional office supported TUMA with advice and assisted in acquiring emergency funds for both repairs.

Besides emergency repairs at the mission church, numerous other projects were completed in FY 2010 under Jeremy's supervision. Encroaching vegetation was removed at TUMA's two detached units, Calabazas and Guevavi. Executed with the help of a youth group, this work improved both the visual landscape and the condition of the resources. Both sites also received minor preservation treatments and capping, and Jeremy conducted repeat

photography to document natural erosion and rodent impacts. At Calabazas Jeremy oversaw the construction of a new fence around the mission compound to reduce trespass and vandalism, and motion sensing cameras were installed to detect and record intrusions. Also at Calabazas, drainage of the metal shelter over the site was improved by installing seamless gutters, downspouts, and piping that will drain water away from the building walls.

Working with Desert Archaeology Inc., Jeremy obtained the funding for, and coordinated the execution of, a project aimed at understanding the surface archeology and the date of surface deposits at Calabazas. So far, the project has resulted in the identification of an 1850s U.S. Calvary blacksmith shop that was in operation during the time that the mission was being used as the headquarters for Fort Mason. This project has also found prehistoric pottery, suggesting that there may have been early pre-mission occupation at Calabazas (which is a hotly debated topic). Jeremy worked with the park's Facility Manager on a contract for new roofing on the mission church.

After three years of work, Jeremy completed the repatriation and reburial of human remains and associated funerary objects (AFOs) to the Tohono O'odham Nation in October. In addition, a two-day multi-tribal reburial ceremony resulted in the reinterment of 170 individuals on park lands. Jeremy has worked to improve tribal consultation and involve our affiliated tribes in park decisions, resulting in improved tribal relationships for the park.

In the area of outreach and external preservation projects, Jeremy assisted three Arizona State Park units with preservation and archeological compliance projects. At Sonoita Creek State Natural Area, Jeremy completed a small survey for archeological sites near springs within a new addition to the preserve. As a result, three large archeological sites were identified and mapped, and artifacts were analyzed to determine the site's age and cultural affiliation. This site info was entered into AZSITE. At Karchner Caverns, Jeremy completed a small archeological clearance for proposed new RV pads that resulted in the decision to move the RV pads to another location that would not damage known archeology. Jeremy and the TUMA preservation staff also assisted Tubac Presidio State Park with preservation maintenance of the historic Rojas House and we will continue to assist Arizona State Park units near Tumacácori.

Training: Jeremy worked two details in FY 2010, totaling two months. He served as a resource advisor for the Gulf Oil Spill and later as the Acting Chief of Resource Management for the Southeast Utah Group in Moab, Utah. These details expanded Jeremy's knowledge of project management, leadership, and the management of large-scale operations.

Ray Madril, Masonry Worker FY 1998 Position

Skills: Ray is a skilled mason and a true jack of all trades. He is the lead mason at Tumacácori and his skills include all facets of historic preservation treatments including adobe and stone masonry, lime and mud plasters, and project planning and execution.

Accomplishments: Ray put his skills to work this year in the repair of two major wall collapses resulting from heavy rainfall events. He repaired the large hole that surrounded the west sanctuary window, replacing adobes, setting a new window lintel, and replastering the repaired area.

A few months later Ray supervised the rebuilding of a portion of the northeast corner of the sacristy wall that collapsed after heavy monsoon rains. A crew from Fort Davis assisted with this work. Ray also completed preservation maintenance and recapping at Guevavi, installed a new gutter system for the metal ruins shelter at Calabazas, and assisted with fence work to protect Calabazas and Guevavi.

Ray also assisted Tubac Presidio State Park with preventative maintenance on the historic Rojas House.

Training: Ray completed cardiopulmonary resuscitation (CPR) and First Aid training.

David Yubeta, Exhibit Specialist FY 1998 Position

This position was not vacant during FY 2010; however David retired from his long career with the National Park Service at the end of the fiscal year. David has these parting words:

Over the last 14 years, in my tenure as a circuit-riding Vanishing Treasures Exhibit Specialist, I have had the opportunity to work at over 70 different NPS and other land agency sites both in Mexico and the United States. I have provided treatment interventions, condition assessments, preservation training, and guidance; and I have had the opportunity to work with some of the most dedicated preservation-minded people in the world.

It is with this thought that I dedicate this final farewell to the often unheralded people whose job it is to care for the resources under their charge, the Preservation Craftswomen and Craftsmen of the NPS. These men and women are the future of the VT program. They are highly skilled artisans who ply their knowledge and demonstrate their love of the resources on a daily basis. These are the archaeologists, architects, engineers and those hands-on masons who are the best in the nation at what they do, caring for the patrimonies and treasures entrusted to their care. I am honored to have been a part of the VT program and to have crossed the paths of so many of these true professionals. I would like to thank my Superintendents, Ann Rasor and Lisa Carrico, for believing in me and supporting this program. I will continue to assist the preservation community in whatever capacity that I am asked.

Adelante!

David Yubeta

Skills: David provided all levels of preservation project management for NPS projects as well as for other Federal and state agencies.

Accomplishments: After an inordinate amount of winter rain in early 2010, a large portion of the exterior sanctuary wall on the Franciscan church failed and approximately two tons of material were lost. Adobes had to be made to fill in the large void and repair was begun. David spent most of his time facilitating work to repair the wall failure. VT preservation specialists, park staff, and other southwest preservation experts assisted in the repair.

David also worked on capping the ruins of mission Los Santos Angeles de Guevavi and used this venue as an opportunity to train a seasonal crew on treatment intervention. Following the capping at Guevavi, the preservation crew made adobes and removed a failed lime plaster coat on the corridor at Tumacácori's Franciscan church.

David also provided assistance to Tubac Presidio State Park in assessing damage to the historic Otero House and providing treatment strategies for repair. David provided a condition assessment on the historic Tilford Cabin at Great Basin National Park.

Condition assessments were also provided to historic Ft. Lowell in Tucson, Bureau of Land Management's Fairbank Mercantile, Sosa Carrillo House, Marist College, and other earthen resources in the Tucson area.

David continued to serve as an instructor for the Facility Managers Cultural Resource training, this year presenting his session at Mt. Rainier National Park.

Finally, David ended the year with a condition assessment of the 14 buildings of the Southwest National Sheep Breeding Laboratory at Ft. Wingate, New Mexico for the U.S. Forest Service.

Training: David did not participate in any VT-related training this year.

VANISHING TREASURES PROJECT FUNDING

Tumacácori National Historic Site did not receive Vanishing Treasures project funding in FY 2010.

V a n i s h i n g T r e a s u r e s

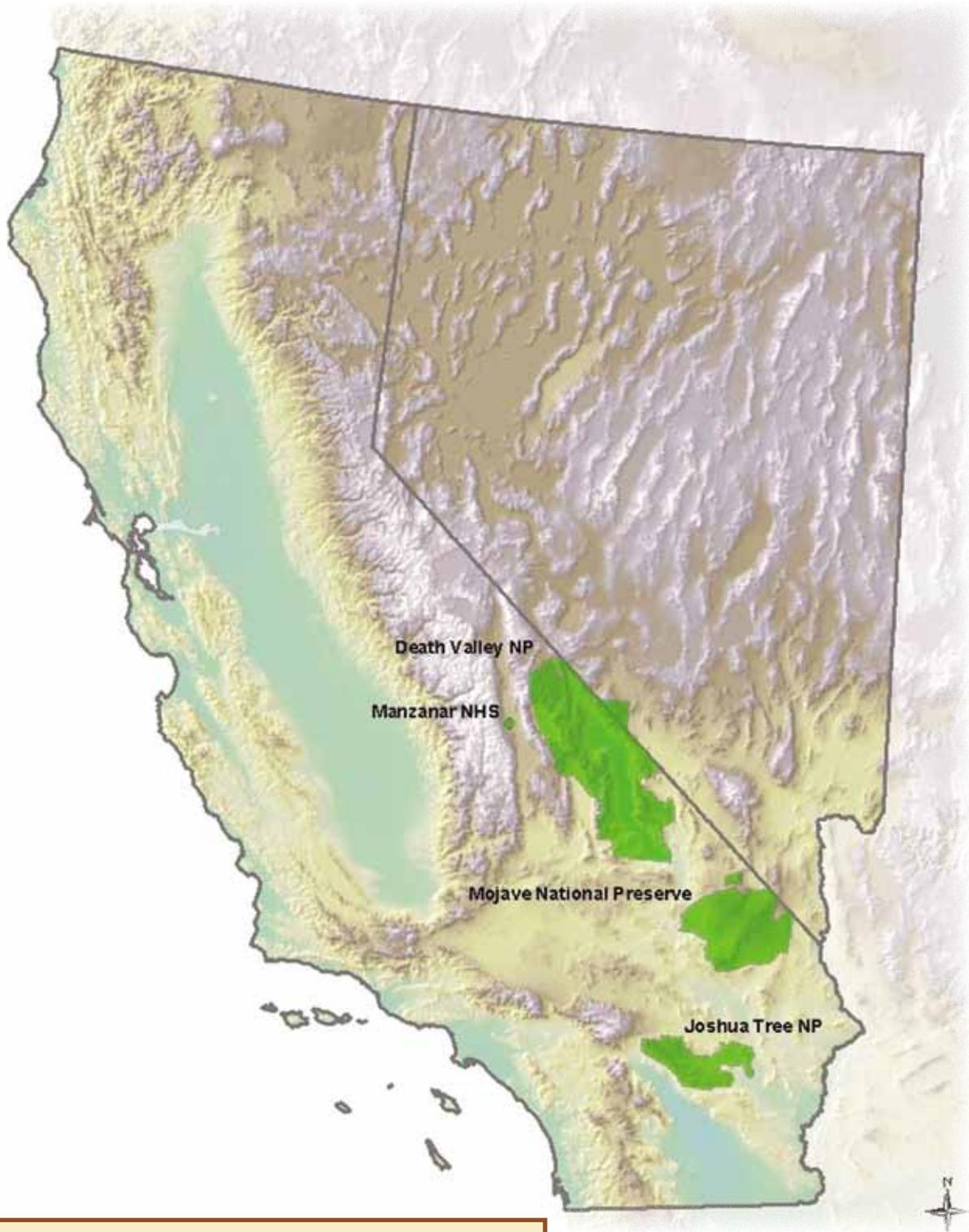
California/Nevada



Retaining walls and a 70-foot brick stack are all that remain of the Panamint City smelter, Death Valley National Park

Photo: Randall Skeirik

- ◆ Death Valley National Park
- ◆ Joshua Tree National Park
- ◆ Mojave National Preserve
- ◆ Manzanar National Historic Site



**California/Nevada Fiscal Year 2010
Project Funding Summary**

Funded Projects:

Mojave National Preserve \$ 35,000

Mojave National Preserve

VANISHING TREASURES ACCOMPLISHMENTS AND CHALLENGES

VT Challenges and Successes: Through consultation with the Vanishing Treasures Program leadership, Mojave National Preserve (MOJA) was able to redirect funding for a project (which had partially collapsed in 2009) from condition assessment and treatment planning to an emergency stabilization effort. This project was a complete success, and has since been featured in the park newspaper as a showcase example of National Park Service management of public resources. It has also been presented to fellow staff, and to the public, as an outstanding example of the use of NPS money, and local history groups (that have, in the past, had strained relations with the Park) have expressed appreciation for the work accomplished.

Consultation: There were no consultation issues related to this project.

Safety: In working on our VT funded

project, partially collapsed roof and walls, as well as an unstable brick fireplace and chimney, demanded creative safety solutions. The present Mojave historic preservation staff has been selected and hired from a variety of carpentry backgrounds, many focusing on historic structures rehabilitation, giving us the knowledge and experience to work safely on unstable structures.

VANISHING TREASURES STAFF

Mojave National Preserve has never received funding for a Vanishing Treasures position.

VANISHING TREASURES PROJECT FUNDING

Project Name: Conduct Condition Assessment and Prepare Treatment Plan for Bighorn Mine Residence

PMIS Number: 120263

Project Summary: The Big Horn Mine residence, or “Hilltop House”, is located at the southeastern base of the Hidden Hills and is part of the Hidden Hill Mining

District in the south-central portion of Mojave National Preserve (MOJA). Although little is known about the history of the mine or the residence, we do know that the house was built prior to 1933. At that time, W. E. Wilson was the Big Horn Mine operator and Herbert and Anna von Wagenheim were living on-site at the mine as caretakers. We also know that the Big Horn Mine operation was one of the customers of the historic 7IL Ranch cattle operation. While the mine was in operation, the “Hilltop House” residence was a gathering place for local miners, ranchers, and homesteaders for holidays and other celebrations.

This Vanishing Treasures funded project was originally intended to provide a condition assessment and treatment plan for the historic Big Horn Mine residence. Unfortunately, by the time the project was approved and funded, half of the structure had collapsed. After consulting with the VT Leadership, it was agreed that the money would be redirected toward the goal of stabilizing the structure. It is the long-term goal of the park to preserve



*Site of Hilltop House with Pinto Mountain in the background, Mojave National Preserve
Photo: David Nichols*



*The Mojave Historic Structures Maintenance Crew works on Hilltop House, Mojave National Preserve.
Photo: Jennifer Morrell*

this structure and to nominate both the mine and the residence to the National Register of Historic Places. Because this project money was diverted for emergency stabilization work, no assessment of this structure's present condition, integrity, or potential threats has been yet been prepared.

Project Budget:

Total VT Project Funding:	\$35,000
Personnel:	\$16,171
Vehicles:	\$1,331
Travel/Training:	\$0
Supplies/Materials:	\$17,387
Equipment:	\$0
Services/Contracts:	\$0
Other:	\$111

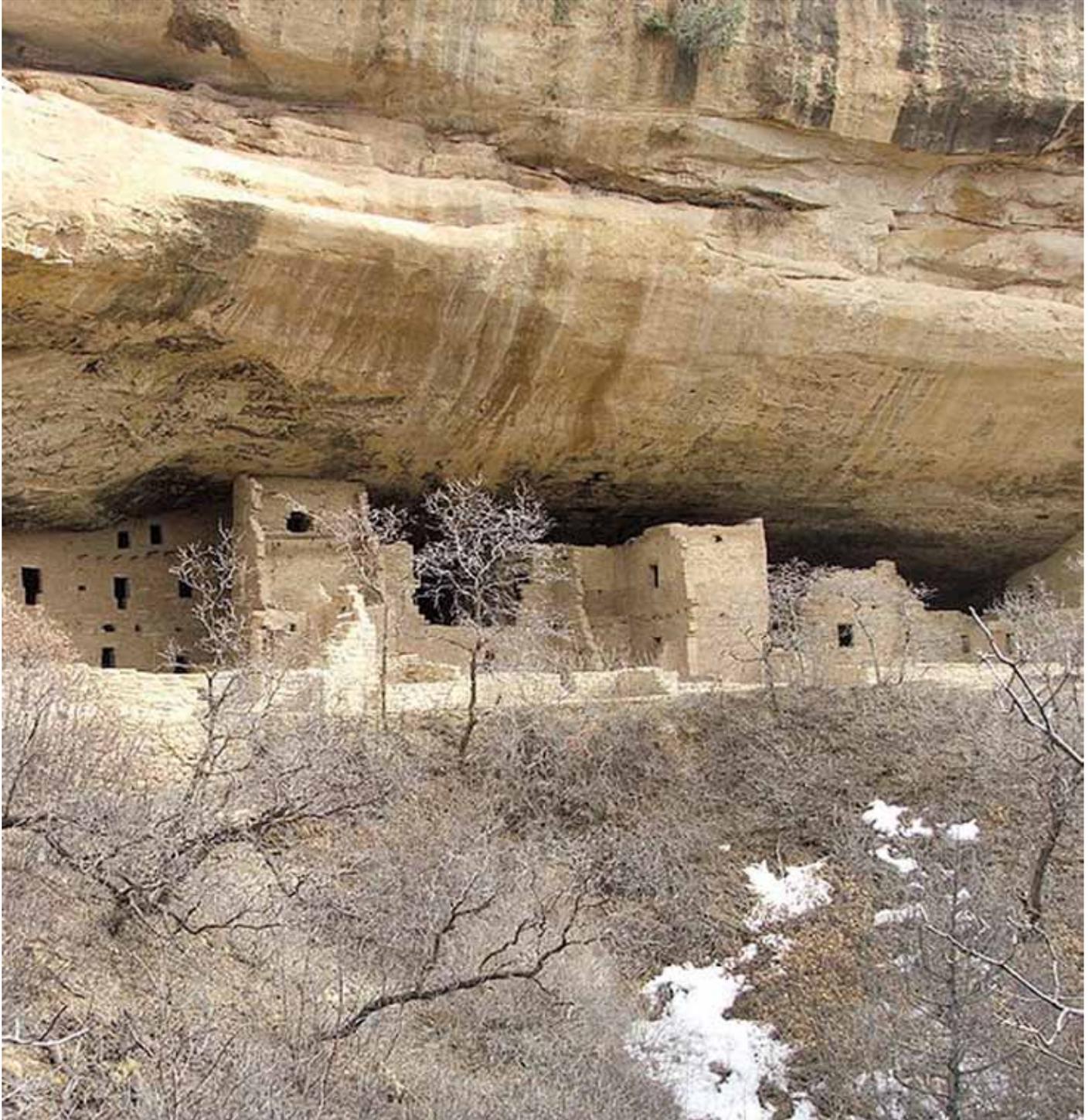
Project Accomplishments: Initial site visits by the MOJA Historic Structures Maintenance Crews determined that the Hilltop House was constructed in a vernacular architectural style that had inherent structural faults. These design flaws eventually resulted in its partial collapse. Faulty open-beam ceiling construction caused

the north end of the house to collapse. This flaw was remedied during stabilization by drilling the beams near where they strike the top plates of the walls and installing chains from wall to wall to create a truss effect. At the time of stabilization, it was also evident that the one remaining standing wall was out of plumb by 2 inches and that the attached porch was leaning and applying pressure to this wall. To maintain integrity, the porch and the standing wall were shored up while debris from the collapse was removed. During demolition and cleanup, it was also discovered that the ridge beam was not resting on a king post, but rather was held in place by nails alone. Despite this additional construction flaw, this portion of the structure was successfully deconstructed. Original lumber was salvaged, when possible, for use in the reconstruction of the collapsed portion of the house. Nevertheless, ten large truckloads of on-site debris were removed from the house.

Completed work included the truing and

repair of the southeast wall, which was also detached from the newly shored porch and porch rafters enabling it to move freely. The existing floor, although level, had been constructed on 4x6 sleepers laid on the bare earth and required the excavation of soil underneath to create a crawlspace. The subfloor was replaced and the existing tongue and groove finish flooring reinstalled. The interior of the house was cleaned out and all non-original materials were removed. Subfloor piers that were of structural importance to the entire building were repaired or removed and replaced as necessary. The existing roof, which was the result of many years of patching and overlayment, was completely removed and replaced with period (circa 1930s) composite shingles over roofing felt. As a result, the roof is now completely watertight and weatherproof. Finally, the entire exterior of the building was sheathed with plywood and battens and was painted to match its appearance in period photographs.

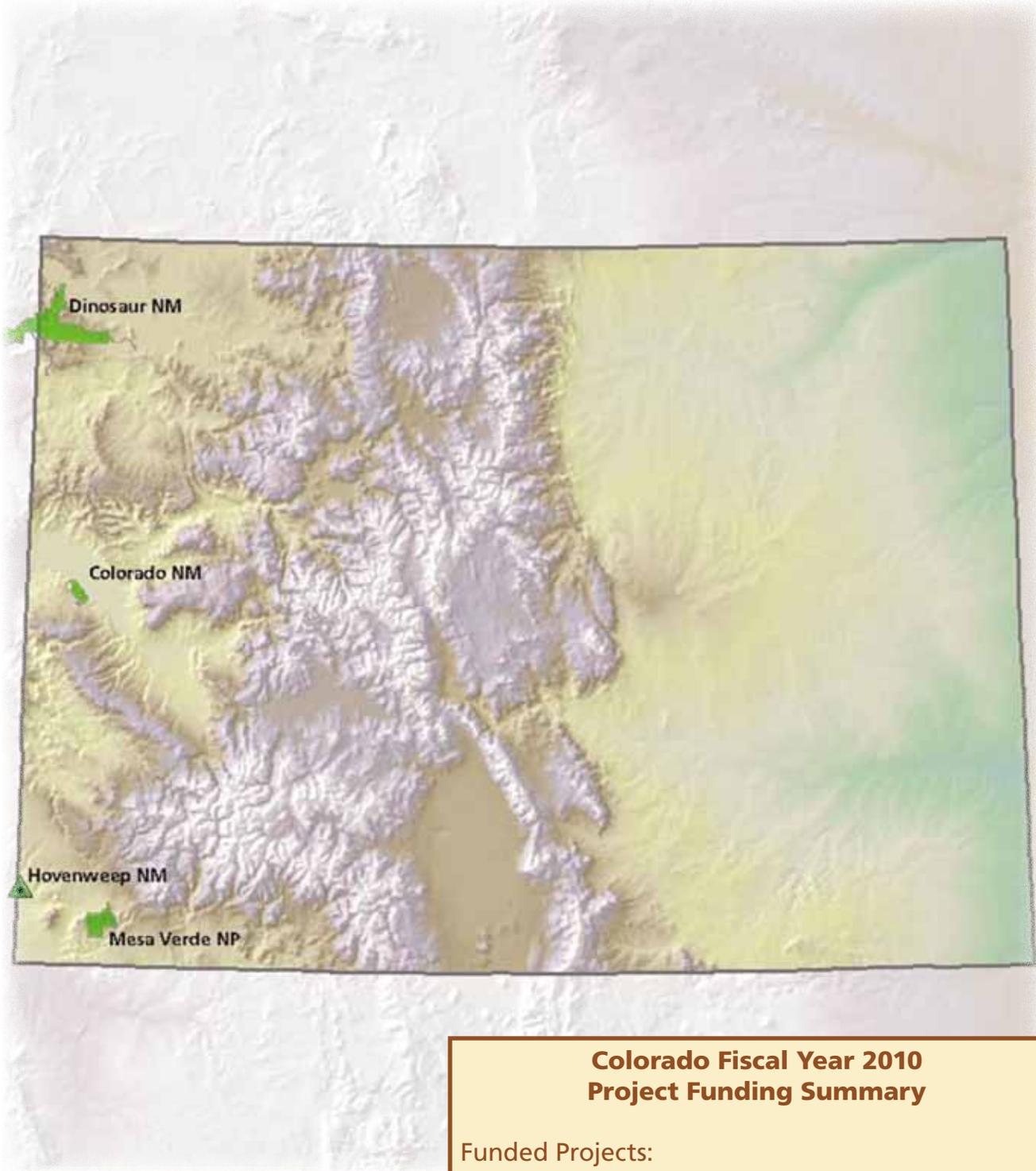
V a n i s h i n g T r e a s u r e s
C o l o r a d o



Spruce Tree House, Mesa Verde National Park

Photo: Free-Photos.biz

- ◆ Colorado National Monument ◆ Dinosaur National Monument ◆
- ◆ Mesa Verde National Park ◆



**Colorado Fiscal Year 2010
Project Funding Summary**

Funded Projects:

No Colorado parks received Vanishing Treasures Project Funding this year.



Mesa Verde National Park

VANISHING TREASURES ACCOMPLISHMENTS AND CHALLENGES

VT Challenges and Successes: A big challenge for the VT program at Mesa Verde (MEVE) is that we currently have three vacant VT positions: Exhibit Specialist GS-12 STF (stabilization crew leader), Exhibit Specialist GS-11 STF (conservator), and Exhibit Specialist GS-9 STF (stabilization crew). The Exhibit Specialist position (conservator) has been vacant since 2005, and the Exhibit Specialist position on the stabilization crew that was funded by VT in 2004 has never been filled. The Stabilization Crew leader position has been vacant since 2007. Funding for all of these positions has been absorbed into the overall Park budget to cover annual deficits.

Probably our most significant program de-

ciency is the shortage of trained permanent staff with supervisory capability. This is essential to the continued success of the program, given the diverse nature of our preservation projects and our increased reliance on volunteer organizations. Despite significant improvement in FY 2010, the permanent staff remains inadequate in size to address an annual work load that is driven by serious ongoing deterioration at several of our interpreted sites. Simply addressing the backlogged maintenance at these interpreted sites consumes virtually all staff time during the field season. This leaves little time to address the needs of our backcountry sites or to write technical reports, manage records, or participate in training.

A major success of FY 2010 can be measured by the fact that, despite only having four subject-to-furlough positions on the stabilization crew, funding from projects was used to hire two seasonal archeolo-

gists and an emergency hire to work alongside the crew. As a result, the crew was able to complete major repairs to Spruce Tree House, Cliff Palace, Far View House, and nine backcountry alcove sites: they also repointed and repaired historic masonry chimneys on many of the park's Civilian Conservation Corps (CCC) era buildings. For the third year in a row, Mesa Verde was able to hire seasonal positions to help with preservation projects.

In addition to the major stabilization efforts that were undertaken in FY 2010, the stabilization crew began the process of redefining our preservation program. This included evaluating the effectiveness of the current program, defining long-term goals and objectives, and outlining program needs to meet established goals and objectives. Most significant was the development of a draft program that includes assembling a reference library specific to preservation treatments and the procure-



*Nordenskiöld's Ruin, Mesa Verde National Park.
Photo: Courtesy Mesa Verde National Park*

ment of equipment and materials for a soils characterization laboratory. Both of these elements are critical to identifying, documenting, and defining past preservation treatments; evaluating the effectiveness of treatments; and developing new treatments.

Another measure of success for Mesa Verde is that our Archeological Sites Conservation Program (ASCP) crew has been contacted to complete documentation and stabilization projects by other NPS units and land management agencies. The Monticello BLM field office has prepared an interagency agreement for the ASCP crew to document and stabilize 3 Kiva Ruin which is located in southeast Utah. In addition, Glen Canyon National Recreation Area will use the ASCP crew to complete stabilization treatments at Defiance House, building on a 2003 condition assessment completed by ASCP staff. This project will execute the treatments that were recommended in the 2003 report. Both of these partnering projects will be completed in FY 2011.

Although not funded by VT, another success in FY 2010 was the start of a complete condition assessment of Spruce Tree House. Although an extensive architectural documentation project has been on-going at Spruce Tree House for a number of years, a complete condition assessment of the site has never been completed. Spruce Tree House contains 120 rooms, 54 open areas, 9 kivas, and 30 miscellaneous structures. In FY 2010, base funds supported a two-person crew to execute this project and condition assessments of 169 of the 213 total study units were completed this year. Assessment of the remaining study units will be completed in FY 2011.

Major Information Management and Technology successes included the completion of Phase 4 of the Mobile Documentation Management System project, the upsizing of the archeological database, and the ninth year of the Mesa Verde/Fort Lewis College Internship Program.

Consultation: Mesa Verde National Park has a programmatic agreement with 24 affiliated and traditionally associated Native American tribes and with the Colorado State Historic Preservation Office. These agreements outline the types of routine assessment, documentation, and preservation methods that can be employed by the Archeological Site Conservation Program without needing consultation. No compliance-related issues were encountered during FY 2010.

Safety: Mesa Verde National Park's VT program maintained an effective safety program with no reportable injuries or incidents in FY 2010.

VANISHING TREASURES STAFF

Tim Hovezak, Exhibit Specialist FY 1998 Position

This position was originally filled as a Masonry Worker but was converted to a Exhibit Specialist in 2005.

Skills: Tim specializes in southwestern archeology, prehistoric and historic architecture, site preservation, conservation research, architectural documentation, archeological inventory, testing, excavation, and reporting.

Accomplishments: Tim served in a temporary position as the preservation crew leader for three months during FY 2010, a position that has been vacant since 2007. As acting crew leader, Tim supervised the crew, established priorities for site preservation projects, worked on drafting a program design, and ensured that safety guidelines were followed throughout the season.

Tim and the crew began the season in the spring by conducting assessments of sites in the park that are open to the public. This included evaluating the condition of the sites and ensuring that they are safe for public visitation. While these annual assessments focus on structural defects, they also include evaluation of the condition of pedestrian surfaces and the detection of evidence of new rock fall hazards in the alcoves. Routine minor repairs and cleaning of prehistoric structures and trail surfaces are also conducted during these assessments. The only significant repairs that were made during this process were to Balcony House and included repairs to the plaza surface, and the replacement of a 30-foot wooden exit ladder and wooden elements of a post-and-rail barrier fence.

Later in the spring, Tim and the crew completed stabilization treatments at Spruce Tree House, the park's most heavily visited alcove site. This work was completed between April 12 and 27, concurrently with the repaving by the Division of Maintenance of the trail to the site. Interdivisional cooperation allowed for the sharing of labor and resources and was especially beneficial to the stabilization crew by providing access to motorized equipment to transport materials and equipment to and from the site.

At Spruce Tree House, the major work consisted of the replacement of approximately

half of the pavement covering the roof of Kiva F. Accessible to the public via a ladder, exposure to moisture, combined with heavy visitor traffic, had resulted in erosion of the kiva roof, leaving voids in the pavement that created a tripping hazard. The roof pavement was replaced with colored soil cement (a combination of commercial masonry cement and native soil) that closely replicates other nearby historic surfaces. At the front of the site, gravel was imported to sections of the trail and plaza. Other work included minor repairs to the masonry retaining wall at the front of the site and to the plaza surface south of Kiva H, repairs to the south wall of Room 60, and comprehensive cleaning of the kivas that are viewed by the public.

Tim and the crew also worked at Cliff Palace this season, focusing on repairs in areas that are located in the exposed areas of the alcove. These areas are more susceptible to moisture-related deterioration and include Kivas A and B (located next to the trail at the south end of the alcove) and Kivas S, T, and U (at the north end of the site). Moisture infiltration into Kivas A and B had resulted in the deterioration of the basal masonry and many of the mortar joints. The widespread use of Portland cement mortars indicated that these kivas had been extensively repaired in the past, and much of this inappropriate material was replaced. Kivas S, T, and U were generally in much better condition but had been damaged by rodent intrusion as well as a combination of other effects including damage from unauthorized visitor traffic and inappropriate past stabilization treatments. In Kiva S, visitor intrusion was the likely cause of the collapse of the vent tunnel and part of the southern recess floor. Kiva T, located immediately to the west, suffered from masonry deterioration in a section of the north wall--an area that had been inappropriately repaired in the past. Nearby, Kiva U suffered from a variety of problems including loose masonry, eroded mortar joints, and animal burrowing. All three of these structures were rehabilitated--a process that included cleaning, mapping, and reburial of fragile adobe floors in Kivas S and U.

In addition, work at Cliff Palace included the partial reconstruction of a masonry retaining wall at the edge of Kiva B and a small section of collapsed wall between Rooms 9 and 130. Gravel was also added to the trail and minor repairs were made to Kiva M, Open Area F, and Room 23.

In addition to the work at Cliff Palace, Tim

and the crew completed treatments at Far View House. Far View House, which is suffering from a backlog of deferred maintenance, is considered in poor condition. The goal of the preservation crew is to upgrade Far View House to “fair” condition so that it can withstand exposure to the elements for a few more years, giving the park time to develop and implement a long-term preservation plan for the site.

Significant progress was made in returning Far View House to fair condition as the result of treatments completed by the Sierra Club. Seventeen volunteers worked for a week alongside the preservation crew to complete fabric repairs to four of the site’s five kivas (Kivas A, B, D, and E) and one surface room (Room 35). The work primarily consisted of masonry repointing and resetting of loose stones. After the volunteers left, the stabilization crew continued the work at Far View House and completed the treatment of loose and displaced masonry in Rooms 5, 13, and 24, as well as at various locations along the pueblo’s south façade. In preparation for winter, Tim and the crew installed wooden shoring to brace several walls that are in danger of collapse and covered broken compound wall caps with tarps in order to prevent moisture from infiltrating the cores of the walls.

Tim and the crew were also able to complete repairs to nine small backcountry alcove sites in FY 2010 (5MV572, 5MV573, 5MV574, 5MV575, 5MV553 [Corn Cob House], 5MV1142, 5MV1206, 5MV1218, 5MV1221). At site 5MV572 a condition assessment from 2005 recommended that the site’s five rooms and one kiva be treated to prevent structural deterioration that had been exacerbated by a 2002 wildfire. Those treatments were finally implemented this year and consisted of basal and mid-wall repairs to Rooms 1, 2, 3, 4, Open Area 1, and Open Area A. The repointing and stone replacement to the north and south walls of Room 1 were relatively minor compared to the work undertaken at Room 2, which required extensive basal repointing of the west and north interior walls as well as extensive repointing on the west exterior basal and mid-wall sections. The most significant treatment to Room 2 was reinforcement of the deteriorated bedrock foundation adjacent to the southwest corner of the north boundary of Open Area A. The kiva, which contains fill to approximately one meter from the top of existing intact masonry, was not treated. Both 2010 archeology interns from Fort Lewis College participated in the stabilization of

this site, learning park service procedures for mapping and narrative documentation, structural condition assessment, and the methods and materials used in structural stabilization. Work completed by the stabilization crew brought this site into good condition.

Site 5MV573 contains the partially collapsed remains of three masonry rooms and the treatments here were very simple. They consisted of basal and mid-wall repairs to all three of the rooms and one open area (Rooms 1, 2, 3, and Open Area 1). These repairs used unamended soil mortar procured from a local source on the floor of Spruce Canyon.

The single, isolated masonry room at site 5MV574 was assessed to be in fair condition, with the exception of basal mortar erosion and several deteriorated basal stones. Treatment here involved the replacement of eroded basal and second course stones, reinforcement of the entryway sill and jambs, and the removal of a small packrat midden from the Room 1 interior. Basal stones were installed without mortar to facilitate drainage through the base of the wall and away from the structure. Repairs to the entryway used a soil mortar procured from the colluvial slope above the site.

Site 5MV575 is a small site within a low alcove immediately below and to the north of 5MV574. Stabilization consisted of dry laying one large stone with leveler spalls to support broken and deteriorated masonry at the northeast corner of Room 1.

Corn Cob House (5MV553) is a three-room structural site located beneath a pour-off on the floor of an unnamed branch of Soda Canyon. Site documentation here was updated in 2005 and again during a site monitoring event in 2007. The 2007 records noted severe impacts to all three masonry rooms caused by animal activity—specifically, rodent “nesting and excrement”—and displacement of basal masonry supporting the outer, east walls of two of the rooms caused by erosion and pedestrian traffic. Preservation work at Room 2 was relatively minor, consisting of resetting several lower mid-wall stones in the south exterior face. Room 3, however, required basal and top course repointing and the installation of a vertical brace in the room interior to support a large, partially detached sandstone ceiling slab. Room 1 required extensive reinforcement of the deteriorated bedrock ledge supporting the south wall and packrat debris was removed from the room interior. Finally,

the silicone drip line was replaced across the entire front of the alcove. For all of the repairs, the mortar utilized unamended local soils procured from the canyon floor below the site.

Site 5MV1142 has only one masonry room and, although the masonry appeared to be in good condition, severe basal stone deterioration threatened the structural integrity of the entire room. Room 1 required basal reinforcement to the west façade at both west wall corners and along the north wall. Most basal deterioration here derives from granular exfoliation of the bedrock, rather than deterioration of the masonry elements. This has undercut the base masonry course along the outer, west façade to a depth of approximately 5 cm. While this erosion was not severe in most areas, deeper undercutting at the corners endangered the entire west wall. If left unchecked, it would have resulted in structural failure. Both bedrock and masonry deterioration at this site appear to derive from external sources, notably direct precipitation and runoff from the alcove face, evidenced here by severe mortar erosion on the northwest corner of the exterior, west façade. Masonry deterioration along the base of the north wall appeared to be exacerbated by capillary absorption from the 10 to 20 cm of fill that covered the alcove floor.

At 5MV1142 the treatment consisted of the insertion of a tabular stone beneath the basal masonry of the west wall, replacement of two basal stones at the north wall, extensive repointing of the entire west wall and where the mortar had eroded at the northwest corner. The soil mortars used at this site were derived from standard park sources on Chapin Mesa and were imported to the site.

Site 5MV1206 consists of three alcoves that once contained standing walls although currently, only one alcove contains intact architectural elements; this alcove was the focus of the preservation treatments that were executed here in FY 2010. The architecture here consists of a single room, constructed as a low curved masonry wall enclosing the front of a shallow alcove. The condition of this room is considered to be “poor” because of the unstable nature of the bedrock floor and ceiling and the resulting erosion of the alcove floor. The most serious issue here is the movement of a large wedge-shaped block of ceiling bedrock that is placing a load on the masonry wall. This block appears to be moving down and outward, causing multiple verti-



STEP employee Stephen Matt and Masonry Worker Neill Smith work on the retaining wall at Long House, Mesa Verde National Park.

Photo: Courtesy Mesa Verde National Park

cal stress fractures in wall masonry. Some of these fractures are ancient, as suggested by consistency in patination between masonry surfaces and crack interiors: however, other fractures appear to be fresh and new. Additional evidence of recent movement is provided by two crack monitors that were installed between the block and the adjacent cliff. Because of its irregular shape, the weight of the block is difficult to estimate but it is approximately 288 cubic feet in volume with an estimated weight of 8.6 tons.

Intrusive interventions, such as stone replacement, were not recommended for 5MV1206 in the 2010 assessment because of the unstable and dangerous nature of the alcove ceiling and the poor condition of the prehistoric masonry. In order to bring this site into good condition, treatment measures would have to be extensive. This would entail removing the decomposed bedrock on the alcove floor and replacing and/or removing the entire basal course of the wall. Because it is difficult to determine the extent to which the detached ceiling block is dependent on the masonry wall for support, it has been decided that any intervention has the potential to destabilize and collapse the ceiling and must be considered a dangerous and life-threatening undertaking. Therefore, treatment here consisted of placing two steel screw jacks between the bedrock shelf forming the alcove floor and the ceiling block. Jack placement is at the block's estimated center of gravity, a short distance outside of the room. This action may help to stabilize the block and prevent the destruction of cultural remains within

the alcove, but it is impossible to know how long this treatment will be effective.

Site 5MV1218 is a small habitation complex located in a low alcove immediately above the narrow floor of the west fork of Long Canyon. Although the overall condition of the site is considered to be "good," there were several significant exceptions. Treatment required at this site consisted of repointing the north exterior wall of Room 20 between the bedrock and a detached boulder, minor repointing of the south wall of Room 19 and the addition of two dry stacked stones to fill a void in the wall base, and the positioning of a single stone on the sill of Room 20's entry wall (WE 9) to support a broken and collapsing right jamb. Additional work consisted of repointing the south wall of Room 21, the addition of masonry to fill voids in the abutment of Room 25 and the alcove wall, and removal of encroaching oak brush at the front of the site.

Site 5MV1221, a multi-unit habitation complex located in the west fork of Long Canyon, is just a short distance from 5MV1218. Although the site had been stabilized in 1998 and the previous stabilization work was in good condition, additional treatments were needed to stabilize areas not addressed in 1998. Most of the stabilization needs here were minor but essential for the prevention of ongoing deterioration in seriously unstable wall segments. Treatments consisted of repointing, with some minor stone resetting and new stone laying in Rooms 1, 2, 3, 4, 5, 9, 13, 15, 16, 20, 23, 30. A significant wall patch was constructed to fill a large void in the south wall

of Room 7. Also, the broken and unstable north corner of Room 17 was reinforced with dry stacked masonry and encroaching oak brush was removed from in front of the site.

In addition to the treatments executed on prehistoric resources, the stabilization crew worked on repairing masonry chimneys of 30 historic buildings in the park. This was the second and final year of a repair-rehab project that began in FY 2009 to address the needs of 57 historic chimney features in the administrative, maintenance, and residential districts. Most of the chimneys required repointing of eroded mortar joints and the repair or installation of new shelter caps. Some of the chimneys however, were in need of partial or full reconstruction.

Finally, Tim assisted with the design, planning, and installation of new metal wall panels at seven site shelters on Wetherill and Chapin Mesas and the replacement of roof membranes at five of the six Chapin shelters. The old wall panels in these shelters consisted of canvas curtains. This old closure system was not very effective, since it did not prevent moisture from infiltrating the primarily earthen structures and rodents could easily penetrate the shelters seeking refuge inside the closed-off areas. In addition, installing the curtains in the fall and removing them in the spring was a very cumbersome and time-consuming task that required at least four people to maneuver the long, heavy pipes that were used for attaching the curtain material. The new metal wall panels offer much more protection from wind, snow, and rain and they simply roll back and forth on a track to open and close.

Training: Tim attended facility maintenance software system (FMSS) training in FY 2010.

Neill Smith, Masonry Worker FY 1998 Position

This position was originally filled as a Historical Architect but was converted to an Exhibit Specialist in 2005.

Skills: Neill specializes in masonry work, fabric repair, and site preservation.

Accomplishments: As a member of the preservation crew, Neill participated in all of the projects described above in Tim Hovezak's accomplishments.

Kay Barnett, Exhibit Specialist FY 2004 Position

Skills: Kay specializes in southwestern archaeology; prehistoric and historic architec-

ture; architectural documentation; historic inscriptions; osteology; and archeological inventory, testing, excavation, and reporting.

Accomplishments: Kay continued working on the Spruce Tree House Architectural Documentation Project during FY 2010. The entire project, which includes 20 study units at two ledge sites just north of Spruce Tree House (5MV530 and 5MV641), has identified and documented 233 architectural units including 130 rooms, nine kivas, two towers (consisting of three rooms), 62 open areas, and 32 miscellaneous structures. The Spruce Tree House alcove contains 120 rooms, 54 open areas, 30 miscellaneous structures and nine kivas.

Kay's primary duty was data checking all of the field forms and database records generated by the work that has been completed by various crew members over the past few years. Data checking involves cross-checking the paper records (field maps and forms) against database files and in-field checks to verify information and resolve conflicts. By the end of FY 2010, the bulk of the data cross-checking and corrections had been completed. Approximately 60 of the 120 study units at Spruce Tree House received some degree of data cross-checking in FY 2010. In a few instances the plan view maps of study units had to be completely re-done.

Kay worked closely with Neal Morris, an archeologist who specializes in producing AutoCAD graphics. Together, they produced a nearly complete grid-oriented composite plan of the site in AutoCAD. Previous AutoCAD site plans were rotated, and in some cases "rubber sheeted," to fit a 1934 site map by Stanley Morse. Rubber sheeting is normally used to modify an inaccurate map to fit a map that is more precise. In this case, it was used to modify a supposedly accurate field drawing to fit a base map of unknown accuracy. In addition, scanned images that were used as the background for digitizing were often imprecisely scaled or rotated, which further compounded the problems of assembling an accurate composite plan. Kay assisted Neal in completing almost all the plan view maps and approximately 60 percent of the elevation maps (n=300) for the 120 study units in Spruce Tree House.

As part of the Spruce Tree House project, Kay also assisted photographer Robert Jensen in producing high-quality photo images of specific architectural details that were deserving of further documentation, such as unique doorways, artifacts, embel-

ishments, etc.

Kay worked on finalizing the site chronology by utilizing tie and abutment patterns and the Spruce Tree House tree-ring dataset. With the chronology finalized, the construction sequence can now be systematically analyzed with final, corrected data. Also at Spruce Tree House, Kay worked with the University of Pennsylvania's Graduate Program in Historic Preservation under the direction of Frank Matero. This crew executed a condition assessment of surface finishes and documentation and treatment of four high-priority study units in Spruce Tree House (Rooms 115, 104, 116 and 122). In addition, Professor Matero directed the production of graphics that illustrate the distribution of surface finish types throughout Spruce Tree House. He began drafting a study unit-specific analysis of the architecture based on surface finishes. Professor Matero's analyses will be an integral part of the overall understanding and interpretation of the chronology of Spruce Tree House.

As the most visited, and one of best preserved, dwellings at Mesa Verde, Spruce Tree House has been selected for detailed architectural documentation. Because it retains numerous intact plaster finishes, roofs, and second- and third-story rooms, Spruce Tree House presents a unique opportunity to develop an integrated approach to site management and problem-oriented research and interpretation. We are nearing completion of the architectural documentation phase of the project and now want to realize the potential of the data collected while also continuing the development of site management tools to allow for science-based decision-making for park managers. These data can also be used in comparative studies among alcove sites since there is considerable variation between the sites. Although there are broadly shared traits, each cliff dwelling has its own character and preservation challenges; the detailed documentation of each site is critical since it ultimately informs our interpretation and management decisions, particularly where shared traits may not be as easily assessed in some alcoves as they are in others. For efficient implementation, these aspirations for the Spruce Tree House Project require planning and integration into broad goals for Mesa Verde National Park resource management.

In addition to her duties at Spruce Tree House, Kay compiled information sheets and maps for the park's employee back-

country program.

Training: Kay attended FMSS training and an Archeological Resource Protections Act (ARPA) refresher course in FY 2010.

Laura Ninnemann, Supervisory Archeologist (Databases)

FY 2000 Position

This position was originally filled as an Archeologist but was converted to a Database Archeologist in 2005.

Skills: Laura is skilled in condition assessment documentation and possesses critical knowledge and understanding of archeological data captured at Mesa Verde. She specializes in relational database management system implementation, database and Web site design, electronic and print media data management, program/project management, and reporting activities.

Accomplishments: Laura is responsible for Information Management and Technology (IMT) within the Research and Resource Management (R&RM) Division. She focused most of her activities in FY 2010 on three multi-year projects: (1) upsizing Microsoft Access archeological database models to Microsoft structured query language (SQL) Server 2008 and Web site development for internally hosting R&RM Division data, (2) Phase 4 completion of the Mobile Documentation Management System (MDMS), and (3) reorganization/integration of archeological documentation into complete working files.

Upsizing of database records to SQL Server 2008 was completed during FY 2010. This process included extensive data analysis and clean-up of database records prior to passing Microsoft (MS) Access database models to the contractor for upsizing. As the Contracting Officer's Representative (COR), Laura worked with the contractor to resolve client-side issues and coordinated all contracting activities, including database model submissions, on-site visits, installation/updating of required software applications and hardware needs with Mesa Verde IT staff, and database security configuration. She also initiated the design of a Web site to host online data, provided oversight for contractor activities, and developed 75+ Web site pages utilizing web development applications and add-on tools. The contracted portion of the project was successfully completed in FY 2010 on time and within budget. The remaining in-house Web site and SQL Server database development will be completed in 2011.

Phase 4 of MDMS was completed in 2010 with analysis and testing of new State Historic Preservation Office (SHPO) reevaluation and historic data topics within the site survey component, and new dendrochronology and historic inscription data components. As Project Manager, Laura coordinated consultation services in preparation for the final on-site visit and close-out of this phase insuring that all deliverables were received. Phase 5, planned for completion in 2011, will integrate MDMS into the new Web site providing a single data access portal for archeological data.

As a mobile solution for electronically capturing data, including data required by the archeological sites management information system (ASMIS), during field documentation activities, the advantages of MDMS are far-reaching. The platform is georeferenced and Global Positioning System (GPS) data are directly transmitted to the relational database model. Data flow from primary databases to a mobile device (handheld personal digital assistant [PDA] with integrated GPS) where records are added or updated based on field observations. As data flow back into primary databases, the records are evaluated for completeness and integrity utilizing a group of quality assurance/quality control (QAQC) queries within a separate database model. Throughout this process, relational data structures are maintained. In addition, an attachment tool allows crews to carry photographs and documents into the field on a digital storage card and the Data Capture Standards Manual (totaling approximately 270 pages) is available in HTML (hypertext markup language) format on the mobile device. When fully implemented, MDMS will result in significant cost/time savings, as well as increased data completeness and integrity.

FY 2010 marked the second year of a multi-year project to reorganize and create complete working site files that contain all of the project documentation that has been generated over 100+ years of field work at Mesa Verde. A primary goal of this project is to make documents available in both print media and electronic formats--many as searchable files. During FY 2010, Laura provided training and oversight in document scanning, organization procedures, and equipment use. She created 3,500 site and study unit classification folders and supervised their integration and organization. These folders are divided into documentation components and labeled for easy identification and retrieval of data.

Approximately 60% of existing working documents have been transferred to and organized within these folders. In addition to creating the folders, Laura updated procedural documents and restructured the electronic file hierarchy to accommodate changing needs. She also developed a procedure for transferring image files, and coordinated their transfer into the new site file hierarchy structure, expanding an earlier file naming standard for photographs to accommodate naming of document files. File names now include three parts. Part 1 includes a site designator, document type, page reference, and project code; Part 2 includes the year the document was generated; and Part 3 includes the document series designator. By using this format, all electronic files can be captured by the MDMS image tool and loaded onto a storage card for access in the field. In theory, all data generated for a site, as well as the data capture forms, will be accessible in the field from either handheld mobile devices with integrated GPS or from notebook computers, if a larger display format is desired. This will eliminate the need to carry paper records and forms into the field.

Laura also coordinated the Mesa Verde/Fort Lewis College Internship Program through the Colorado Plateau-Cooperative Ecosystem Study Unit (CP-CESU) and the Intermountain Regional Office (IMR): Partners in this program include the Colorado Historical Fund and the Fort Lewis College Foundation. This highly successful partnership is now in its ninth year and directly benefits the park's VT-funded personnel. To date, interns have been placed in positions mentored by each of our VT staff members, as well as VT's structural engineer, who is duty stationed here. Approximately one third of the successfully completed internships have directly benefited VT activities through mentoring by VT personnel. Laura's internship coordination activities in FY 2010 included compilation of internship opportunities for the current year, organization of the annual internship fair at Fort Lewis College, selection of interns, background-check processing, securing camping privileges at our Morefield Campground, intern/park mentor orientation, mid-term progress reporting by interns, final project presentations and close-out, and managing of daily programmatic issues. Laura authored and processed CP-CESU program approval and IMR procurement documents and, in addition, mentored two IMT interns who assisted with AutoCAD and site file reorga-

nization projects.

Laura continues to manage the ASMIS dataset for MEVE and Yucca House National Monument. Throughout FY 2010, she coordinated and submitted Corrective Action Plan goals for both units and performed data entry for new and existing ASMIS records resulting from field work at 29 sites at both units. She monitored progress during the 2010 field season, provided feedback to crew members, insured that all required data were captured and reported, and archived reporting documents following update activities. As mandated by the ASMIS Corrective Action Plan, Laura insured FY 2010 updated ASMIS records were brought to complete, accurate and reliable condition and submitted Superintendent's Certifications for both units.

As part of Laura's routine IMT responsibilities, she maintained stewardship of archeological site identification numbers and assigned numbers to newly discovered sites. She insured high availability of Microsoft (MS) Access databases, addressed routine database performance issues, and analyzed MS Access database structure changes for impact on successful completion of upsizing and Web site projects. She researched and authored reports describing programmatic goals, current activities, types of funds utilized, and tangible results for all IMT areas of responsibility, and she authored specialized reports and documents requested by the Division Chief. Laura assisted R&RM and IT staff in determining hardware and software needs, addressed software functionality issues, provided training to R&RM staff and Fort Lewis College interns performing data entry activities, addressed questions and issues related to the capture and keying of archeological data into primary database models, and made database improvements to facilitate changing data capture needs.

Training: Laura attended Federal Acquisition Certification for Contracting Officer Technical Representatives (FAC/COR) refresher training, General Services Administration (GSA) procurement training, and a three-day live on-line SQL Server Reporting Services course covering areas of expertise required for successful completion of IMT projects.

VANISHING TREASURES PROJECT FUNDING

Mesa Verde National Park did not receive Vanishing Treasures project funding this year.

V a n i s h i n g T r e a s u r e s

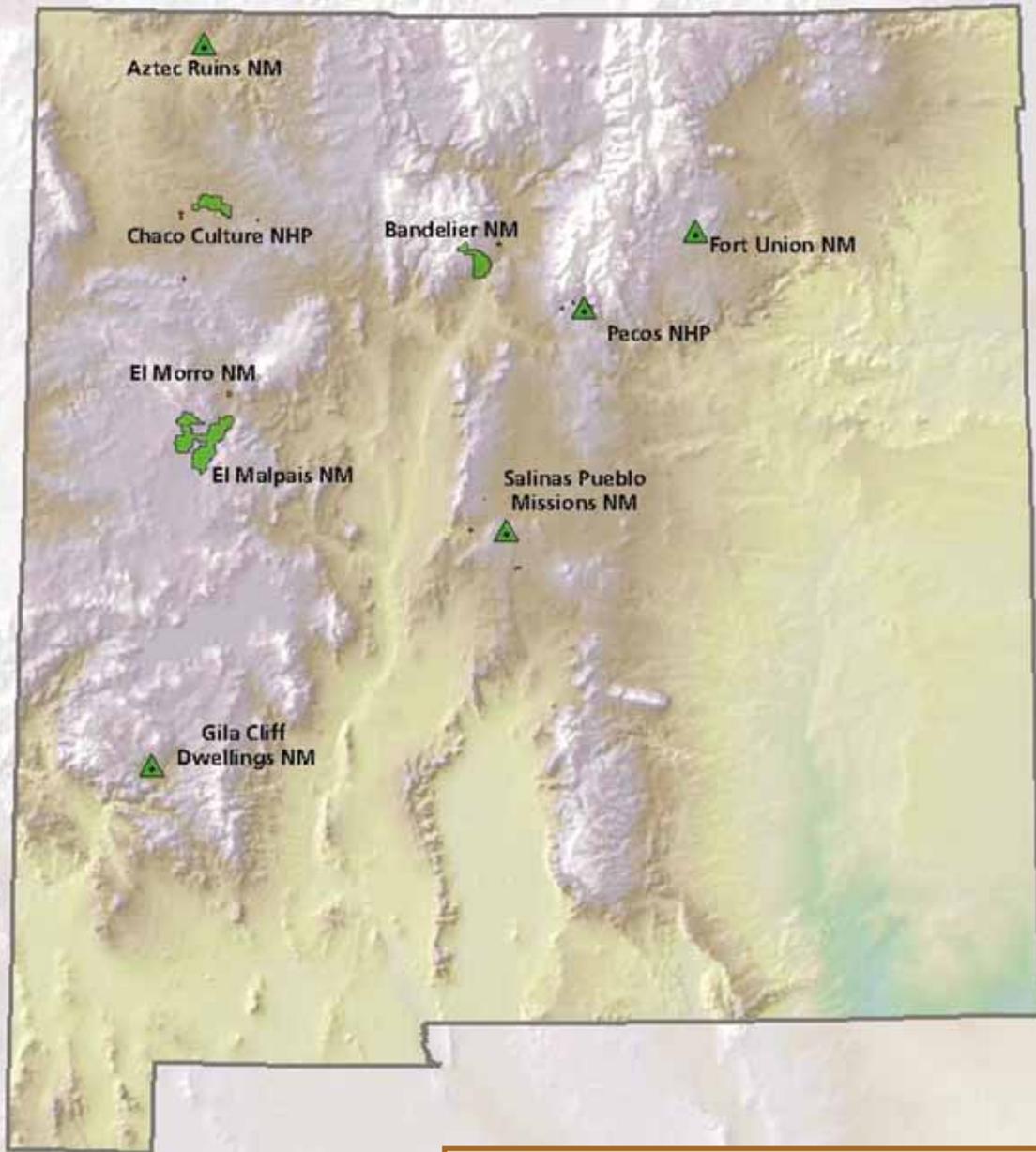
N e w M e x i c o



The Mission San Gregorio de Abo, Salinas Pueblo Missions National Monument.

Photo: C. Ford

- ◆ Aztec Ruins National Monument ◆ Bandelier National Monument ◆
- ◆ Chaco Culture National Historical Park ◆ El Malpais National Monument ◆
- ◆ El Morro National Monument ◆ Fort Union National Monument ◆
- ◆ Gila Cliff Dwellings National Monument ◆ Pecos National Historical Park ◆
- ◆ Salinas Pueblo Missions National Monument ◆



New Mexico Fiscal Year 2010 Project Funding Summary

Funded Projects:

Aztec Ruins National Monument \$ 64,986

Bandelier National Monument \$ 124,990

Chaco Culture National Historical Park \$ 52,491

Aztec Ruins National Monument

VANISHING TREASURES ACCOMPLISHMENTS AND CHALLENGES

VT Challenges and Successes: The ancient Puebloan great house sites at Aztec Ruins National Monument (AZRU) continued to challenge our preservation staff. In addition to cyclic maintenance of the ruins, environmental monitoring and mitigation programs targeted unstable structures and the root causes of deterioration. Modern protective roofs covering original roofs on four rooms at Aztec West Ruin were renovated. A major multi-year backfilling program continued to remediate unequal fill levels that place static loads on standing walls. The backfill work was complemented by limited excavations that equalized fill levels in portions of West Ruin where backfilling was not practical. These included areas with visitor trails and

structures that will remain open for interpretation.

One of the most interesting challenges was the stabilization of walls that were newly exposed during excavation. Stabilization at Aztec has traditionally been focused on areas that were excavated many decades ago. The ancient masonry in these areas has been repeatedly repaired and has much less integrity, and different masonry styles, than the original walls that have been recently excavated. This led our masons to carefully rethink their approach, conserving the original masonry as much as possible while addressing structural problems that had been caused by differential fill levels and other preservation issues. Existing drainage features were maintained and new drainage installed in the areas where backfilling, excavation, or other work was performed.

Consultation: Most of our historic preservation consultation is done through annual written letter reports to our affiliated tribes. Project-specific consultation was

initiated on proposed modifications to the West Ruin Backfilling Program that included fill reduction (excavation) in areas where differential fill could not be equalized through backfilling. The tribes and the New Mexico State Historic Preservation Officer (NMSHPO) were generally supportive, but there were concerns about the excavation of previously undisturbed archeological deposits and the removal of artifacts that might result from this changed strategy. These issues were addressed through meetings and additional tribal and NMSHPO consultation. In this way, a treatment plan for the Fill Levels Adjustment Project was successfully negotiated. As this project evolves, and other routine preservation work is undertaken, additional consultation will be undertaken.

The park is currently finalizing a new General Management Plan that will provide a platform for future consultation with the tribes, NMSHPO, and the public.

Safety: Development of the AZRU Safety Program is ongoing with continued em-



Although beautiful, the winter snow contributes to deterioration of the ancient architecture at Aztec West Ruin, Aztec Ruins National Monument.

Photo: Aron Adams

phasis on Job Safety Analysis and Job Hazard Assessments. Protocols have been developed that address risk management in several new aspects of our preservation work. By involving the preservation crew in the creation of JSAs and JHAs, we have been able to develop a culture of safety and facilitated the staging of tailgate safety sessions that include the preservation crew and other cultural resource personnel.

VANISHING TREASURES STAFF

Gary M. Brown, Supervisory Archeologist

FY 2001 Position

Skills: Gary has experience in archeological field techniques, ruins preservation, compliance, artifact analysis, writing, technical illustration, statistical analysis, and project management.

Accomplishments: During FY 2010, Gary supervised a sizeable staff of existing park personnel, augmented with term and seasonal hires, on a range of preservation, archeology, and curation projects. As acting Chief of Cultural Resources, he provided oversight for structure and site condition assessments, backfilling and fill adjustments, excavation, protective roof maintenance and repair, cultural resource inventory, List of Classified Structures structure documentation, ruins stabilization and minor fabric replacements, laboratory analyses, and museum collections management. The AZRU Fill Levels Adjustment Project

(FLAP) at West Ruin is an innovative approach to unequal fill levels caused by various factors including past excavation work, the survival of numerous original roofs that have prevented deposition in the first place, the existence of unexcavated areas, the terraced multi-story architecture typical of Chacoan great house buildings, and the natural condition of the site after centuries of deterioration. Gary designed this project to rationalize many years of backfilling into an integrated situation that minimizes static load and moisture as major impacts at West Ruin. This was accomplished through continued backfilling, augmented by limited excavations, installation of soil retention structures, and both surface and subsurface drainage improvements.

Gary also supervised the Aztec East Ruin Landscape Mapping Project which resulted in the identification, documentation, and accurate plotting of all cultural resources in a major part of the main ruins complex at Aztec. This work was done with the benefit of funding through the Colorado Plateau Cooperative Ecosystems Study Unit and in partnership with the Center for Desert Archaeology. The result was a comprehensive geographical information system (GIS) database and plan view and profile drawings of major architectural features.

Training: Gary participated in an Intermountain Region Section 106/National Environmental Policy Act (NEPA) compli-

ance workshop, a Bobcat skid-steer loader operations workshop, and several on-line training courses.

Ernest Harrison, Masonry Worker
FY 1998 Position

Skills: Ernest is proficient at masonry ruins stabilization, pre- and post-stabilization documentation, backfilling, protective roofing design and construction, ruins maintenance, and digital photography. In addition to superior craft skills, he is a skilled heavy equipment operator and sets high standards for safe work practices

Accomplishments: Ernest has worked on the AZRU preservation crew since 2002. Through his work as a VT mason, he has assumed the role of work leader on the preservation crew, where he assists with the logistics and implementation of a variety of preservation tasks ranging from routine ruins maintenance to the design and construction of protective roofing. As work leader, he participated in the replacement of several protective roofs that cover ground floor rooms that have completely intact original roofs. He has set high standards for masonry fabric treatments and he provides leadership for a crew composed of both masonry workers and laborers. He has helped to design and implement backfilling work in conjunction with the West Ruin Backfill Project and the Fill Levels Adjustment Project. Ernest also helped to design and install drainage systems that facilitate drainage away from the ruin walls.

Training: Ernest participated in a Bobcat skid-steer loader operations workshop and various online training courses.

Jeffery T. Wharton, Exhibit Specialist
FY 1998 Position

Skills: Jeffery has an extensive background in the archeology of the Colorado Plateau, particularly of the San Juan Basin, along with experience in dealing with a range of cultural resource management concerns. His experience in archeology includes all aspects of survey and excavation, report preparation and editing, GIS data analysis, computer graphics production, and data/laboratory analysis. He is also skilled in the design and construction of protective roofs and protective gates for archeological sites.

Accomplishments: Jeffery's accomplishments this year included the design and the oversight of construction and installation of protective roofs and gates for East and West Ruins, responsibility for routine environmental monitoring of the Visitor Cen-



Archeological test excavations and backfilling in the Fill Levels Adjustment project area at Aztec West Ruin, Aztec Ruins National Monument.

Photo: Sean Ludden



Installation of PVC drainage system during backfilling in Fill Levels Adjustment project area at Aztec West Ruin, Aztec Ruins National Monument.

Photo: Sean Ludden

ter and West Ruin, and the installation and monitoring of crack monitors throughout the site.

Other accomplishments include the archeological survey of the monument beyond the main ruins group, with condition assessments of survey sites and GIS analysis of survey data a part of the overall project. Jeffery coordinates with the preservation crew and archeologists on a number of preservation, stabilization, and documentation tasks related to the preservation of the ruins; he conducted archeological monitoring of various park projects; and he was involved in preparing sections of the AZRU General Management Plan.

Training: Jeffery received training in Planning, Environment, and Public Comment (PEPC), Facility Maintenance Software System (FMSS), Project Management Information System (PMIS), Project Scoping

Tool (PST), 106/NEPA, and Operational Leadership.

VANISHING TREASURES PROJECT FUNDING

Project Name: Install Drainage System to Divert Water from Protective Roofs away from Aztec West Ruin
PMIS Number: 134803

Project Summary: Structures at Aztec West Ruin that still have intact ancient roofs have been covered by modern protective roofs that drain through spouts onto the ground adjacent to the ruins. Typically, these drains discharge only about two feet away from the exterior walls and much of this water can be drawn into the walls through capillary action, causing deterioration. During the course of the large-scale West Ruin backfilling project over the past several years, effective drains were installed

in several areas. Two locations with similar drainage problems that were not included in the backfilling project were addressed by this project. The project was designed to correct the moisture surplus through drainage into a closed system that could be discharged onto the ground, away from the site and near an irrigation ditch. Unlike the backfilled areas, the areas addressed by this project also required limited trenching, in addition to some backfilling. One of the affected rooms contains a significant earthen plaster mural that had been damaged by moisture over the years, a condition that has been corrected by this project. Trenching for the subsurface drains was done only after the excavation of two one-by-one meter test units. The test units were excavated using formal archeological methods; all fill was screened; and the (sparse) artifacts that were recovered were systematically collected.

Trenching for the pipes was done with pick and shovel, and all work was closely monitored by an archeologist. Large drainage boxes/silt traps now catch the water that pours off the roofs. The drain boxes are connected to four-inch PVC pipes that were buried in shallow trenches. Because the ground surface slopes down away from the ruin the pipes did not need to be buried deeply. The PVC pipes were connected together in a Y-configuration and then routed under the West Ruin Visitor Trail, where the single pipe then proceeds west toward an irrigation ditch.

Project Budget:

Total VT Project Funding:	\$64,986
Personnel:	\$59,563
Vehicles:	\$0
Travel/Training:	\$298
Supplies/Materials:	\$4,677
Equipment:	\$0
Services/Contracts:	\$0
Other:	\$448

Project Accomplishments: The new subsurface drainage system, installed without significant archeological impacts, now drains water more than 50 feet away from the ruin into a low area where cottonwood trees will benefit from the additional moisture. Environmental monitoring initiated with prior VT project funding (FY 2009) will document the positive result of decreased ground moisture in the adjacent area, including the room where a decorated earthen plaster mural has been partially destroyed by exposure to moisture.

Bandelier National Monument

VANISHING TREASURES ACCOMPLISHMENTS AND CHALLENGES

VT Challenges and Successes: The Bandelier National Monument Vanishing Treasures Program completed work on seven projects in FY 2010, including one funded by the Vanishing Treasures Program. The park also made substantive progress on contracts and agreements initiated in or before FY 2010.

Funded projects in FY 2010 included:

1. Vanishing Treasures: Emergency Conservation of Frijoles Canyon Cavates
2. Cultural Cyclic: Assess and Stabilize Duchess Castle (year 1 of 2)
3. Cultural Cyclic: Assess and Stabilize Alcove House Kiva (year 1 of 2)
4. Cultural Cyclic: Graffiti Mitigation in Frijoles Canyon Cavates
5. Cultural Cyclic: Assess and Conserve

North Mesa Cavates (year 2 of 2)

6. Cultural Cyclic: Assess and Stabilize Long House Pueblo
7. Cyclic Maintenance: Maintain Tyuonyi Pueblo

Project work was carried out by crew leaders Stephen Merkel, Martin Davenport, and Rachel Adler, along with seasonal employees and/or interns Jonathan Holdsworth, Clifford Hickey, Ashley Crossen, Will Goumas, Karim Hassanein, Jonathan Brenemann, and Student Conservation Association (SCA) worker Eli Logan. Several members of the Bandelier Youth Conservation Corps also worked with our VT program on a part-time basis in order to develop experience in the preservation field.

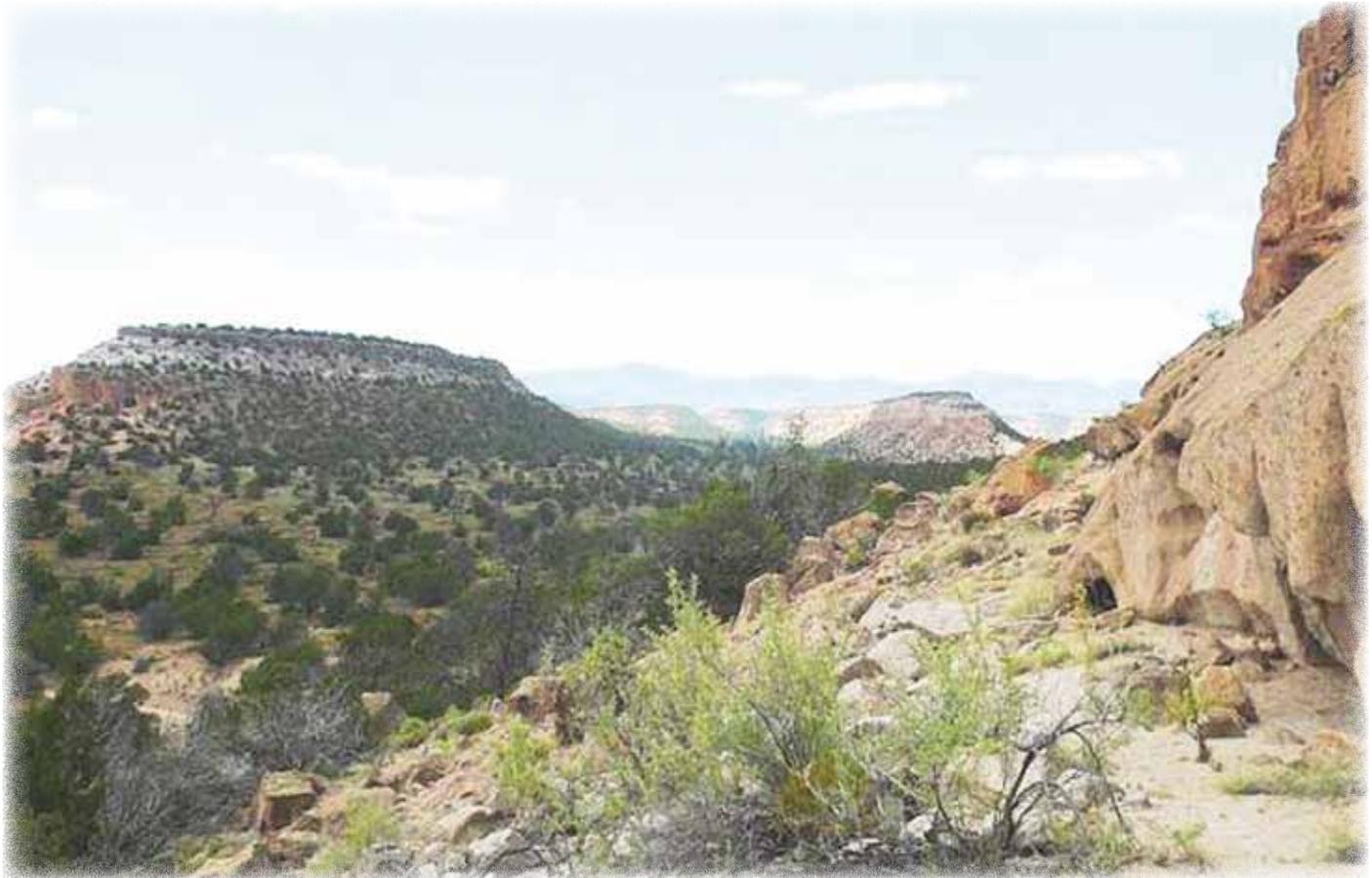
With support from project manager Shannon Dennison, the Bandelier VT program was managed by Lauren Meyer through April 10, 2010. In April, 2010, Lauren left Bandelier for a position with the VT Program office in Santa Fe (see Lauren's message on page 3). After Lauren's departure, Shannon Dennison took on a 120-day temporary

promotion to serve as VT program manager and Stephen Merkel assumed temporary responsibility as project manager. Following her temporary promotion, Shannon Dennison was selected as the new VT program manager at Bandelier and the permanent project manager position was allowed to lapse.

Bandelier Vanishing Treasures Program Project Summaries

Assess and Stabilize Duchess Castle (year 1 of 2)

FY 2010 was the first year of a two-year documentation, condition assessment, and stabilization project for Duchess Castle. Duchess Castle is a historic domestic ruin constructed in the 1910s and associated with the development of Pueblo pottery as an artisanal commodity craft in the northern Rio Grande area. In FY 2010 the site was photographed with digital and black and white film and documented with detailed plan and elevation drawings. A stabilization plan is being drafted.



*Tankawi Landscape, Bandelier National Monument.
Photo: Courtesy Bandelier National Monument*

Assess and Stabilize Alcove House Kiva (year 1 of 2):

Alcove House Kiva is a reconstructed kiva located in an elevated alcove that is accessible to visitors. The kiva is iconic to Bandelier National Monument and is featured on Works Progress Administration-era posters and modern art works. The site is highly photographed and is a significant part of the visitor experience at Bandelier. In FY 2010, a detailed condition assessment was completed that revealed considerable structural problems. The kiva is constructed on overlapping layers of weak volcanic tuff and is situated on a slope at the edge of a steep cliff. Initial investigation revealed that a more detailed and thorough investigation of the structural conditions, involving a structural engineer, will be necessary to develop an appropriate stabilization strategy. Bandelier National Monument is in the process of developing a multi-phase partnership with the University of New Mexico Department of Architecture and Engineering in order to carry out non-destructive evaluation and treatment. This work is planned to begin in FY 2011.

Graffiti Mitigation in Frijoles Canyon Cavates:

See the New Contracts and Cooperative Agreements narrative for information on this project.

Assess and Conserve North Mesa Cavates:

This was the second year of a two-year project to document and conserve cavates at North Mesa in the Tsankawi unit of Bandelier National Monument. The fieldwork at North Mesa had four main goals: 1) verify and update site maps for six cavate groups there; 2) complete baseline architectural documentation for all cavates and associated components in these six sites; 3) complete condition assessments of all identified cavates and prioritize them for treatment; and 4) develop and implement a treatment plan for highly significant cavates and those showing the most need for intervention.

During the 2010 field season, the Bandelier VT crew updated maps of six cavate groups at North Mesa, adding 35 previously unidentified or incorrectly categorized cavates to these groups. In addition, the crew completed architectural documentation and condition assessments for 90 cavates. Once the documentation and prioritization was complete, treatments

were performed on a variety of high and medium priority cavates.

Treatments implemented at North Mesa included masonry stabilization, drainage modification, and graffiti mitigation. Masonry stabilization was completed on one of the only intact masonry enclosure walls remaining in the cavate pueblos at Bandelier. This cavate is located in an area of the park that receives moderate visitation and, with no supervision from park personnel, is vulnerable to visitor-related impacts. Drainage modifications were completed in four cavates in which erosion and natural topography were directing water flows into cavate interiors. Two of these cavates contain a large number of intact petroglyphs and other embellishments from both the prehistoric and historic periods and are ranked as high priorities. Water diversion treatments used here included regrading, mortar replacement, and lime mortar drip lines. Graffiti mitigation was completed in two additional cavates at North Mesa and vandalism has not reappeared since treatment.

Additionally, The VT crew produced a floor map of Moccasin Cave, a cavate with unique foot-shaped floor features that had not previously been documented; all cavates identified as high priorities for treatment were photographed with both film and digital cameras to provide archival documentation for the future; and a field report was completed for the FY 2010 field season.

Assess and Stabilize Long House Pueblo; Maintain Tyuonyi Pueblo:

The main objective of both the Long House Pueblo and Tyuonyi Pueblo projects was to continue the stabilization of deteriorating masonry walls. Both Long House Pueblo and Tyuonyi Pueblo are 14th- to 16th-century Ancestral Pueblo villages with numerous extant masonry walls in varying states of preservation. The walls were originally constructed of shaped tuff blocks set in earthen mortars. Excavations of these sites in 1908-11 revealed masonry foundations of over 200 ground floor rooms in Long House Pueblo, and around 240 rooms in Tyuonyi Pueblo. Both pueblos are on the main interpretive trail at Bandelier and are viewed by the vast majority of the visiting public. Past stabilization efforts included the use of physically and visually incompatible cement mortars that are damaging the original fabric. Recent stabilization efforts have been directed toward removing the incompatible mortars and replacing

them with a softer earthen mortar that is amended with dilute El Rey 2000, a commercial acrylic stabilizer.

During the 2010 field season, crew members stabilized 45 walls at Tyuonyi Pueblo and 22 walls at Long House Pueblo. Treatment included raking back and removing hard cement mortar and replacing it with a more compatible amended earthen mortar, filling voids in walls, stabilizing wall foundations, and re-grading compartment floors to direct water away from the sites. In addition to this work, six walls were completely rebuilt, and one highly unstable wall received emergency stabilization in order to prevent collapse. Overall, 18 tons of accumulated cement rubble from this and previous years were transported to the Los Alamos concrete recycling facility. Vegetation was removed from several rooms in Long House Pueblo to prepare it for documentation through laser scanning, and a preliminary vegetation survey was completed. Detailed before-, during-, and after-treatment documentation was completed for all phases of the project.

The Long House Pueblo and Tyuonyi Pueblo projects served as training opportunities for seasonal workers and members of the Bandelier Youth Conservation Corps, who received training in masonry preservation by assisting with work this season. In addition, because Tyuonyi and Long House Pueblos are both located on the visitor trail in Frijoles Canyon, work there is highly visible to the public, offering an opportunity for education about the histories of the sites as well as Bandelier's ongoing measures to preserve and protect them.

NEW CONTRACTS AND COOPERATIVE AGREEMENTS

In addition to the fieldwork completed by the VT crew, work was initiated, completed, or continues on several contracts and cooperative agreements.

Laser Scan and Digital Modeling of Long House Pueblo:

This contract is the second in a multi-phase project designed to digitally document Long House in its entirety. This project has three goals: 1) produce a baseline record of the site to establish current conditions; 2) serve as a reference for future monitoring of decay and loss of features, and support research related to cavate architecture; and 3) develop digital and 3-D visualizations of extant site features that graphically explain spatial relationships and that can be incor-

porated into interpretive media.

The first phase, carried out in 2006, consisted of a pilot project designed to assess laser scan technology and determine its effectiveness at Bandelier. The pilot scan produced a digital 3-D triangulated irregular network (TIN) model of a 20-meter long by 14-meter high portion of the cliff face (including limited architectural components) in high resolution (1 mm) and ultra-high resolution (0.1 mm). Reflectivity models were also produced to enhance the visibility of petroglyphs. The current phase of the project will build on the data gathered in Phase I and it will serve as a model for future phases. The contract was awarded to 4G LLC and Western Mapping Company. Fieldwork and data processing are planned for FY 2011 with an anticipated completion date of June 30, 2012.

Tuff Analysis for Cavate B002:

This project was initiated as Cooperative Ecosystem Study Unit (CESU) cooperative agreement between Bandelier National Monument and the University of New Mexico School of Architecture and Planning, in partnership with the University of Vermont. Funding was used to support a graduate-level student scholarship for further study and analysis of the volcanic tuff in the area of cavate B002. The results of this localized tuff analysis will be used to advance research related to the structural analysis and predictive modeling of the prehistoric masonry enclosure wall in cavate B002. Final results are expected by August 30, 2011.

Graffiti Mitigation in Frijoles Canyon and Tsankawi Cavates:

This cooperative agreement with the Museum of New Mexico will facilitate ongoing graffiti mitigation efforts in cavates throughout Bandelier National Monument. Graffiti, in the form of incised writing, imagery, or amorphous lines and shapes, is widespread throughout our high-visitation areas and is most often located in plastered or sooted architectural components. The primary objective of graffiti mitigation treatment is to obscure modern graffiti in high-priority cavates. This agreement will provide funding for two conservators and an intern from the Museum of New Mexico to travel to Bandelier on a weekly basis to document and treat modern graffiti.

Measured Drawings of Duchess Castle:

Duchess Castle is a small historic masonry

ruin located in the Tsankawi unit of Bandelier National Monument. A small contract was awarded to architectural historian Kathleen Corbett to complete archival quality measured architectural plan and elevation drawings of the remaining structural components. Final drawings will be delivered to Bandelier in FY 2011.

ONGOING CONTRACTS AND COOPERATIVE AGREEMENTS

Sampling, Testing, and Analysis of the Anthropogenically Altered Portions of the Tshirege Member of the Bandelier Tuff:

This CESU cooperative agreement with the New Mexico State University Department of Geological Sciences was initiated FY 2008 and has progressed through several phases of fieldwork, laboratory analysis, and reporting. Professor Nancy McMillan, head of the Geological Sciences Department, is leading the project to characterize the geology and composition of the portion of the Bandelier tuff into which the cavates are excavated and to determine the deterioration phenomena causing cavate disintegration. Ultimately the data will be used to design appropriate conservation treatments for the cavates. This project has three specific goals: 1) to determine whether anthropogenic alteration of the tuff (including carving, sooting, and use over time) has changed its chemical and physical nature; 2) to understand the weathering phenomena that cause tuff deterioration; and 3) to investigate the role of lichen in protecting or accelerating the deterioration of the tuff. This project has been extended to August 31, 2011.

Graffiti Mitigation Field School:

Bandelier National Monument and the University of New Mexico School of Architecture and Planning developed a CESU cooperative agreement to conduct an educational field school in graffiti mitigation and, under the direction of Associate Professor Douglas Porter, four students from the University of New Mexico participated in the field school in June, 2010. The students learned the principles and methods of graffiti mitigation in cavates located in Frijoles Canyon, attended tours and lectures, completed field documentation, and contributed to a project report. The field school was completed in FY 2010 and a field report is expected in June, 2011.

Structural Assessment and Monitoring of Cavate B002: This project involves

structural analysis and predictive failure modeling of a prehistoric masonry enclosure wall in cavate B002. The primary collaborators in this project are the School of Architecture and Planning at the University of New Mexico, led by Associate Professor Douglas Porter, and the Vanishing Treasures Program at Bandelier National Monument. Professional participants will include architectural conservator Angelyn Bass Rivera; Dr. John A. Ochsendorf, Associate Professor of Civil and Environmental Engineering and Architecture at the Massachusetts Institute of Technology; and Jim Holmlund and Joe Nicoli of Western Mapping Company, Inc. The project is being facilitated by the Colorado Plateau Cooperative Ecosystem Study Unit.

Cavate B002 is unusual in that two of its original walls were built of masonry. Both walls were intact in the 1920s, but one has fallen down; the surviving wall is extremely fragile because of extensive mortar loss between masonry units and severe cracking in the cliff face above. This multidisciplinary project will evaluate the structural stability of the wall and study deterioration of the Bandelier Tuff. The initial phase of research included a detailed condition assessment of the cavate, laser scanning to record wall geometry, design and analysis of a structural model, and development of recommendations for ongoing structural monitoring.

In FY 2010, Western Mapping Company completed a laser scan of the cavate and masonry wall. The laser scan data were used to generate an initial structural model illustrating the possible mechanism of structural failure. The model will be used to theoretically predict wall behavior based on small changes in existing conditions and will provide the theoretical basis for establishing stability/failure thresholds. This program will serve as a pilot to determine the techniques and equipment necessary to monitor the structural stability archeological masonry. The project is expected to yield results that will be applicable to similar sites within the Monument. Expected project completion date is February, 2012.

Finalize Document, 'Preliminary Data Analysis and Treatment Recommendations for the Frijoles Canyon Cavates:

This small contract was awarded to Architectural Conservator Angelyn Bass Rivera with Conservation Associates. In 2006, conservators from the VT Program at Bandelier drafted a report that summarized

nearly a decade of research and fieldwork related to the cavate pueblos. This document laid out management strategies for the cavate pueblos in Frijoles Canyon, which are extremely significant archeological resources that are identified in the Monument's enabling legislation. The park is currently using this draft document to aid in the development of documentation and conservation strategies for the cavate sites in Frijoles Canyon. The document is also being used to guide the development of pilot projects in other parts of the park and in areas managed by other federal, state, and tribal agencies with similar resources.

The finalization of this draft document is a high priority for the VT Program and Bandelier National Monument. Angelyn Bass Rivera, who is a former manager of the Bandelier Vanishing Treasures Program, is currently working to prepare this document for publication. A draft of the final version of the document was delivered in FY 2010. Final revisions are expected to be complete sometime in FY 2011.

Documentation of Tsankawi Cavates:

This CESU cooperative agreement with the University of New Mexico has developed into a multi-phase documentation project for the significant maintained archeological sites at Bandelier National Monument. Under the direction of Principal Investigator Richard Chapman, Phase I of the project consisted of systematic and detailed documentation of more than 350 cavates at the Tsankawi unit of Bandelier National Monument. Phase I fieldwork was completed in 2008 and analysis and reporting for this phase were finalized in April, 2010.

Planning for Phase II of this project was conducted in FY 2010. Phase II will consist of detailed documentation and analysis of Alcove House Kiva under the direction of Principal Investigator Douglas Porter, Associate Professor in the Department of Architecture and Engineering at the University of New Mexico. The fieldwork, planned for FY 2011, will allow students from the University of New Mexico the opportunity to gain hands-on experience in site investigation. The expected completion date is June 14, 2013.

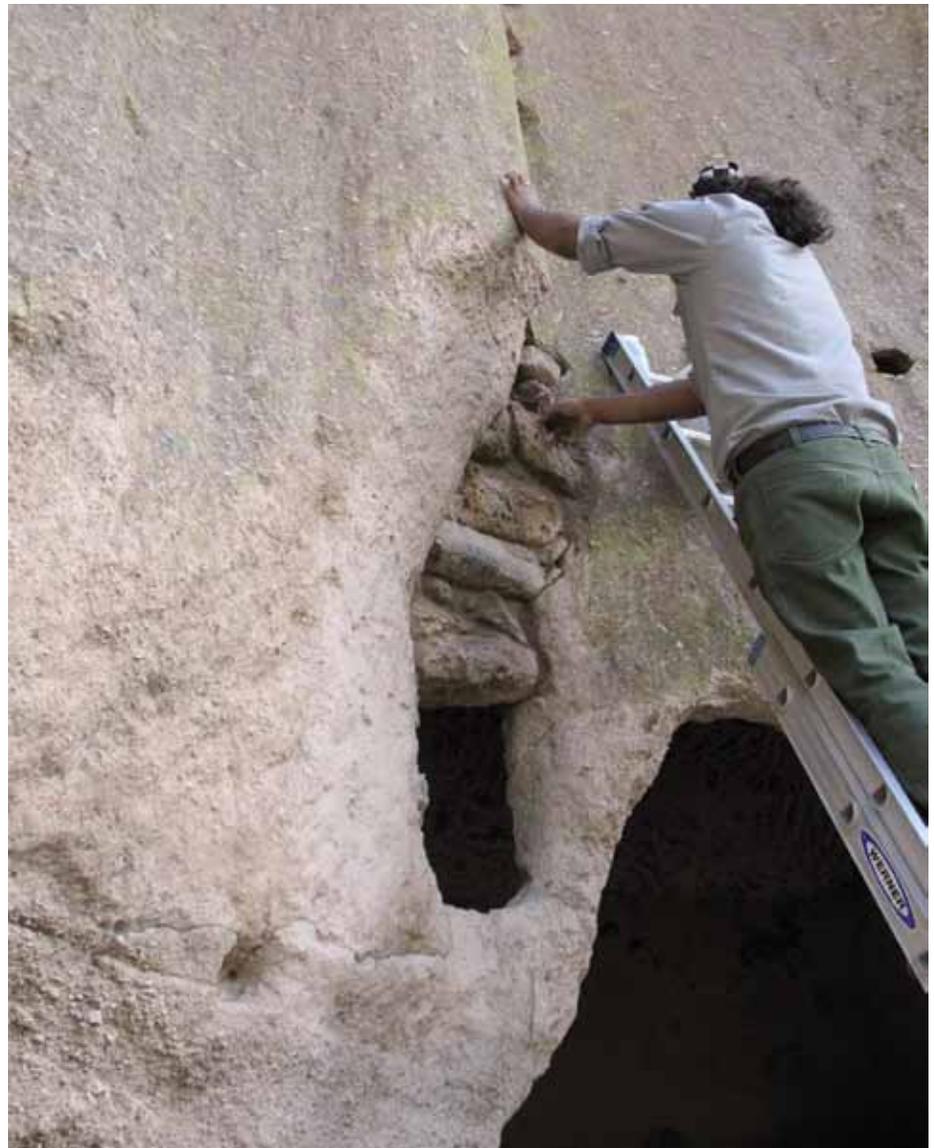
A number of challenges faced the Bandelier VT Program in FY 2010. One of our biggest ongoing technical challenges has been working with the local geologic material, an extremely soft and vulnerable volcanic stone. The chemical and physi-

cal characteristics of the stone, particularly in areas impacted by human occupation, remain largely unknown. The complex causes of certain deterioration conditions are sometimes unclear, leading to challenges in developing effective conservation treatments. It is anticipated that the results of two of our ongoing cooperative agreements will help us make substantial progress toward filling these knowledge gaps and will lead to improved decision making in the selection and application of conservation treatments.

Another challenge at Bandelier has been finding appropriate and accurate graphic documentation techniques for the unusual, and sometimes spherical, interior spaces of

cavates. Prior to FY 2010, graphic documentation methods consisted primarily of still photography, which provides excellent detailed images but little context, or laser scanning, which produces an exact digital model of the space but is cost prohibitive as a large-scale application. The VT staff at Bandelier was interested in finding an alternative method of documentation that fits several criteria:

1. Providing visual context for cavate interiors and accurately reflecting spatial relationships of architectural components and features on surfaces with compound curvature;
2. Allowing the visual representation of the relationships of interconnected interior



A member of the Bandelier preservation staff works to stabilize masonry on a cavate site, Bandelier National Monument.

Photo: Courtesy Bandelier National Monument

- spaces (when present);
- 3. Capturing variations in plaster and tuff color and applied pigment (when present) through colorization;
- 4. Providing relative ease and low cost in capturing, processing, and using data; and
- 5. Providing archival stability and accessibility in the long term.

In June, 2010, Kay Barnett and Robert Jensen from Mesa Verde National Park traveled to Bandelier National Monument to help us refine and expand our documentation procedures. The Mesa Verde team, working with the Bandelier VT crew successfully completed detailed hand-drawn maps with feature overlays and produced high-resolution rectified photographic montages that met some of the above criteria. The VT crew also experimented with 360 degree panoramic digital photography and produced several successful stitched panoramas of cavate interiors that can be viewed as 3-D models. These efforts to expand our visual documentation methods resulted in many successes; however none of these methods individually succeeded in meeting all of the criteria. The Bandelier VT program will continue to experiment with documentation methods for these complex spaces.

Continuity of staffing continues to be a challenge at Bandelier. In many ways FY 2010 was a great success for the Bandelier VT program, since most of our seasonal crew members returned from previous years. However, the VT staff had to adjust to the departure of program manager Lauren Meyer, and the program operated short-staffed for the second half of the year. This proved to be even more challenging when the program manager posi-

tion was filled by an existing staff member and the resulting vacancy was lapsed, leaving the program understaffed going into FY 2011.

Consultation: VT program manager Shannon Dennison consulted with San Ildefonso Pueblo and Santa Clara Pueblo prior to the start of the FY 2010 field season. In addition, Barbara Judy, Chief of Resource Management, consulted with Cochiti Pueblo and the New Mexico State Historic Preservation Division (SHPO) on behalf of the VT program. Bandelier conducted outreach to San Felipe Pueblo, Kewa Pueblo (formerly Santa Domingo), and Zuni Pueblo but no consultation was scheduled. All of our field projects received Section 106 and National Environmental Policy Act (NEPA) compliance review and were entered into Planning, Environment, and Public Comment (PEPC) database prior to implementation.

Safety: At Bandelier, a multitude of safety hazards exist that could potentially result in injury to VT staff members in the field. The most common hazards at Bandelier are slips and trips on uneven terrain, wildlife interface, viral exposure (particularly Hantavirus and plague), heat exposure and dehydration, high-angle site access, lightning and inclement weather, rock falls, and other hazards likely to be encountered in a natural outdoor environment. In order to manage risk during fieldwork, all crew leaders are tasked with creating or updating site-specific safety plans and reviewing the details of those plans with supervisors and crew members. The VT staff also participate in daily briefings (which include a safety component) and weekly safety sessions on various subjects. In addition, all supervisors and crew leaders have com-

pleted the Operational Leadership and Risk Management training, and one member of the VT program staff is a member of the park-wide Employee Safety Committee.

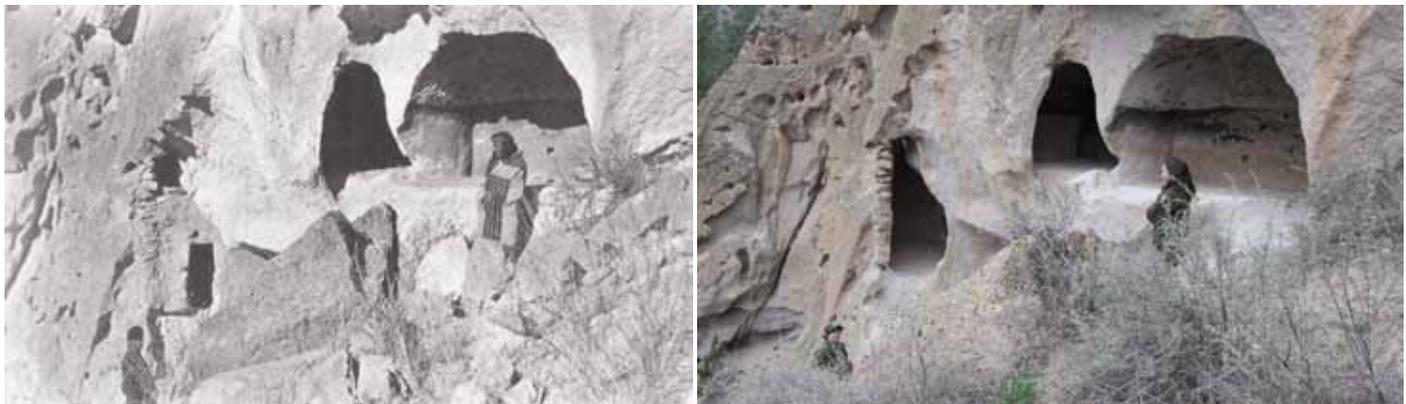
One safety incident, resulting in a broken ankle, occurred in FY 2010. A safety review concluded that the accident was a result of trail conditions and recommendations were put forth to help avoid similar incidents in the future.

VANISHING TREASURES STAFF

Lauren Meyer / Shannon Dennison, Exhibits Specialist (Architectural Conservator)
FY 1999 Position

This position was vacant during part of FY 2010. Part of the lapse salary was used to support a 120-day detail in the program manager position, and the remaining funds were reserved to cover permanent-change-of-station (PCS) relocation costs. Because the vacancy was filled by an existing employee, the relocation money was ultimately absorbed into the park base. The vacancy was filled at the end of FY 2010.

Skills: Lauren Meyer worked as the VT program manager through April 10, 2010. Lauren has a background in archeology and historic preservation and has been employed as an architectural conservator with the NPS since 2002. She has experience with architectural documentation, condition assessment and treatment of archeological sites and historical architecture. For the last several years, Lauren has focused on the development and implementation of treatments for stone masonry, earthen mortars and earth and lime plasters. Lauren is also highly skilled at database de-



Bandelier monitors and documents incremental and catastrophic loss by recreating photo points from historic images. In this scene, Stephen Merkel and Lauren Meyer (right) stand in front of cavate B002, illustrating the loss of an intact masonry doorway that is visible in a late 19th century photograph (left), Bandelier National Monument. Photos: Courtesy Bandelier National Monument

velopment and management as a result of both project work through the Vanishing Treasures Program at Bandelier and contracts completed for museums and conservation organizations. In April, Lauren accepted a position with the VT program in the IMR-Santa Fe office.

Upon Lauren's departure, Shannon Dennison took over program management duties first, through a 120-day temporary promotion and then through competitive appointment. Shannon has a background in archeology and architectural conservation and has worked and studied in several western states and the United Kingdom. Shannon first worked with the NPS in 2004 as a seasonal Interpretive Ranger at Mesa Verde National Park and went on to work in the private sector doing cultural resource management after she completed graduate school at the University of York (UK). Shannon began working at Bandelier National Monument in 2007, where she has served as a crew leader, project manager, and now program manager. She has a strong interest in the public use and understanding of cultural sites, the philosophical and practical issues surrounding the preservation of "ruined" architecture, and the administrative history of the NPS.

Accomplishments: In FY 2010, Shannon assisted Lauren with the development of the FY 2010 operating budget and took over budget management after Lauren's departure. She developed and entered all FY 2010 VT field projects in PEPC and submitted them for Section 106/NEPA review. She also served on the Section 106 review committee and participated in tribal consultation. Shannon managed all hiring activities and supervised two term employees, one temporary employee, six seasonal employees, and one SCA intern. Shannon developed and organized multiple training opportunities for the seasonal staff and, with assistance from acting project manager Stephen Merkel, directed the planning and implementation of seven field projects. Shannon oversaw seven existing contracts and agreements and developed two new cooperative agreements and one new contract. She oversaw the VT safety program, participated in the park-wide Employee Safety Committee, and developed informal testing for experimental conservation materials.

Training: Shannon completed NPS Fundamentals V, Agreements Technical Representative, FMSS training for Maintained Archeological Sites, and other mandatory online training.

Shannon Dennison / Stephen Merkel, Exhibits Specialist (Architectural Conservator)
FY 1999 Position

This position was vacant during part of FY 2010. Lapse salary was absorbed into the park base budget.

Skills: Shannon Dennison held this position through April 10, 2010, after which she took over program management duties. Stephen Merkel took over as the VT project manager through a 120-day temporary promotion.

Stephen began working at Bandelier in 2008 and has served as a field crew member, crew leader, and project manager. He is interested in the technology of cavates and has begun to study the pigments used in a wall painting in Cavate M160, particularly an unusual green pigment. Stephen is passionate about preservation and documentation of cavates and masonry structures, and has particular interests in how their uses changed and how the construction materials weather and degrade over time.

Stephen attended the University of Maryland, majoring in Art History and Archeology. He went on to the Institute of Archeology at University College, London, where he earned a graduate degree in Artifact Studies. His academic interests are in archeometry, material science, and material culture. During his graduate studies he interacted with object conservators and developed an interest and understanding of object conservation. Prior to working at Bandelier, Stephen studied collections in Egypt and Belize and he worked for a cultural resources management firm in the Mid-Atlantic States. His interests have shifted from working around archeological excavations to maintaining collections and conservation.

Accomplishments: In FY 2010, Stephen supervised four temporary/seasonal employees and managed the Frijoles Canyon cavate conservation project. Stephen took on primary responsibility for developing and implementing the treatment plan for the cavates, directly oversaw fieldwork, and served as primary author of the field report. Stephen also provided guidance and assistance to Rachel Adler in developing a treatment plan for the North Mesa cavate conservation project and assisted with the implementation of treatments there. In addition, Stephen contributed to the photo-documentation of Duchess Castle.

Training: Stephen completed Operational

Leadership and Risk Management training and Basic 40-Hour Supervision. Stephen also developed and presented a poster on Bandelier's graffiti mitigation program for the Society for American Archeology conference.

VANISHING TREASURES PROJECT FUNDING

Project Name: Emergency Conservation of Frijoles Canyon Cavates

PMIS Number: 134200

Project Summary: Bandelier National Monument implemented conservation treatments that included detailed documentation of the Frijoles Canyon cavate pueblos. The primary aim of the project was to develop appropriate methods to identify, document, conserve, and maintain the cavates as both natural and constructed heritage. In addition, through Native American consultation, the project sought to create a culturally adaptive management strategy that would address the physical conservation of the cavates within the context of their landscape.

Project Budget:

Total VT Project Funding:	\$124,990
Personnel:	\$78,361
Vehicles:	\$0
Travel/Training:	\$3,760
Supplies/Materials:	\$1,343
Equipment:	\$3,292
Services/Contracts:	\$38,234
Other:	\$0

Project Accomplishments: The documentation and stabilization of the approximately 1,100 cavates in Frijoles Canyon is a long-term project. The following is a summary of the work completed in FY 2010.

1. Documentation and Stabilization of Cavate Masonry

The preserved masonry associated with cavate architecture is rare, although masonry was once ubiquitous in cavate architecture. The loss of what does remain is occurring at an alarming rate, with only half of the 12 masonry walls that were stabilized in a 1940 stabilization campaign remaining today. Many of these collapsed masonry walls are located in areas that are presently closed to visitors but were once open to unmonitored visitor access. It is unclear how much of the collapse was due to environmental conditions and how much was human caused, but it is likely that visitation was the primary contributing factor to the loss of these masonry components. A



Group M in Frijoles Canyon, a three-story cavate pueblo comprised of earthen plastered interconnected cavates, architectural features such as smoke holes and viga sockets on the cliff face, standing masonry walls at the cliff base and, shallow depressions that remain as the rear walls of once constructed rooms, Bandelier National Monument.

Photo: Lauren Meyer

large portion of the field work done in FY 2010 was aimed at inspecting, documenting, prioritizing, and stabilizing both unstabilized and previously stabilized cavate masonry throughout Frijoles Canyon.

A total of 30 masonry walls were inspected, 11 of which were selected for stabilization. Of the 11 walls stabilized, 9 had been stabilized between 1940 and the 1970s and 2 had never received treatment. Before treatment commenced, the wall faces were thoroughly photographed and the presence of original and stabilization mortar was graphically documented. Two types of stabilization mortar were used during the course of the project. An unamended earthen mortar was used for the primary stabilization work, but an acrylic-amended earthen mortar was used in walls that were directly exposed to the elements or had been heavily impacted by earlier stabilization work.

2. Plaster Stabilization Treatment Testing

Plaster delamination is occurring in a

large number of the cavates at Bandelier. Not only are original plaster finishes being lost on a relatively large scale, but plaster detachment due to substrate deterioration is threatening significant murals and carved imagery. Plaster stabilization treatment testing began at Bandelier in 1999 when Angelyn Bass Rivera successfully treated earthen plaster with a diluted acrylic solution. This year, treatment testing began using gelatin in place of the acrylic solution. Its performance will be evaluated over the next several years.

3. Drainage Modification

Two cavates in Frijoles Canyon were treated to address damaging water flows. A high-priority cavate in Group I received treatment for damaging water flow that was entering the cavate via a smoke hole above the doorway and a small dam was constructed on the side of Snake Kiva to prevent water from further eroding its floor.

4. Cavate Photography Archive

A project is underway to create a photographic archive of each cavate in Frijoles

Canyon. A total of 659 cavates had been photographed as of 2008, and film and digital photographs of an additional 171 cavate structures were taken during FY 2010. Cavates are photographed both with a high-resolution, color, digital, single lens reflex camera and with traditional 35mm black-and-white film.

5. Development and Implementation of Plan Mapping, Orthorectified Photography, and 360 Degree Photography of Cavate Structures

Robert Jensen and Kay Barnett from Mesa Verde collaborated with staff at Bandelier to develop strategies to accurately map and photograph cavate interiors. Kay Barnett helped to produce a scaled floor plan of Snake Kiva, which was first mapped by Edgar Lee Hewett in 1909. Robert Jensen trained staff in orthorectified photography, which will be utilized in future years to record imagery and murals on cavate walls. We are also employing a 360 degree tripod that allows cavate interiors to be recorded in the round.

Chaco Culture National Historical Park

VANISHING TREASURES ACCOMPLISHMENTS AND CHALLENGES

VT Challenges and Successes: See Vanishing Treasures Project Funding below.

Consultation: The preservation treatment program at the park seldom encounters problems relating to consultation with our 23 affiliated tribes or with the State Historic Preservation Division (SHPO). We consulted with the tribes and received SHPO concurrence before work began on the Chacra Mesa project.

Safety: No safety problems were encountered in executing the Chacra Mesa project. Our biggest challenge was the long hike from the road, across Chaco wash, and up

the side of the 400-foot mesa. UNM completed the condition assessment and the preservation crews executed preservation treatments with no injuries or weather-related illnesses.

Another project on a VT site, also located on Chacra Mesa, was funded from another source. This project proved very challenging and it required a good deal of engineering and safety planning. Treatment of 29SJ 2606, The Fortress Site, required designing and building a cable conveyor system to transport equipment and mortar to structures that are located on 20- to 25-foot high sandstone pinnacles on a narrow finger of the mesa. Actual treatment of the site took more than a month after which the cable conveyor system was dismantled. The preservation crew received a safety award for completing this project with no injuries or near misses and for the safety elements that they built into the conveyor system.

We continue to maintain and update our job safety analyses (JSAs) and conduct project safety reviews before starting field work on any of our projects; the park continues to offer Red Cross First Responder training to all our staff on an annual basis. We also have several VT staff who are trained as professional rescuers. Most of the preservation staff have also received formal training in tube-and-clamp scaffold use; review of the use of protection equipment and climbing gear was held prior to the start of work on the Fortress Site.

VANISHING TREASURES STAFF

**Roger A. Moore, Archeologist
FY 1999 Position**

Skills: Roger is highly skilled at writing successful servicewide comprehensive call (SCC) funding applications, working with multi-ethnic teams of employees and park



To work on the Chacra Fortress Site the preservation crew had to design and build a conveyor system to get mud and equipment to this difficult-to-access site which is located on several adjoining 20-foot tall sandstone pinnacles on a narrow mesa finger, Chaco Culture National Historical Park.

Photo: Courtesy Chaco Culture National Historical Park

partners, planning preservation programs, executing preservation work and documentation, designing databases, and site monitoring. Roger continues to expand his skills in masonry work, testing mortar mixes, and monitoring and evaluating historic structures for structural stability. He has formal training in general preservation techniques, maintains scaffold use and safety certifications, professional rescuer certification, lithic artifact analysis and replication, lithic materials identification and analysis, National Environmental Policy Act (NEPA), Section 106, Archeological Resource Protection Act (ARPA) investigations and incident reporting.

Accomplishments: Roger provided guidance, training, and oversight for the University of Virginia and the University of New Mexico teams that carried out condition assessments on Chacra Mesa and other sites in the park. The information that was collected provided background information that facilitated the work of the preservation crew on a number of the VT sites on the mesa.

Training: Along with Dabney Ford, the Cultural Resource Division Chief, Roger took part in a week-long training program in the facility management software system (FMSS) geared toward its use with

maintained archeological sites (MAS). The training will help the park to comply with the requirements for FMSS data on sites when submitting SCC projects for VT and other funding sources relating to cultural resources.

**Leo Chiquito, Masonry Worker
FY 1999 Position**

Skills: Leo is a very skilled masonry worker, having worked for many years doing wall repointing, stone replacement, wall core rehabilitation, wall basal repair, and wall capping construction and repair. His extensive background has been a great asset in helping to train new members of the preservation crew in proper techniques and methods for treatment of the prehistoric and historic resources in the park. He has helped design and build protective roofs over intact prehistoric roofs in several of our greathouses, and has restored roofs on historic Navajo hogans. Leo has also served as acting work leader from time to time.

Accomplishments: Leo, along with the rest of the crew, helped design, construct and operate the 200+ foot-long conveyor system used to access the Fortress Site on Chacra Mesa.

Training: Leo takes part in our regularly scheduled formal scaffolding training, first responder first aid and cardiopulmonary resuscitation (CPR) training, and the annual northwest New Mexico VT workshops.

**Garry Joe, Acting Work Leader
FY 2003 Position**

Skills: Garry has been the temporary acting work leader since Earl Johnson retired in December 2009. Garry is a skilled masonry worker, with over 11 years of experience. His skills include wall repointing and stone replacement, wall core rehabilitation, wall basal repair, and wall capping construction and repair. Garry has helped design and build protective roofs over intact prehistoric roofs in several of our greathouses, as well as restoring roofs on historic Navajo hogans. For the last several years he has filled in as acting work leader whenever Earl was absent. He served as Earl's assistant during most of FY 2008 and 2009, where he learned the management responsibilities that go with the position. Garry assisted with the orientation of new crew members and helped to teach them the skills they needed to function well on the preservation crew. Garry has worked with the VT archeologist in planning field season schedules, estimating project costs, and maintaining necessary supplies and equipment. He has a commercial driver's license and he drives our dump truck and operates our front-end loader, both essential activities for obtaining and transporting soil for backfill operations and mud mortar mixes.

Accomplishments: Garry coordinated and oversaw the team effort to design and construct the conveyor system on Chacra Mesa. He devised the logistical system needed to convey the supplies and equipment up to the mesa top and then dismantled the system when the treatment was complete. His focus on safety helped make this an accident-free season, despite the difficult terrain and climbing hazards involved with both Chacra Mesa projects.

Training: Garry takes part in our regularly scheduled formal scaffolding training, first responder first aid and CPR training, and the annual northwest New Mexico VT Workshops.

**James Yazzie, Masonry Worker
FY 1999 Position**

Skills: James is a skilled masonry worker, with over 29 years of experience working



Adding additional capping to the great kiva at Chetro Ketl will allow the grade to be raised around the kiva's perimeter so moisture will flow away from the kiva walls, Chaco Culture National Historical Park.

Photo: Courtesy Chaco Culture National Historical Park

on prehistoric wall facing, repointing and stone replacement, wall core rehabilitation, wall basal repair, and wall capping construction and repair. He assists with the backfilling of sites, operating our Bobcat loader for these operations. He participates in the design and installation of drainage systems, has helped design and build protective roofs over intact prehistoric roofs in several of our greathouses, and has restored roofs on historic Navajo hogans. He is one our photographers, documenting before- and after-conditions of areas receiving treatment, and he assists the Work Leader from time to time with crew supervision.

Accomplishments: James was instrumental in helping to design the conveyor system, adding his knowledge and skills from his training in rock climbing.

Training: James participates in our regularly scheduled scaffolding training, first aid and CPR/AED (automatic electronic defibrillator) training, and he attends the northwest New Mexico VT workshops.

**Harold Suina, Masonry Worker
FY 2001 Position**

Skills: Harold is a skilled masonry worker, with many years of experience working on prehistoric wall repointing and stone replacement, replacement stone shaping, wall core rehabilitation, wall basal repair, and wall capping construction and repair. He takes part in all phases of our back-



Chaco Culture NHP's Preservation Crew leader, Earl Johnson retired this year, after 48 years of government service.

Photo: Courtesy Chaco Culture National Historical Park

fill operations, taking a lead role in mapping the location of drainage systems and completing backfill documentation for treatment records before the systems are covered by backfill. Harold has helped to design and build protective roofs over intact prehistoric roofs in several of our greathouses and has restored roofs on historic Navajo hogans. He also inspects scaffolding for correct set up and safety and he assists in training new crew members.

Accomplishments: Harold was a key player in designing and constructing the Fortress Site conveyor system and is one of our documentation photographers.

Training: Harold participates in our regularly scheduled scaffolding training, first aid and CPR/AED training, and the annual northwest New Mexico VT workshops.

**Vacant, Masonry Worker
FY 1999 Position**

This position was vacant for most of FY 2010. In December, 2009, Earl Johnson, our long-time preservation crew leader, retired after 48 years of government service. Earl worked for several government agencies, including the NPS and the Bureau of Land Management. During his long career Earl worked at nearly all of the major sites and parks throughout the southwest, as well as many of northwest New Mexico's prehistoric greathouses and Navajo puebletos. Earl's preservation skills, leadership, and knowledge of the history of preservation work on our sites were a great asset to our program. His retirement leaves a void that will be difficult to fill.

Skills: Earl is a master mason with 40 years of experience. For the past 14 years he has served as the crew work leader at Chaco helping to develop field schedules, estimating project costs, obtaining materials, and maintaining equipment.

Accomplishments: Earl continued to provide leadership to the Chaco crew right up until his retirement.

Training: Earl did not participate in any VT-related training prior to his retirement.

**VANISHING TREASURES PROJECT
FUNDING**

Project Name: Assessment of sites and emergency treatment on Chacra Mesa
PMIS Number: 114694

Project Summary: Chacra is a high mesa on the east end of the park with many sites that are difficult to access. The Chacra

Mesa Condition Assessment and Emergency Treatment project located approximately 40 sites, including late Basketmaker through Pueblo II sites as well as late 19th- to early 20th-century Navajo single-family and extended-family homesteads. Site maps and data were updated and a detailed condition assessment was completed for each site. All pertinent data from the sites were entered into the preservation treatment archive database and the archeological site management information system (ASMIS). Facility management software system (FMSS) data entry will begin in early FY 2011 when trained staff become available. Data from these assessments will be incorporated into our annual preventative and cyclic treatment programs.

Project Budget:

Total VT Project Funding:	\$52,491
Personnel:	\$10,720
Vehicles:	\$0
Travel/Training:	\$0
Supplies/Materials:	\$1,432
Equipment:	\$339
Services/Contracts:	\$40,000
Other:	\$0

Project Accomplishments: Based on the information obtained through the condition assessments, the preservation crew evaluated needs and treated the most critical areas--those where fabric loss was great or where there was a threat of severe fabric loss in the coming year. Project work included stone and mortar treatments on habitation structures (hogans), stone corals, an oven, and sweat lodges. Hogan roofs of cribbed logs were repaired, with decayed elements replaced with new logs. At over four acres, site 29SJ 2966, known as the "George Mescalito Camp," is both the largest and best-known of the sites that received treatment.

The condition assessment work was accomplished through our Cooperative Ecosystem Study Unit cooperative agreement with the Department of Anthropology at the University of New Mexico (UNM). Our long-term partnership with UNM began in the 1920s and continues to the present. University professors and students provide the park with accurate and up-to-date information on the details and condition of the sites, and the University benefits by providing its students with practical, on-the-ground experience in a variety of settings and site types. The University generally matches the funding by 3 or 4 to 1. The Chacra Mesa condition assessment and emergency treatment project was complete by the end of September, 2010.

El Malpais National Monument

VANISHING TREASURES ACCOMPLISHMENTS AND CHALLENGES

VT Challenges and Successes: The Vanishing Treasures Program at El Malpais National Monument had a very productive year. Some of the notable successes of our preservation program for FY 2010 include the first-ever preservation treatments to the historic Earl L. Head Homestead, the completion of condition assessments for all archeological sites lacking assessments in El Malpais, and the identification and documentation of Vanishing Treasures resources on the lava flows adjacent to the Chaco-style great house community of Las Ventanas.

The Earl L. Head Homestead, built in the 1930s and occupied for less than 10 years, consists of a two-room log residential structure and several nearby features including wood stock pens, a chicken house, a water catchment basin, earthen berms, fence posts, and a road. A large material culture scatter surrounds the cabin and its associated features. The Head Homestead is one of only three cabins in El Malpais and, though its condition is poor, it is the best preserved of El Malpais' historic cabins. El Malpais began a multi-year docu-

mentation and planning project focused on the homestead in 2005 that culminated in 2010 with a final report that included architectural documentation and a long-range preservation plan, along with the first preservation treatments to the log cabin. The final report and the preservation treatments were completed through a partnership between El Malpais and the Drachman Institute, a research and public service unit of the College of Architecture and Landscape Architecture at the University of Arizona. This partnership was facilitated through the Colorado Plateau Cooperative Ecosystem Study Unit (CPCESU).

The preservation treatments to the cabin consisted of the application of a borate solution to three exterior walls of the cabin's north room and one exterior wall of the south room. The treatment was conducted as the final phase of the project for the cabin. In addition to the preservation treatments, the fieldwork included a condition assessment of the cabin and training for El Malpais VT staff in the preparation and application of Bora-Care (a borate solution). The training was provided by VT Historical Architect Randy Skeirik and included VT staff from El Malpais and El Morro National Monuments.

Conducting condition assessments of archeological resources goes right to the heart of NPS stewardship. The completion of site condition assessments for all of the

sites in El Malpais that lacked assessments was a milestone for our preservation program. Credit for this accomplishment goes to the park's seasonal staff, in particular archeological technician Jimmie E. McKenzie. Several years ago, independent audits identified this particular need within the NPS Cultural Resource program, because without an understanding of the condition of our unique and irreplaceable resources, there can be no true assessment of how well we are caring for them. Stewardship involves taking care of these resources today so that we may hand over that responsibility to future generations. El Malpais has been conducting these assessments for several years and has established this work as a key component of its preservation archeology program.

Archeological studies at the Chaco-style great house community of Las Ventanas (LA 1328) in El Malpais' Sandstone Bluffs area consisted of archeological testing in 1983 and site documentation in 2000 to mitigate the effects of illegal excavations at the great house--both conducted by the NPS. Las Ventanas was listed in the National Register of Historic Places in 1983 (83001619). El Malpais and the Center for Desert Archaeology (CDA), through a CP-CESU agreement, began a multi-year project to analyze Las Ventanas' archeological collections, conduct instrument mapping of the site, re-assess the surface artifact as-



The Sandstone Bluffs seen from the lava flow during the Studies at the Las Ventanas archeological survey, El Malpais National Monument.

Photo: Steve Baumann

semblage, and conduct a survey of the lava flows directly west and north of the site.

Although the location of some archeological sites and probable pre-contact-era trails were known on the lava flows near Las Ventanas, there had never been an archeological survey of the flows. In September, 2010, the CDA and El Malpais surveyed approximately 1,000 acres on the lava flows directly west and north of Las Ventanas, confirming that a network of trails crosses the lava flows west and northwest of Las Ventanas. Several of the trails are well developed and include architectural elements that constitute Vanishing Treasures resources. Fifteen sites were recorded on the lava flows during the survey. Thirteen are prehistoric trails, one is a shrine, and one is a site of unknown function.

Rock cairns are the most common trail markers although other features were also used to indicate routes across the flows. Some of these features include some quite large rubble and tabular basalt bridges, trail segments of intricately laid tabular basalt paving, single tabular basalt steps or groups of steps built in ravines or collapsed lava tubes, curbing along the edge of trail segments, cleared and leveled segments of trail through lava fields, concentrations of pot sherds sometimes at trail junctions, lava tube rock shelters with walls constructed around the openings, and pottery caches. Several trails consist of a network of these features. Such networks may represent planned and cooperative construction activities during the period Las Ventanas was occupied (ca. A.D. 1050-1200). Other trail features and site types recorded during the survey, particularly the shrines, are still in use today by people from the pueblos of Acoma and Zuni.

The results of this survey suggest a sophisticated use of the landform going back to the pre-contact period. The Las Ventanas Pueblo community and other communities in the area began, or maybe continued, the development of the lava flows into a sacred landscape, one that contains water in perpetual ice caves and a mosaic of environmentally diverse niches. The possible links—economic, ritual, sacred, and adaptive—between the cultural landscape of Las Ventanas and the cultural landscape of the lava flow will be explored further with the Las Ventanas study.

Regarding challenges, El Malpais continues to face the loss of archeological resources as a result of widespread soil erosion. Erosion continues to affect several Vanishing Treasures resources along



Calvert Ondelacy and Edwin Seowtewa apply borate solution to the Head Homestead during a one-day field school under the direction of VT Historical Architect Randy Skeirik, El Malpais National Monument.

Photo: Steve Baumann

El Malpais' sandstone bluff-lava flows interface. To mitigate these effects, archeological testing is being planned for the 2011 field season at multiple sites in this area. With VT funding in past years, El Malpais conducted an erosion control project at three VT sites. While the project was successful, the scale and rate of erosion in the monument demand the implementation of multiple preservation strategies including archeological testing and data recovery.

As in previous years, El Malpais and El Morro have faced challenges regarding museum management. Annual inventories, cataloging needs for VT projects and other VT activities (such as monitoring and condition assessments), requests for data and information from archives, collection information management, and required software maintenance are just a few of the activities needed to maintain museum collections generated by our VT program. This challenge continued in FY 2010 and we continue to recommend that there be an evaluation of this need program-wide to determine if a program curator position should be pursued. El Malpais and El Morro invite other VT parks facing this same challenge to begin a discussion on sharing a museum management position.

Consultation: El Malpais has very good relationships with Indian tribes in New Mexico and Arizona and with the New

Mexico Historic Preservation Division (the NMSHPO). In FY 2010, El Malpais consulted both the tribes and the NMSHPO regarding a number of activities, most specifically fire management activities. Consultation was conducted with the New Mexico Historic Preservation Division and New Mexico Indian tribes for two undertakings, one prescribed burn and one fuels project. Vanishing Treasures sites were protected during both projects.

Jim Kendrick organized and chaired a meeting that brought together the Acting State Historic Preservation Officer and staff from the New Mexico Historic Preservation Division with Superintendents and Cultural Resource Specialists from NPS units in New Mexico. The meeting focused on meeting the requirements of the Programmatic Agreement among the NPS, National Council of State Historic Preservation Officers (NCSHPO), and the Advisory Council for Historic Preservation.

Safety: The Vanishing Treasures Program at El Malpais recorded another safe year without injuries. We mentioned in last year's report that the ruggedness of the lava flows, and the great size and remoteness of the monument, pose many safety issues, including falling and tripping and getting cut and bruised on the jagged lava. These conditions will always make El Malpais a

challenging place to conduct field work safely. As also mentioned last year, the lava flows will attract lightning during storms, so our staff must really pay attention to the skies as well as our Vanishing Treasures resources during field work. Our staff and volunteers again encountered rattlesnakes and bobcats. The Vanishing Treasures staff at El Malpais and El Morro work very hard to keep Job Hazard Assessments updated, and to conduct frequent safety tailgate sessions. Every project and activity that we conduct is considered successful if everyone returns home safely at the end of each day.

VANISHING TREASURES STAFF

James W. Kendrick, Archeologist
FY 1999 Position

Skills: Jim's skills include archeology, project direction, and cultural resource program management.

Accomplishments: Jim manages the Vanishing Treasures Program at El Malpais and El Morro National Monuments as well as at Petrified Forest National Park (PEFO). He is also the Chief of the Heritage Preservation Division at El Malpais and El Morro, and serves on its management team as the key advisor regarding cultural resources. His VT-related accomplishments in FY 2010 were many and included completion of important projects in each of the three parks. These projects are described in the Challenges/Successes sections of each



Using a drill and a long, narrow bit, Jim Kendrick looks for deterioration in a wall timber at the Head Homestead during a one-day field school conducted by VT Historical Architect Randy Skeirik, El Malpais National Monument.

Photo: Steve Baumann

park's contribution to this report. A management perspective is provided below.

El Malpais National Monument completed a multi-year documentation and preservation planning project at the Earl L. Head Homestead, which dates to the 1930s. The homestead's residential structure is the largest wooden VT resource in the monument. The documentation drew largely from an archeological project conducted in 2003 by Jim along with Harding Polk II. This project improved our documentation by adding detailed condition assessments for each wooden element in the structure and by providing guidance on the long-term preservation of the site. This was one of the first cooperative agreements initiated by El Malpais and the Colorado Plateau CESU, and the final architectural documentation and preservation plan will prove useful for managing this site for years to come.

A significant phase of the archeological condition assessment project was wrapped up in FY 2010. Since the beginning of the VT Program at El Malpais, there have been numerous archeological resources in the archeological site management information system (ASMIS) database that did not contain condition assessments. At the beginning of our program in 1999, nearly 200 sites had no up-to-date information on condition. By the close of FY 2010, every archeological site in the El Malpais ASMIS database had a condition assessment. Future work will focus on assessing sites that are in poor condition or are in imminent danger of collapse or loss. Once this phase is completed, El Malpais will move forward on addressing data recovery needs for the resources found to be most threatened or already disturbed.

The archeological work conducted on the lava flows adjacent to the Las Ventanas great house complex will greatly increase our understanding of the significance of this, the largest archeological resource in the monument. Las Ventanas was first reported by Adolf Bandelier in the 1800s and, since the 1970s, has been the focus of several archeological surveys, and to a lesser degree, archeological excavation. The survey being conducted to the immediate west, however, has the potential to provide the most enlightening new information on this site in generations. Documentation of new and interesting types of VT resources will be one of the most beneficial results of this project. As discussed earlier, elaborately constructed trail features have been discovered, including bridges, "paved" sec-

tions (containing flat, tabular basalt laid to provide a better trail surface), cairns, steps, and walls to enclose natural shelters within the lava flows. This project will continue into FY 2011, with a focus on analyzing the artifacts recovered from archeological testing conducted in the early 1980s. Jim Kendrick and Steve Baumann worked together to develop the scope of work for the project and then worked with the CPESU and the Center for Desert Archaeology to initiate this project.

At El Morro, Jim and the VT staff made a decision to focus their efforts on the rapidly deteriorating retaining walls of the historic trail leading to the top of the north side of Inscription Rock. These walls were constructed in the 1930s and are not considered VT resources; but the trail provides access to Atsinna Pueblo, the largest VT resource in the monument. Visitor and employee safety would also be compromised if the walls were not addressed in FY 2010. This project was very challenging, and innovative methods were used to address the preservation of the walls while maintaining an extremely safe work environment in a steep and rugged setting. Although our VT program still worked on VT resources during FY 2010, the majority of our work was devoted to the switchbacks of the historic trail. In small parks with few staff, occasionally these decisions have to be made to ensure safety and preserve non-VT historic properties.

In addition to these projects, Jim coordinated compliance for El Morro and El Malpais, worked with the Museum of Northern Arizona on a cultural affiliation study for the Native American Grave Protection and Repatriation Act (NAGPRA) collection from Atsinna, consulted with tribes and the NMSHPO throughout the year, assisted a CESU partner and the NPS Intermountain Regional Office (IMRO) with three Cultural Landscape Inventories for El Malpais, managed the Depot Tank Stagecoach Preservation Project at PEFO enlisting the help of the Ancestral Lands Office of the Southwest Conservation Corps, worked on the Wenk Work Group that established the strategic goals of the Park Museum Management Program for 2011 to 2015, sat as the Chair of the IMR Resource Stewardship Advisory Team, and was awarded the Appleman-Judd-Lewis Award for Excellence in Cultural Resources for 2009.

Training: Jim's training in FY 2010 included Building Cultural Competencies (regarding Diversity), an archives manage-

ment workshop at UNM, Blood Borne Pathogens, Defensive Driving, Managing a Virtual Workforce, and Survival Skills for Supervisors.

**Calvin Chimoni, Masonry Worker
FY 2000 Position**

Skills: Calvin has exceptional preservation skills, especially with masonry and earthen materials. Calvin also performs architectural documentation through photography, conducts architectural condition assessments, and assists in determining appropriate preservation treatments.

Accomplishments: Calvin's activities in FY 2010 included leading a preservation work crew at El Morro's Atsinna Pueblo (a 700-year-old structure containing nearly 900 rooms), and assisting his colleagues on various projects at El Malpais and Petrified Forest National Park. Early in the field season, Calvin and the preservation crew conducted architectural documentation such as photography and condition assessments and determined that two walls in a single room were in need of immediate repairs due to severe winter and summer weath-

ering. Prevailing snow and rainstorms resulted in channeling, creating a need for repairs that included repointing and resetting of fallen masonry. During the summer season, Calvin provided training for our seasonal archeologist in the application of preservation treatments using earthen materials. In previous years, we have used only earthen mortars, but this year a single wall was completely repaired and then prepared for a final protective layer of soil-cement mortar. This technique, placing an underlying earthen mortar base then adding a protective soil-cement layer, proved successful and reduced the need for additional repairs. Another important activity at Atsinna Pueblo included seasonal vegetation removal as well as cleaning several four-inch PVC drainage intakes that help to conduct moisture away from the pueblo walls.

Through most of FY 2010, Calvin also assisted and provided technical expertise in El Morro's rehabilitation of the switchbacks along the Headland Trail. During the project, Calvin and other VT staff from El Malpais and El Morro assisted

monument resource managers with initial planning and designing a scope of work specifically identifying the process for conducting photographic documentation, wall condition assessments, and hands-on preservation treatments to reset, repair, and, in a few areas, repoint the severely undermined trail walls.

Training: Calvin attended and completed the 2010 Scaffold Industry Training Program (Competent Person Training: Frame Scaffold) provided by Territorial Scaffold, Inc. Calvin also completed Leadership Skills for Non-supervisors and attended several safety and health related trainings including Safety – Blood Borne Pathogen Training, cardiopulmonary resuscitation/automatic electronic defibrillator and First Aid Training, Respiratory Protection Program Training, a 4 hour hazard communication (HAZCOM) Training; and a snow removal training using power equipment.

VANISHING TREASURES PROJECT FUNDING

El Malpais National Monument did not receive VT project funding in FY 2010.



El Morro National Monument

VANISHING TREASURES ACCOMPLISHMENTS AND CHALLENGES

VT Challenges and Successes: Typically, beginning in May and ending in October, El Morro conducts preservation maintenance activities at Atsinna Pueblo (LA 99). Although some maintenance activities were performed at Atsinna this year, the work was intermittent. Instead, the focus of our preservation efforts in FY 2010 was shifted to repair and rehab work along the switchback segment of the historic Headlands Trail that leads to the top of El Morro's cuesta (and Inscription Rock).

Though not a Vanishing Treasure resource, the masonry retaining walls that support the switchbacks were, by the end of 2009, on the verge of collapse. The purpose of the project was to stabilize and repair damaged sections of the masonry retaining walls along the 1939 Civil Works Administration (CWA) constructed trail (LCS 063215). There are eight switchbacks in this section of trail and they are supported primarily by dry-laid masonry retaining walls. The switchbacks have a 15- to 20-percent grade

and drop 100 feet in elevation along 500 linear feet of trail. The walls are constructed with over 600 stones, ranging in size from one to four feet in diameter. Since 2000, heavy summer rains greatly accelerated the already serious erosion of both the retaining walls and the slopes at the base of the walls. Severe weather events resulted in three major masonry collapses that seriously undermined the walls. Erosion of base materials resulted in the shifting of large sections of the stone walls. These destabilizing effects created holes and cracks in the walls and undermined the asphalt trail surface. Emergency repairs to shore up collapsed wall sections provided a temporary fix until a full-scale repair and stabilization project could be implemented by El Morro's Heritage Preservation Division (HPD).

Three HPD stone masons completed all of the repair and stabilization treatments and the associated documentation (notes and photographs) over the course of the project. At three switchbacks, 36 cubic feet of mortared masonry wall was stabilized using soil cement and an additional 10 linear feet of capstones were stabilized also with soil cement. Where severe basal erosion had displaced original mortar and stone,

12 cubic feet, or four tons, of new stones were used to fill gaps in the walls. The new stones were selected to match the original masonry in color, size, and material (sandstone). All six tons of materials (dirt, gravel, and wood) and equipment (chain pulleys, hoists, screw jacks, slings, pry bars, ropes, shovels, sledge hammers, water) were transported by the HPD crew with a motorized wheelbarrow over a mile of trail to the staging area below the switchbacks.

At three of the switchbacks, intake drains were installed at the surface to capture runoff. These were connected to four-inch PVC drain pipes that were drilled with weep holes and buried to help protect the retaining walls and the switchbacks from erosion. The drain openings were covered with quarter-inch hardware cloth and then concealed with small stones. A total of 45 linear feet of drain pipe was installed. A series of check dams were constructed along the slopes below the drain exits to slow and direct the movement of water and debris down slope.

Photographic documentation of the walls and condition assessments were completed in 2009 before the stabilization and repair treatments began and again after the treatments were complete. In addi-



Inscription Rock during the height of the sunflower bloom, El Morro National Monument.

Photo: Steve Baumann

tion, photographic documentation was completed at all stages of the repair and stabilization treatments and the drainage installations. The HPD staff developed the scope of work and completed all planning and compliance documents for the project. The work at the switchbacks began in the fall of 2009 and was completed in October, 2010.

Accomplishments at Atsinna in FY 2010 included repointing eroded mortar joints in Room 8, resetting fallen masonry, and repairing voids in eroded walls. Although working only intermittently, El Morro's preservation crew worked hard on Atsinna's upkeep, particularly during the monsoon season. The rains present ongoing challenges in terms of mortar erosion and the proliferation of weeds. Both were kept in check by the diligent efforts of the preservation crew.

In addition to our work at Atsinna and the switchback trails, we continued building partnerships with local and regional organizations. Our partnership with the Pueblo of Acoma's Office of the Southwest Conservation Corps, which began in FY 2009, continued into FY 2010. In addition to developing three new agreements for preservation work, we continued partnerships on preservation activities at the Depot Tank Stagecoach Station and Puerco Pueblo in Petrified Forest National Park (PEFO) and preservation maintenance treatments at the Historic Alben Homestead in El Malpais National Monument.

El Morro and El Malpais National Monuments are co-managed, and our Vanishing

Treasures Program is also combined with VT staff from El Malpais. El Morro has many of the same challenges as El Malpais. Loss of archeological values from soil erosion affects a few sites at El Morro, but it is not as big a problem as at El Malpais. At El Morro, our greatest challenge continues to be the management of our museum collections. As mentioned in past VT reports, archives and museum objects are not considered VT resources; but we continue to generate, often on a daily basis, a significant number of project-related archives. El Morro continues to urge that we (the VT Program) evaluate this need program-wide to determine if a shared museum management position would be beneficial.

Consultation: El Morro consulted with the New Mexico Historic Preservation Division (the NMSHPO) prior to executing preservation treatments on the switchbacks along the historic Headlands Trail. We also consulted with the NMSHPO regarding the replacement of a split-rail fence that borders much of the Inscription Loop Trail. Consultation with Indian tribes, including the Navajo Nation and the Pueblos of Acoma and Zuni, was conducted regarding a cultural affiliation study of Atsinna (El Morro's largest VT resource) and a tree-ring study of living trees within the monument being conducted by the University of Tennessee.

Safety: The Vanishing Treasures preservation crew had a perfect safety record in FY 2010. No near misses or injuries were reported while conducting VT activities, including projects at Atsinna Pueblo (El Morro), at the Depot Tank Stage Station

(along the Big Lithodendron in PEFO), or during the stabilization work along the switchback segment of El Morro's Headland Trail. Work on the switchbacks presented many challenges in which safety was of paramount concern. Using motorized wheelbarrows, the El Morro preservation crew moved more than four tons of rock and nearly two tons of equipment along one mile of trail to get to the switchbacks, all without injury or damage to resources. Boulders weighing hundreds of pounds were moved, replaced, or refitted with great precision using an A-frame, chain pulleys, and screw jacks. This difficult job was accomplished on steep slopes with the assistance of platforms, shoring, and safety rails. Frequent tailgate discussions were conducted (at least weekly) and all routine work required the use of Job Hazard Analyses and use of the program's safety plan.

VANISHING TREASURES STAFF

**Steven M. Baumann, Archeologist
FY 2001 Position**

Skills: Steve has experience in archeology field techniques, project management, preservation treatments, database development, and geographical information systems (GIS)--experience he has gained through work in several NPS units in the Intermountain and Pacific West regions. Complementing these skills is his ability to develop and manage cultural resource information systems and to manage major Vanishing Treasures projects. Steve holds a Red Card and has acted as a Resource Advisor on prescribed burns and wildfires at El Malpais National Monument.

Accomplishments: During FY 2010, Steve worked on cultural resources projects for three NPS units: El Morro and El Malpais National Monuments, and Petrified Forest National Park. These projects included preservation activities at all three units, resource protection and fire management activities at El Malpais and El Morro, and site condition assessments and archeological survey at El Malpais.

Steve assisted with preservation maintenance activities at Atsinna Pueblo, which were completed in conjunction with the repair and rehab activities along the switchback segment of El Morro's Headlands Trail. The redoubled effort of El Morro's preservation crew resulted in the successful completion of both projects just as the leaves of El Morro's Gambel oaks changed color. Steve's work on the Atsinna Pueblo Preservation Project was a continuation of preservation maintenance activities that have been conducted annually at Atsinna since 2005, when Steve first began working at Atsinna.

Preservation activities at Petrified Forest's Depot Tank Stagecoach Station also continued in FY 2010. This work was conducted as a phased project that began in FY 2009. In Phase I, staff from El Morro, Petrified Forest, and the Southwest Conservation Corps (SCC) conducted "triage" repairs to the walls of the structure to prevent its collapse. The SCC completed Phase I in the spring of FY 2010 and, following a condition assessment of the structure by El Morro staff, preparations began

for Phase II of the project. For Phase II, which continued the partnership with the SCC, Steve collaborated with Lauren Meyers, Vanishing Treasures Exhibit Specialist, to develop a detailed scope of work and an agreement with the SCC to conduct the Phase II treatments. The completion of these documents will allow the SCC to continue their work at Petrified Forest in FY 2011.

Steve also completed agreements and scopes of work for projects at two other Vanishing Treasures sites: Puerco Pueblo in Petrified Forest and the Alben Homestead in El Malpais. The SCC plans to complete preservation treatments at both sites in FY 2011.

Steve worked closely with the fire management program on a fuel reduction project in El Morro's Atsinna Unit. The Atsinna Fuels Unit contains three highly visible Vanishing Treasures sites (LA 46022, LA 99, LA 46023). Atsinna Pueblo (LA 99) has the greatest visibility of the three because of its size, but also because the features at the other two sites are covered with heavy stands of Piñon and juniper. Steve supervised resource protection activities during this project and assisted seasonal Archeological Technician Wade Kaiser with marking site boundaries, with photographic documentation (before and after fuel removal), and with the sometimes subtle nuances of coding archeological site management information system (ASMIS) threats and disturbances data. Steve assisted the fire crew with selective thinning of Piñon and juniper trees growing on structures

at two sites (LA 46022 and LA 46023) and with the removal of dead and down fuels.

Steve assisted the Fire Management Program as a wildlands fire resource advisor (READ) on two wildfires, and he supervised site protection treatments for a prescribed burn in El Malpais. The preparations for the prescribed burn involved working closely with fire module crews from Saguaro National Park and Bandelier National Monument, who provided assistance to El Malpais' Fire Management Program on the proposed burn. Steve supervised on-site thinning of trees and the removal of dead and down fuels from 21 sites. Many of the sites have architectural features and, though mostly buried, are Vanishing Treasures resources. Steve supervised thinning and fuel removal activities from architectural features and marked site boundaries, enabling the fire crews to cut buffer zones around the sites.

Steve also served as Resource Advisor on two wildfires at El Malpais: the Barbell and Lava fires. Both were lightning-caused fires and were not suppressed under Federal Wildland Fire Use policy. The Lava Fire started on a kipuka (a land form completely surrounded by younger lava flows) and this kipuka has 14 sites, many with architecture. Steve and Archeological Technician Wade Kaiser, also a red-carded READ, assisted the El Malpais fire crew with the removal of dead and down fuels from the sites. The fire was monitored until it burned out naturally. No sites were affected.

No archeological sites were found near the remote site of the Barbell fire. However, during a survey of the fire's perimeter, Steve found an unexploded 100-pound bomb! The bomb was dropped by Army Air Corps aircraft practicing bombing runs in the El Malpais area during World War II. The fire crew was evacuated from the area, and the ordnance was later detonated by an explosives ordnance disposal team from Kirtland Air Force Base, New Mexico.

Training: In FY 2010, Steve completed Wildland Fire Resource Advisor (READ) Training, the annual wildland firefighter refresher, agreements technical representative (ATR) training, and the annual NPS on-line training courses.

VANISHING TREASURES PROJECT FUNDING

El Morro National Monument did not receive VT project funding in FY 2010.



Calvert Ondelacy and Calvin Chimoni placing a boulder in a retaining wall supporting the historic switchback trail, El Malpais National Monument. Photo: Edwin Seowtewa

Fort Union National Monument

VANISHING TREASURES ACCOMPLISHMENTS AND CHALLENGES

VT Challenges and Successes: The 2010 preservation season at Fort Union National Monument was a great success, thanks to our excellent cadre of preservation specialists and an eager and willing seasonal staff. We were fortunate to receive VT funding in the past to fill critical positions including a permanent Exhibit Specialist and a permanent Preservation Craftsman, as well as two seasonal preservation masonry workers. In 2010, Fort Union received funding through an Operation Formula System (OFS) request and a Cultural Cyclic project to supplement our preservation program. We also received American Recovery and Reinvestment Act (ARRA) funds to document and stabilize historic flagstone courtyards in HS-13 and HS-14.

A challenge for Fort Union was to research and develop a consistent amended mud plaster formula. Prior to our research, crews utilized a standard mix protocol but modified the amount of the Rhoplex amendment to suit individual application preferences. On hot days they could add up to 20% solution to keep the mud wet and on rainy days it could be as low as 5%, leading to inconsistent Rhoplex to soil ratios. The Exhibit Specialist recommended a change in the mixing process: use a specific quantity of Rhoplex (around 12% or 20 oz. = 1¼ pints) to be added after the soil, sand and water were mixed. The change has resulted in less amendment used and a more consistent mix.

Another challenge this year was that our amendment of choice, Rhoplex E-330, went out of production. This required the use of an alternate material. Based on an analyses report completed by Robert Hartzler in 1998, Daraweld-C was chosen as the best alternative. This meant that some testing was needed to fine tune the mix, and monitoring of the areas where Daraweld-C was used will occur next season. It will be compared to areas where Rhoplex had been used to determine how well the new mix holds up.

A test on heavily weathered areas was also conducted. A small section along the top of the north-facing walls of HS-32 received mud plaster with varying amounts of Rhoplex. Mud plaster with three concentrations of Rhoplex (40, 30, and 20 oz. per



The visita at Fort Union with the fort visible beyond, Fort Union National Monument.

Photo: Courtesy Fort Union National Monument

batch) was applied to the top half of the walls where weathering was most notable. It was found that the 40 oz. mix weathered the best for these harder hit areas. Fort Union has phased out Portland cement in its mortar mixes in favor of lime, which better matches historic mortars in composition and hardness.

This year the preservation staff, including seven seasonal masonry workers and seven laborers, completed the following projects:

- The application of approximately 98,000 sq. ft. of earthen shelter coat;
- Clearing 40 acres of noxious/invasive plant species;
- Removal of over three cubic yards of excess soil along foundation perimeters;
- Clearing of approximately 3000 sq. feet of excess soil and encroaching vegetation inside two historic courtyards in HS-13 and HS-14; flagstones were leveled and stabilized as needed;
- Stabilization of over 30 lineal feet of stone foundation;
- Removal of encroaching vegetation along 1.5 miles of trails;
- Documentation of the work completed in 2010 for future reference.

The preservation work accomplished in 2010 is a testament to the dedication, skills and expertise of the staff and we acknowledge everyone's contribution to a long-term preservation program here at Fort Union.

Consultation: No issues to report

Safety: The safety program at Fort Union continues to maintain a very positive re-

cord; for the fourth straight season we had no recordable injuries. All employees are members of the safety committee and they are encouraged to provide feedback, ideas, and concerns on any safety-related issue. Safety issues are addressed in a timely manner so they don't get lost in the shuffle and safety inspections at Fort Union are among the best in our area.

Staff conducts biweekly safety talks and tailgate safety sessions at the job site. We have instituted best management practices to actively inspect all ladders on a daily basis prior to use and to conduct monthly recorded inspections. We continue to complete weekly inspections and maintenance on all vehicles, improving their overall safety and working condition. Fort Union has also improved the way employees think about chemicals and how chemicals are stored, and we are proactive in maintaining a clean working environment to improve safety.

VANISHING TREASURES STAFF

**Sean Habgood, Exhibit Specialist
FY 2002 Position**

Skills: Sean Habgood has a Master's degree in objects conservation and a B.A. in fine art with an emphasis in sculpture and painting. Sean has taken chemistry, fire science, and Occupational Safety and Health Administration (OSHA) courses for safety managers and is a Hazardous Waste Operations and Emergency Response (HAZWOPER) first responder. Sean has worked in several museums doing curatorial work on exhibits, as well as exhibit design and

installation, for about 10 years.

Sean has conducted research on paintings and linings at the Smithsonian Center for Materials Research and Education, where he and Marion Mecklenburg (one of the top scientists in the field of conservation materials in the world) developed the only flexible lining material that meets the structural needs of paintings. Sean has also worked on the development of a flexible lining material for the structural lining of textiles, as well as on a study of rubber and its aging process, in the hope of developing a coating to help preserve and stabilize it from UV, ozone, and oxygen degradation.

Sean has executed several conservation projects ranging from small objects to large monuments. Some of the larger projects included Thomas Jefferson's family graveyard; the Shaw Memorial; the Peace Monument in Washington DC; the Congressional Cemetery; the Pennsylvania State House; removal and reconstruction of a 17th- to 18th-century Italian marble fireplace; the conservation of artifacts from the Titanic including a large section of hull; and frame conservation in the rotunda of the US Capitol. Small objects that Sean has conserved include ceramics, glass, furniture, plaster, ethnographic objects, and metals of all types. Sean has taken archeology courses, including hands-on field work.

Accomplishments: Sean currently occupies the exhibit specialist position that was funded through VT in 2002. Throughout FY 2010, Sean has been working on standardizing the formulas for both the mud plaster and the stone foundation mortar. Through analyses conducted by the Highlands University Geology Department, the park was able to obtain the precise composition of the historic mortar. Based on these results, Sean is conducting research into the possibility of modifying the mortar mix for stone foundations from a combination of lime, Portland cement, sand and local soil to a lime and sand mix. The sand used in the new mortar mix is larger and has a pink color, which better matches the historic mortar.

Sean supervised the stabilization of a 10" x 10" x 12' beam and the wood beam stone/foundation project to ensure that they were completed safely and executed to high preservation standards. He is actively researching material sources closer to the park and working to simplify mortar and plaster mixes while maintaining a quality end product. Sean performed shelter coat



Removal of mortar from the wall of the East Room of HS-49 in preparation for the replacement of the deteriorated wood lintel, Fort Union National Monument.

Photo: Courtesy Fort Union National Monument

analyses on north facing adobe walls to determine material durability; and he designed, built, and installed a new wall brace that does not require penetration through the adobe wall like much of the existing bracing. This new brace supports a wider area with a stronger, less flexible footprint, minimizing wall movement and cracking

Sean is producing a brief treatment history at Fort Union that may be accessible online, perhaps as a link on the park website. Ready access to a treatment history will make research for past and future conservation treatments easier. Sean is also updating historic structure field maps to include previously omitted features such as the cellar in the HS-57 Hospital complex, which is in the 1958 work reports but not recorded on the working maps. Sean has proposed new research to build on the work that was done in the past to identify causes of mud plaster failure. This research process can be applied to many different types of material.

Training: Sean had no training relating to his VT work.

**Theodore Garcia, Preservation Craftsperson
FY 2005 Position**

Skills: Teddy is the senior team leader for

work done on the adobe ruins and Teddy's team handled most of the special conservation/preservation projects conducted in FY 2010.

Accomplishments: Teddy and his team stabilized two 10" x 10" x 12' beams in the warehouse basement ceiling that were causing damage to the adjacent adobe wall. These beams are important because they illustrate how the first floor of the warehouse (HS-43) was constructed over the basement.

Teddy and his team also removed unstable foundation stones around rotted wooden beams in HS-29, preventing a collapse that would have caused damage to the brick cellar. Teddy provided valuable input on the mud plaster mix, and his team completed a number of adobe support projects and applied approximately 75,000 square feet of mud plaster. Teddy was the lead on Fort Union's safety programs, new and old, always setting an example of "how to do it."

Training: Teddy had no training relating to his VT work.

VANISHING TREASURES PROJECT FUNDING

Fort Union National Monument did not receive Vanishing Treasures project funding this year.

Salinas Pueblo Missions National Monument

VANISHING TREASURES ACCOMPLISHMENTS AND CHALLENGES

VT Challenges and Successes: Through the Cultural Cyclic Maintenance Program in FY 2010, Salinas completed the stabilization of the Manzano Church and Pueblos at Quarai; the Spanish Storage Rooms at Abó; and the Mound 10 Pueblo, San Isidro Church, Convento, and Campo Santo at Gran Quivira. We also installed an experimental adobe plaster basecoat to the Abó and Quarai Churches and conserved three historic dioramas at Abó and Quarai. The park also executed additional work on the San Buenaventura Mission complex at Gran Quivira, the 19th-century Spanish resettlement structures at Abó, and the San Gregorio Mission complex at Abó. Salinas's VT staff completed a project using Cultural Resource Preservation Project (CRPP) Base funding to document the Abó Painted Rock site utilizing 3-dimensional laser imaging technology, and we collaborated with VT staff at Aztec Ruins National Monument to install an innovative sandbag method to backfill archeological sites. A particular challenge for us was the management of 29 high school and college students hired under the Student Temporary Employment Program (STEP) authority to complete the year's stabilization program and to assist in the office and with other tasks. Originally conceived and implemented in 2004 by then Chief of Resources Philip Wilson, the program has developed over the years to become one of the park's greatest successes. This is evidenced by the extraordinary accomplishments achieved by the program in FY 2010. The total amount of work time invested by students alone in the 2010 season totaled 13,478 hours, or the equivalent of 6.48 person years! Adding to the achievements of the VT staff and summer student employees was the exceptional quality of the work, which was not compromised by the considerable volume of work accomplished. In fact, work quality was improved over that of previous years.

In FY 2010, two of the original STEP employees (José Nuñez and Azan Chavez) became permanent full-time employees of the park through the Student Career Experience Program (SCEP). Their salaries are partially covered through the VT program and they are now accomplished ruins pres-



La Purísima Concepción Mission at Quarai, Salinas Pueblo Missions National Monument.

Photo: Derek Toms

ervation specialists and crew leaders who are training a new generation of students. The park also expanded its number of VT-funded staff to a total of six by redistributing existing VT funds to include an additional staff member. In that way, each employee on the preservation team can actively participate in - and benefit from - the VT program at the same level as the other preservation specialists in the park. It should also be noted that, along with the Salinas Resource Division's two new permanent hires, 23 of the 29 STEP employees contribute to the Intermountain Region's workforce enhancement goals. The majority of the park's permanent VT staff and student employees come from the local community, and they and their families have long-standing historic connections to the park's resources.

Consultation: While all of our compliance requirements for FY 2010 fell under categorical exclusions, the park nevertheless advised the New Mexico State Historic Preservation Office (NM SHPO) of park activities. In addition, no activities occurred that required extraordinary tribal consultation. The greatest compliance challenge for the park was - and remains - commenting on an external project to construct a major power transmission line and wind farms within view of the park, partic-

ularly the Gran Quivira unit. At Gran Quivira, transmission lines may be placed as close as 1.5 miles from the unit boundary and proposed wind farms may potentially surround the entire unit.

Safety: Our VT and preservation staff experienced no major safety problems in FY 2010. We routinely held tailgate and morning safety sessions; student hires were required to present a major safety topic to the team twice each week, after which the floor was opened for discussion. Full-time staff received training in scaffold competency (for which they received certification), confined spaces, pathogen awareness, occupational leadership, and additional safety-oriented training. All staff received first aid/CPR training as part of the orientation and refresher process.

VANISHING TREASURES STAFF

**Ramona Lopez, Maintenance Worker (Ruins Preservation)
FY 1998 Position**

Skills: Ramona is skilled at stabilizing and building stone walls set in adobe and amended mortars. She is an experienced crew leader and has experience in completing architectural documentation. Ramona is also skilled at woodworking and painting and is a certified competent scaf-

fold user.

Accomplishments: Ramona helped to lead our crew of 29 summer high school student (STEP) hires, serving in a key training role. Ramona's skills were important in helping the park to not only meet, but exceed, its goals for 2010, and her knowledge is routinely conveyed to the students working under her tutelage. Ramona's contribution to the FY 2010 season resulted in the completion of the cyclic stabilization of the Manzano Church and Pueblos at Quarai; the Spanish Storage Rooms at Abó; and the Mound 10 Pueblo, San Isidro Church, Convento, and Campo Santo at Gran Quivira. She applied an experimental adobe plaster basecoat to the Abó and Quarai Churches and conducted additional work on the San Buenaventura Mission complex at Gran Quivira, the 19th-century Spanish resettlement structures at Abó, and the San Gregorio Mission complex at Abó. Ramona performed all of the documentation in advance of the stabilization work.

Training: Ramona completed Operational Leadership training, confined space entry, and a chainsaw refresher course.

C. Derek Toms, Integrated Resources Specialist FY 2000 Position

Skills: Derek's professional experience includes all aspects of cultural resource management, natural resource management, and hazardous materials management.

Derek is an adept National Environmental Policy Act (NEPA) Section 106 compliance officer, archeologist, hazardous material (HAZMAT) manager, and natural resources manager. He is also active in the National Interagency Fire Center (NIFC) fire program and was accepted as a member of the national Burned Area Emergency Response (BAER) team in 2010.

Accomplishments: Derek helped the park manage the cyclic stabilization of the Manzano Church and Pueblos at Quarai; the Spanish Storage Rooms at Abó; and the Mound 10 Pueblo, San Isidro Church, Convento, and Campo Santo at Gran Quivira. He was also involved with the application of an experimental adobe plaster basecoat to the Abó and Quarai Churches, as well as additional work on the San Buenaventura Mission complex at Gran Quivira, the 19th-century Spanish resettlement structures at Abó, and the San Gregorio Mission complex at Abó. Derek played a key role in completing the documentation of the Abó Pictograph site, and he monitored construction activities related to several facility management projects. Derek satisfied the compliance requirements for all of these projects and was centrally involved in helping the park fulfill its 2010 fire management activities. In addition, Derek contributed to a presentation on the documentation of the Abó Pictograph site at the 2010 Association for Preservation Technology International (APTI) confer-

ence in Denver. Derek also went on two work details in 2010. In October and early November, 2009, he served as the Chief of Facility Operation and Cultural Resources at Tallgrass Prairie National Preserve in Cottonwood Falls, Kansas; and in September, 2010, he served as the Chief of Resources at Casa Grande Ruins National Monument.

Training: Derek completed Operational Leadership training and he attended the Society for American Archeology (SAA) Annual Meeting in St. Louis, Missouri.

Marc A. LeFrancois, Chief, Facility and Resource Management FY 1999 Position

Skills: In addition to Resource Management, Marc's skills include architectural conservation, site documentation, historical research and writing, and physical investigation and analysis. He is knowledgeable in the skilled trades, historic trades and technologies, use of period tools, operations and maintenance, and project management. He is certified as a contracting officer representative (COR).

Accomplishments: Marc led the Resource Division's team in accomplishing its preservation projects, archeological work, compliance, historical research, museum and curation activities, and fire management. Marc also traveled to Aztec Ruins National Monument to train their VT staff in the use of an innovative sandbag technology developed at Salinas for ruins stabilization.

Training: Marc's training for FY 2010 included Operational Leadership training, a COR refresher, Leadership in Energy and Environmental Design (LEED) for historic structures, and Human Resource Management/Diversity Hiring training.

William N. Torrez, Exhibit Specialist FY 2003 Position

Skills: Willie has extensive experience in trade skills and project field management, architectural documentation, managing personnel, and leading crews. Willie is a facility management software system (FMSS) user for the park. He is skilled in conducting condition assessments on historic structures and ruins and in estimating costs for the preservation of structures and ruins. Willie is also a COR and a certified competent scaffold user; he is skilled at training and mentoring others.

Accomplishments: In addition to leading the park's VT field crew, Willie successful-



*The student team that worked to stabilize the San Grégorio Mission at Abó, Salinas Pueblo Missions National Monument.
Photo: William Torrez*

ly led our crew of 29 summer high school student (STEP) hires. Willie's leadership was pivotal in the completion of the cyclic stabilization of the Manzano Church and Pueblos at Quarai; the Spanish Storage Rooms at Abó; and the Mound 10 Pueblo, San Isidro Church, Convento, and Campo Santo at Gran Quivira. He was involved in the application of an experimental adobe plaster basecoat to the Abó and Quarai Churches and additional work on the San Buenaventura Mission complex at Gran Quivira, the 19th-century Spanish resettlement structures at Abó, and the San Gregorio Mission complex at Abó. Willie also assisted in managing the documentation of the Abó Painted Rock site and traveled to Aztec Ruins National Monument to assist in training their VT staff in the use of an innovative sandbag technology used for ruins stabilization that was developed by Salinas. Thanks to Willie's leadership, the park was able to complete all of these activities.

Training: Willie completed Operational Leadership training, a COR refresher course, confined space entry, fire and chainsaw refreshers, and re-certification as a Scaffold Competent User. Willie also continued expanding his FMSS skills to help create park projects in compliance with new Servicewide Comprehensive Call (SCC) requirements for cultural projects.

**José Nuñez, Maintenance Worker
(Ruins Preservation)
FY 2003 Position**



José Nuñez and Azan Chavez (in uniform) stabilizing San Buenaventura Mission, Salinas Pueblo Missions National Monument.

Photo: Derek Toms

Skills: José is skilled at stabilizing and building stone walls set in adobe and amended mortars, is an experienced crew leader, and is experienced in completing architectural documentation. José is also a skilled carpenter and is a certified competent scaffold user. José was a 2005-2006 participant in the NPS Intermountain Region Workforce Enhancement Program and he received a 2010 certificate of completion in the Central New Mexico Community College Applied Science Construction Technology program.

Accomplishments: José participated in leading our crew of 29 summer high school student (STEP) hires. José's leadership was pivotal to the completion of the cyclic stabilization of the Manzano Church and Pueblos at Quarai; the Spanish Storage Rooms at Abó; and the Mound 10 Pueblo, San Isidro Church, Convento, and Campo Santo at Gran Quivira. He also helped apply an experimental adobe plaster basecoat to the Abó and Quarai Churches, and performed additional work on the San Buenaventura Mission complex at Gran Quivira, the 19th-century Spanish resettlement structures at Abó, and the San Gregorio Mission complex at Abó. José's skills and leadership were key to helping the park meet all its project goals for the year, and much more. José also participated in the SkillsUSA 2010 competition for carpentry, taking first place in the State of New Mexico.

Training: In completing the certificate program for Applied Science Construc-

tion Technology at Central New Mexico Community College José fulfilled the requirements of his SCEP agreement and was converted to permanent full-time status. José completed Operational Leadership training, fire refresher and chainsaw refreshers, and confined space entry. He also received the Occupational Safety and Health Administration's (OSHA) Scaffold Competent user certification.

**José Azan Chavez, Maintenance Worker
(Ruins Preservation)
FY 2003 Position**

Skills: Azan is skilled at stabilizing and building stone walls set in adobe and amended mortars; he is an experienced crew leader and is skilled in completing architectural documentation. Azan is also a skilled carpenter and is a certified competent scaffold user. Azan holds a 2010 degree in Applied Science Construction Technology from the University of New Mexico.

Accomplishments: Azan participated in leading our crew of 29 summer high school student (STEP) hires. Azan's leadership was pivotal to the completion of the cyclic stabilization of the Manzano Church and Pueblos at Quarai; the Spanish Storage Rooms at Abó; and the Mound 10 Pueblo, San Isidro Church, Convento, and Campo Santo at Gran Quivira. He assisted with the application of an experimental adobe plaster basecoat to the Abó and Quarai Churches, and performed additional work on the San Buenaventura Mission complex at Gran Quivira, the 19th-century Spanish resettlement structures at Abó, and the San Gregorio Mission complex at Abó. Azan's skills and leadership were key in helping the park meet all its project goals for the year.

Training: Azan successfully completed the degree program in Applied Science Construction Technology at the University of New Mexico, meeting all the requirements of his SCEP agreement, and he has been converted to permanent full-time status. Azan completed Operational Leadership training, fire refresher and chainsaw refresher courses, and confined space entry. He also successfully completed OSHA Scaffold Competent user certification.

VANISHING TREASURES PROJECT FUNDING

Salinas Pueblo Missions National Monument did not receive Vanishing Treasures project funding this year.

V a n i s h i n g T r e a s u r e s

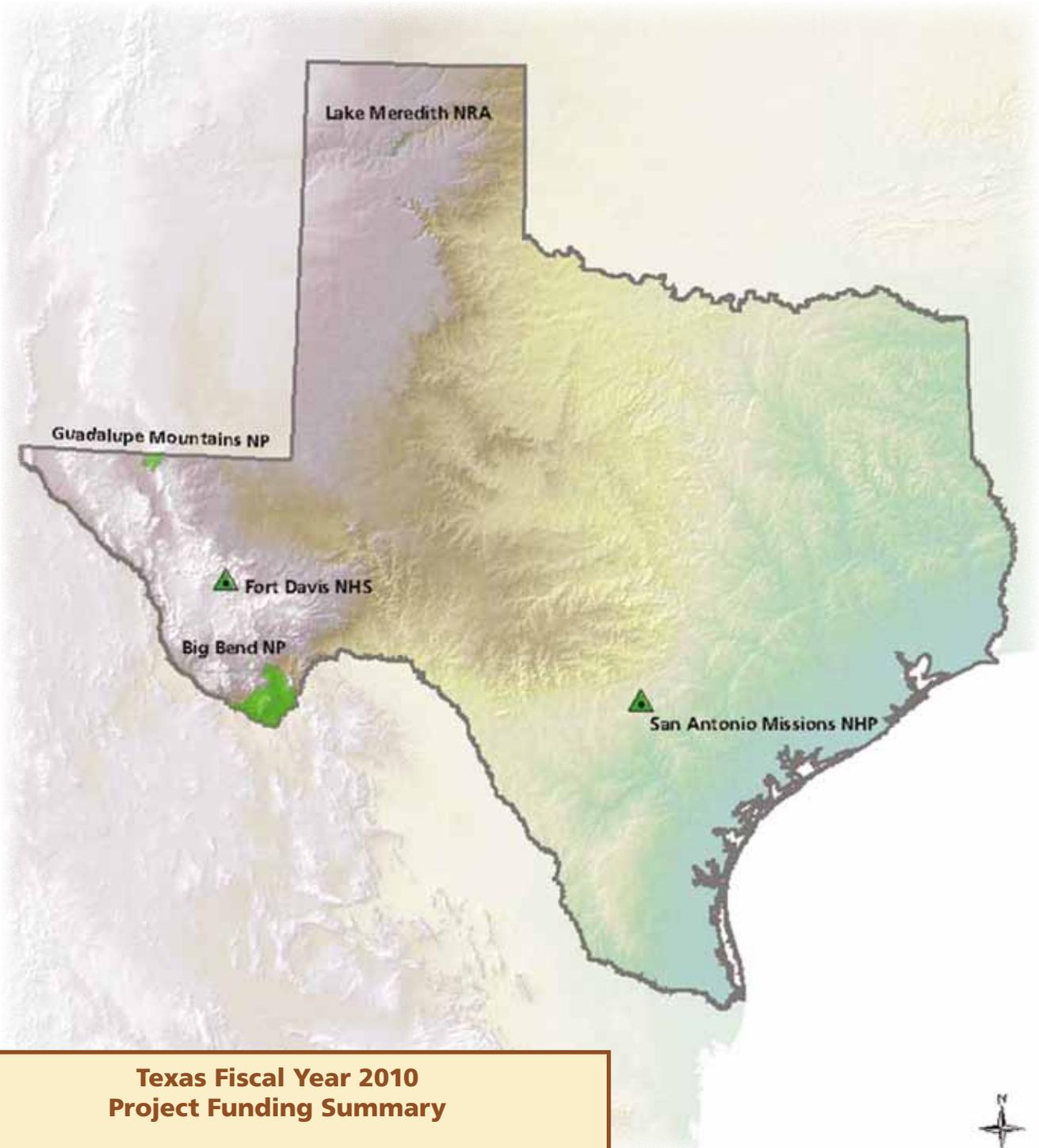
T e x a s



Adobe ruin, Big Bend National Park

Photo: Thomas C. Alex

- ◆ Big Bend National Park ◆ Fort Davis National Historic Site ◆
- ◆ Guadalupe Mountains National Park ◆ Lake Meredith National Recreation Area ◆
- ◆ San Antonio Missions National Historical Park ◆



**Texas Fiscal Year 2010
Project Funding Summary**

Funded Projects:

No Texas parks received Vanishing Treasures project funding this year.



Fort Davis National Historic Site

VANISHING TREASURES ACCOMPLISHMENTS AND CHALLENGES

VT Challenges and Successes: Our greatest challenge for FY 2010 was the stabilization effort on the historic Spring Enclosure, a project that was funded with regular cyclic funds. The original scope of the project called for repointing of existing stonework. However, when we removed support bands placed during a previous stabilization effort, the enclosure fell apart. It was subsequently discovered that the enclosure sat on an unstable surface. After the collapse, a contracted archeologist was brought in to conduct investigative excavations, which revealed an earlier dry-laid enclosure below the surface. This earlier structure was documented and encapsulated by recompacting the soil around it, installing a time medallion, covering it with filter fabric, and pouring a subsurface concrete pad over it, on which the reconstructed spring house now sits. When the partially collapsed enclosure was deconstructed, the stones were numbered, mapped, and photo-documented. The section that was still standing in 1916 photos was then



Officer's Row with the flag pole and parade ground, Fort Davis National Historic Site.

Photo: Courtesy Fort Davis National Historic Site

reconstructed to match. The additional stones were cleaned, reused, and relaid in a matching pattern. Mortar analysis was performed on the historic mortar and it was found to have used natural cement as a binder.

Consultation: The Texas State SHPO was timely and cooperative and no problems were encountered in executing work on our VT resources.

Safety: This project was completed without any accidents or injuries.

VANISHING TREASURES STAFF

**Rojelio (Roy) Catano, Masonry Worker
FY 2000 Position**

Skills: Roy is skilled as a mason and crew leader.

Accomplishments: Roy's considerable masonry skills continued to improve over the past year. He completed projects involving plastering with lime and mud plasters; conservation of plaster; working with natural cement and naturally hydraulic limes; and the making, laying, and repair of adobe.

Training: Roy attended heavy equipment operator training and scaffold training, and did video training in the use of naturally hydraulic lime.

**Rene Laya, Cultural Resource Manager
FY 2000 Position**

This position was originally filled as an archeologist but has been converted to a Maintenance and Cultural Resource Manager.

Skills: Rene is a skilled supervisor of preservation field work.

Accomplishments: Rene oversaw completion of the Historic Spring Enclosure project, a plaster conservation project, and a contract involving preservation work on the post hospital store house.

Training: Rene had no training relating to his VT work.

VANISHING TREASURES PROJECT FUNDING

Fort Davis National Historic Site did not receive Vanishing Treasures project funding this year.



Fort Davis preservation staff work on the spring enclosure, Fort Davis National Historic Site.

Photo: Courtesy Fort Davis National Historic Site

San Antonio Missions National Historical Park

VANISHING TREASURES ACCOMPLISHMENTS AND CHALLENGES

VT Challenges and Successes: San Antonio Missions has 62 entries in the List of Classified Structures, most of which are complex architectural units. Additionally, there are dozens more masonry structures that require the attention of skilled preservation masons. The park contains approximately 250,000 square feet of historic masonry from different eras including Spanish colonial, post-colonial stabilizations and additions, and preservation campaigns from the Civilian Conservation Corps and Works Progress Administration as well as several from the 20th-century. Structures of specific mention include 4 National Historic Landmarks, the nation's only functioning Spanish colonial aqueduct, a functioning rehabilitated 18th century grist mill, 2 historic dams, and 4 historic mission compounds with associated structures, ruins, and archeological resources.

Expansive soils result in the constant movement of structures, causing cracks, fissures, and wall failures. Early reconstructions of some structures were made without adequate foundations, which exacerbate the damage and structural movement. High lime content in the soils creates a micro-environment where water and mineral salts interact, resulting in additional deterioration to historic masonry. Changes to grading prior to NPS administration have resulted in poor site drainage. Many 20th-century repair campaigns utilized hard Portland cement, which continues to cause accelerated deterioration of historic stone. These alone present significant challenges to park staff tasked with maintaining these structures, but the greatest challenge is that the program has only 2 full-time equivalents. We have established a mason apprentice program funded by the Friends group to provide helpers for the park masonry workers and do more contract masonry work. Meanwhile, the facility manager works closely with cyclic program managers to reinforce the idea of masonry work as cyclic in nature. We have submitted a strengthened OFS request to bolster this critical function.

Consultation: We worked with Kay Hindes (City of San Antonio), Nancy Parrish (Army Corps of Engineers), and Mark Denton (Texas Historical Commission) to

address citizen concerns that the San Antonio River Improvement Project (SARIP) near Concepción was negatively impacting the site of the original San José Dam. The outcome was further archeological work by the University of Texas - San Antonio, Center for Archeological Research (UTSA-CAR) in the area of the Dam and the Poor Cemetery. The Poor Cemetery is within the boundaries of the park because of its proximity to a remnant of the San José acequia. While it was determined that SARIP was not negatively impacting the San José Dam or the Poor Cemetery, this incident encouraged COSA and San Antonio Missions to write a new memorandum of agreement about the property within the national park for more clear management delineation. This memorandum will be completed in FY 2011.

Safety: The park obtained funding to contract with an industrial hygienist to conduct air quality monitoring for silica dust for our masonry workers. Monitoring indicated that exposure was within acceptable limits without specialized air filtering devices.

VANISHING TREASURES STAFF

Susan Snow, Archeologist
FY 1999 Position

Skills: Susan is skilled in archeological survey and excavation, budgeting, and project management.

Accomplishments: Between October 2009 and January 2010, Susan collaborated with the UTSA-CAR to carefully remove modern sand fill from Rooms 1-3 at Rancho de las Cabras to document the condition of the walls. Originally planning to leave the walls uncovered until a summer field school, winter rains made it evident that the walls were too fragile to remain uncovered and the walls were reburied after detailed documentation. While the remains were uncovered, the Associated Press did an article on the Rancho that reached over 300 news sources. In June-July 2010, 23 students were trained in archeological techniques at the UTSA field school here. Their research focused on the interior of the compound adjacent to Rooms 1-3, where it appeared additional rooms might adjoin, but no rooms were identified during the field school.

Susan also processed permits for outside researchers. She completed research permits for archeological work for the SARIP project that includes the park boundary off of Mission Road. She also issued a permit for the Theo Road realignment archeological investigations and the AGE refinery test

well. Susan also completed compliance documentation for the environmental clean-up of a contaminated site and monitored the collection of soil samples. Susan did compliance documentation for the San José North Sewer Project and responded to the AGE refinery fire, monitoring park resources to ensure that nothing was damaged by the fire.

Training: Susan attended Agreements Technical Representative and Facility Management Software System training.

Dean Ferguson, Masonry Worker
FY 2000 Position

Skills: Dean is a skilled mason.

Accomplishments: Dean served as an inspector on the 2nd-year rehabilitation work on the Espada Aqueduct and the associated landscape, which was contracted through a competitive award. This 2-year, \$276,000, repair/rehabilitation project corrected masonry deficiencies and major drainage issues to protect this National Historic Landmark. Dean spent a considerable amount of the year assisting with masonry preservation efforts at the Mission Espada contact station along with Mason Stephen Siggins and American YouthWorks mason apprentices.

Training: Dean completed Operational Leadership and Defensive Driving training.

Stephen Siggins, Mason
FY 2003 Position

Skills: Stephen is a skilled mason.

Accomplishments: Stephen served as an inspector on the 2nd-year rehabilitation work on the Espada Aqueduct and the associated landscape which was contracted through a competitive award. This 2-year, \$276,000, repair/rehabilitation project corrected masonry deficiencies and major drainage issues to protect this National Historic Landmark. Stephen spent a considerable amount of the fiscal year as a functional leader on the masonry preservation efforts at the Mission Espada contact station, along with co-VT Mason Dean Ferguson, and he mentored American YouthWorks mason apprentices.

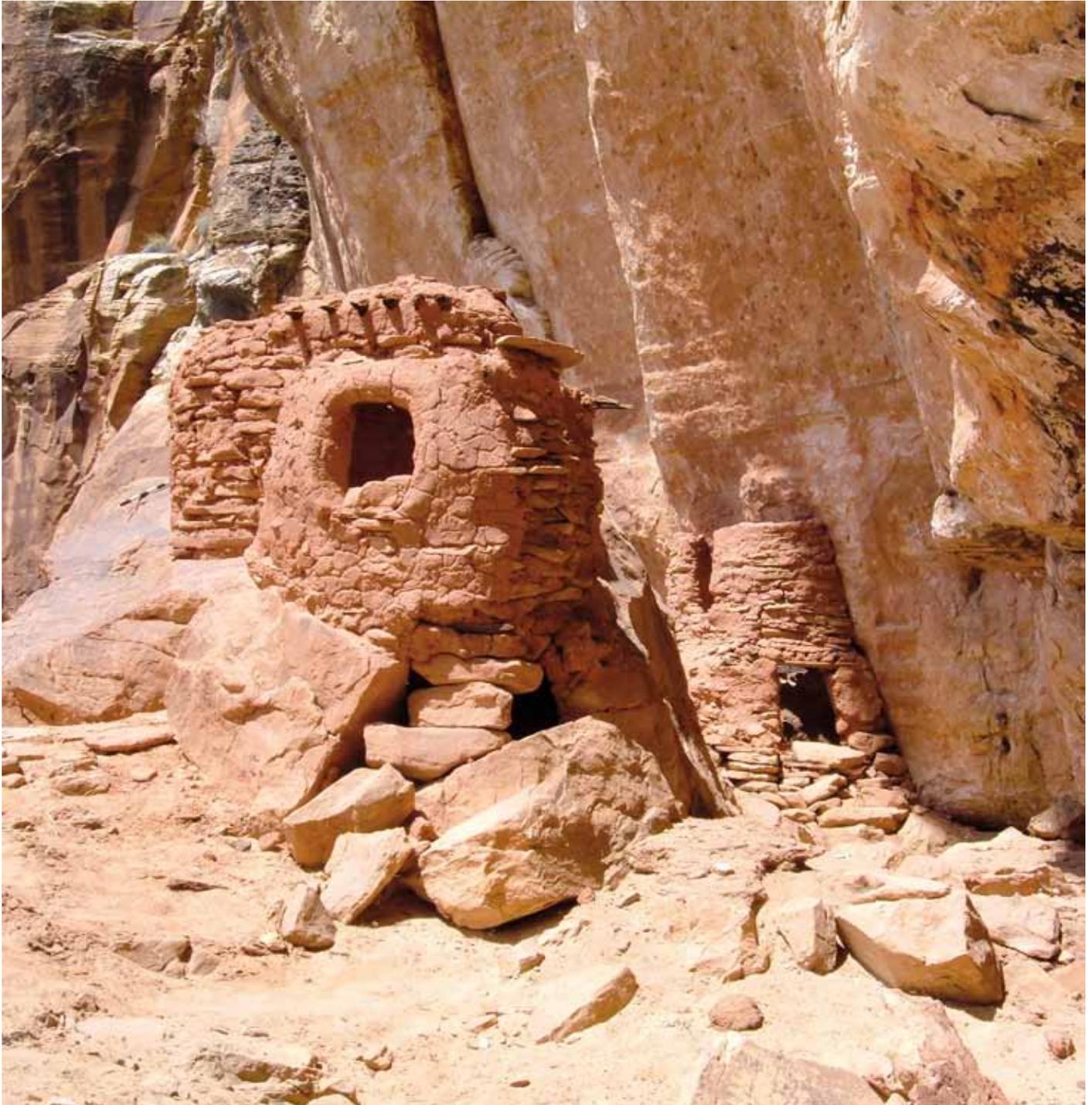
Training: Stephen completed Operational Leadership and Defensive Driving training.

VANISHING TREASURES PROJECT FUNDING

San Antonio Missions National Historical Park did not receive Vanishing Treasures project funding this year.

V a n i s h i n g T r e a s u r e s

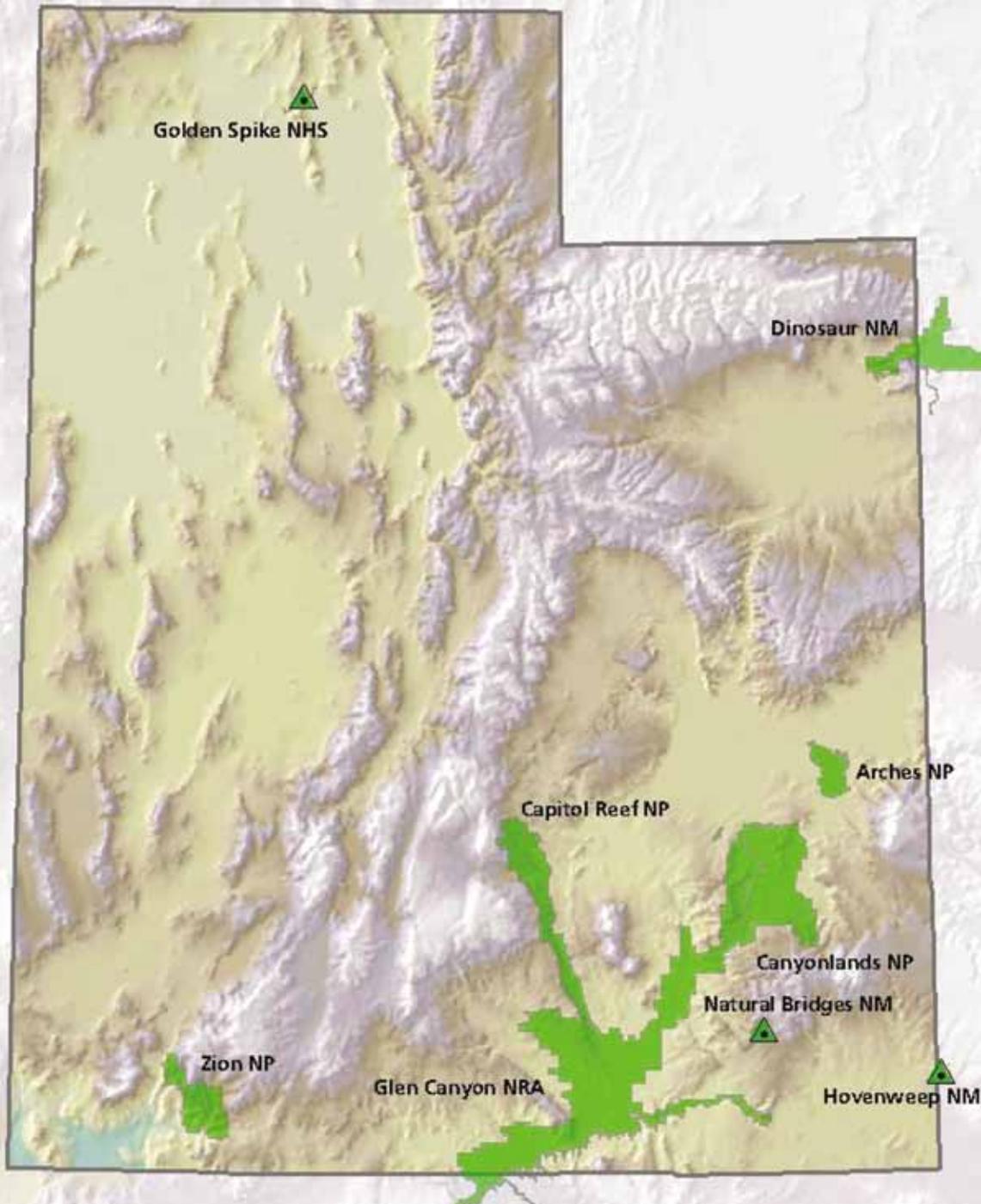
U t a h



An alcove site, known as the Granary, in Parunuweap Canyon, Zion National Park.

Photo: Courtesy Zion National Park

- ◆ Arches National Park ◆ Capitol Reef National Park ◆ Canyonlands National Park ◆
- ◆ Glen Canyon National Recreation Area ◆ Golden Spike National Historic Site ◆
- ◆ Hovenweep National Monument ◆ Natural Bridges National Monument ◆ Zion National Park ◆



Utah Fiscal Year 2010 Project Funding Summary

Funded Projects:

Arches National Park \$ 50,000

Zion National Park \$ 42,250



Arches National Park

Arches National Park is part of the Southeast Utah Group (SEGU), which also includes Canyonlands National Park and Hovenweep and Natural Bridges National Monuments.

VT Challenges and Successes: N/A

Consultation: N/A

Safety: N/A

VANISHING TREASURES STAFF

Arches National Park has never received funding for a Vanishing Treasures position.

VANISHING TREASURES PROJECT FUNDING

Project Name: Preserve Historic Stone Cabin, Arches, for Visitor Satisfaction

PMIS Number: 132174

Project Summary: Built in the early 20th century, this one-room historic Stone Cabin is associated with both early grazing and later uranium mining history of the area. One of only a few historic Vanishing Treasures resources found within the park, the Stone Cabin is designated HS-14 on the List of Classified Structures (LCS). In its current state, three of the four one-story walls remain largely intact, although the building has lost its roof and the west wall and chimney have begun to collapse. Temporary stabilization was recommended to prevent the building from deteriorating



Rock formations with the La Sal Mountains beyond, Arches National Park. Photo: Randall Skeirik

beyond the possibility of repair.

Condition assessments were performed in 2006 and again in 2009, and the park was provided with a Treatment Recommendation Report for the structure (Skeirik, 2009). The most immediate concern is the stabilization of the south wall, where a poor foundation and a failed wood window frame have caused the wall to lean precariously outward. In the short-term it is essential that this wall be braced to prevent its collapse. Once stabilized with temporary bracing, the deteriorated members of the window frame will be replaced and the wall slowly jacked back to a vertical position. Similar, though less drastic, repairs will be made to the wood window

frame on the east wall. Deteriorated mortar will be removed from all remaining masonry and the walls, fireplace, and chimney repointed with new mortar formulated to match the original in composition and appearance. Particular care will be taken to appropriately cap the walls to minimize the entry of moisture into the restored walls. Before work can be conducted on the fireplace, chimney, and north wall, the flue and firebox must be cleared of packrat nest material. This work will require Tyvek suits and respirators in order to protect against infection with Hantavirus. Other challenges in executing this project stem from its relatively remote location, the lack of a nearby water source, and its location in an area rich in cryptobiotic soils.

Project Budget:

Total VT Project Funding:	\$50,000
Personnel:	\$0
Vehicles:	\$0
Travel/Training:	\$0
Supplies/Materials:	\$0
Equipment:	\$0
Services/Contracts:	\$50,000
Other:	\$0

Project Accomplishments: The project will be executed by the Crow Canyon Archeological Center through a cooperative agreement with the Cooperative Ecosystem Study Unit. Cornerstone Community Partnerships, a non-profit company specializing in stabilization of historic buildings, will be assisting Crow Canyon and the park in completing the work during FY 2011. Several scoping sessions have already been made to the site, a scope of work has been developed, compliance has been completed, and the fieldwork has been scheduled for the spring of 2011



The remains of the Stone Cabin, Arches National Park. Photo: Randall Skeirik

Canyonlands National Park

Canyonlands National Park is part of the Southeast Utah Group (SEGU), which also includes Arches National Park, and Hovenweep and Natural Bridges National Monuments.

VANISHING TREASURES ACCOMPLISHMENTS AND CHALLENGES

VT Challenges and Successes: N/A

Consultation: N/A

Safety: Backcountry projects are logistical-ly complex and pose safety challenges. The crews have developed job hazard analyses that address backpacking, remote camping for extended periods of time, and how to safely evaluate archeological sites that may be difficult to access.

VANISHING TREASURES STAFF

Sue Eininger/Laura Martin,
Archeologist
FY 2002 Position

This position was vacant during part of FY 2010. Sue Eininger vacated the position in June, 2010 to move to Pecos National Historic Site. Her replacement, Laura Martin, entered on duty in August. Lapse salary was spent on moving costs and upgraded equipment.

Skills: Laura has developed mapping protocols for all our VT projects and is skilled in Total Station mapping and producing mapping products using AutoCAD. She



*Near Fort Bottom, Canyonlands National Park.
Photo: Randall Skeirik*

also manages the program's databases.

Accomplishments: Laura was the lead on the VT-funded Natural Bridges Site Documentation and Condition Assessment project. See the narrative under Natural

Bridges for more information about Laura's involvement in that project.

Training: Laura did not participate in any VT-related training this year.

Pat Flanigan, Exhibit Specialist
FY 2002 Position

Skills: Pat Flanigan is skilled at site documentation and condition assessments, photography, graffiti removal, and ruins stabilization.

Accomplishments: Pat worked on a number of Vanishing Treasures resources including the stabilization of the Wolfe Ranch Dugout at Arches. He continued to update our List of Classified Structure resources in both Arches and Canyonlands and he performed condition assessments and monitoring episodes on VT resources in all the Southeast Utah Group parks.

Training: Pat did not participate in any VT-related training this year.

VANISHING TREASURES PROJECT FUNDING

Canyonlands National Park did not receive VT project funding in FY 2010.



*A remote, historic-era stone shelter, Canyonlands National Park.
Photo: Randall Skeirik*

Glen Canyon National Recreation Area

VANISHING TREASURES ACCOMPLISHMENTS AND CHALLENGES

VT Challenges and Successes: In FY 2010 Glen Canyon National Recreation Area (GLCA) conducted condition assessments of cultural resources, including VT resources, as part of our ongoing Monitoring and Maintenance Program. Trip locations were determined by condition assessment data needs, known areas of visitor and grazing impacts, and areas of high visitation. Five day-trips, five overnight boat trips, two overnight car trips, and one backcountry trip were conducted in FY 2010. Given the size (1.25 million acres) and the diverse topography of the park, including Lake Powell (163,000 acres), accessing remote site locations requires careful logistical planning. Trip duration totaled 33 days, averaged three individuals per trip, and resulted in the completion of 85 condition assessments. Site forms were updated as required and data were entered into the archeological sites management information system (ASMIS) database. In addition, backlog ASMIS data entry added or updated a total of 310 site records, resulting in complete, accurate, and reliable records. The updating of monitoring, ASMIS, and facility management software system (FMSS) data will facilitate the process of planning, analyzing, developing, and ultimately implementing appropriate preservation treatments.

FY 2010 maintenance activities were conducted at the three structures in the Lees Ferry/Lonely Dell Ranch National Historic District. At the Weaver Ranch, asbestos removal continued and the kitchen's hardwood floor was carefully removed to the subfloor in preparation for future foundation work. The U.S. Geological Survey (USGS) Building and Spencer Bunkhouse both received interior treatments including the replacement of water-damaged drywall and fiberboard, reapplication of mud to masonry walls, painting, and the replacement of the USGS Building door frame. These activities were greatly assisted by the volunteer efforts of three separate Elderhostel groups.

Consultation: GLCA continues to work successfully with associated tribes and the Arizona and Utah State Historic Preservation Offices. The Rainbow Bridge Consultation Committee meets at least annually with associated tribes to discuss current

and upcoming matters related to GLCA National Recreation Area and Rainbow Bridge National Monument. In September, GLCA hosted its biennial meeting with the Arizona and Utah State Historic Preservation Offices on implementation of the 2008 Servicewide Programmatic Agreement for Section 106 Compliance.

Safety: GLCA had no safety problems related to Vanishing Treasures Resources in FY 2010. This was, in part, the result of the diligent safety planning, review, and training of GLCA staff and volunteers. Hazard Assessment, Analysis, and Control reports are compiled for each project. These reports ensure that safety plans and current Job Hazard Analyses are maintained and updated for all Vanishing Treasures related projects and activities. Tailgate safety meetings and on-the-spot safety inspections of vehicles and equipment are conducted on a regular basis and will continue.

Challenges encountered during backcountry monitoring include hazards associated with the following situations: 1) boat and vehicle operation; 2) navigation to remote locations; 3) hiking off trail across steep and uneven terrain; and 4) environmental exposure. The biggest challenge is maintaining our record of zero safety incidents involving staff and volunteers, with special emphasis on the volunteer Elderhostel groups that assist with preservation maintenance activities at the Lees Ferry/Lonely Dell Ranch National Historic District.

VANISHING TREASURES STAFF

Thann Baker, Archeologist
FY 2002 Position

Skills: Thann has extensive experience in condition assessment, prehistoric architectural documentation, database management, and report writing.

Accomplishments: During FY 2010, Thann served as the project lead for the Monitoring and Maintenance Program

at GLCA and Rainbow Bridge National Monument. Thann led thirteen trips to conduct condition assessments focusing on data needs, known areas of visitor and grazing impacts, and areas of high visitation with the potential for adverse impacts to cultural resources. A total of 85 sites received updated documentation and 11 new sites were identified and entered into ASMIS. Thann also assisted the Grand Canyon National Park VT program in completing condition assessment and architectural documentation at structures in the Nankoweap Drainage.

In addition to providing oversight of the VT program in the park, Thann's other duties include support for the cultural resources program, which includes the development and implementation of an archeological condition assessment and monitoring program, coordination with the park's law enforcement staff concerning site protection, compliance and consultation associated with park operations, preparation of contract documents, project management, overseeing data management operations, and maintaining the park's cultural databases.

Training: In FY 2010, Thann attended the Archeological Resource Protection Training Program and the Section 106 Advanced Seminar. Additional training was completed for FMSS, Planning, Environment, and Public Comment (PEPC), and the Nationwide Programmatic Agreement for Section 106 Toolkit. The two field sessions assisting Grand Canyon's VT program in Nankoweap contributed to Thann's professional development and helped foster a cooperative relationship between the two parks.

VANISHING TREASURES PROJECT FUNDING

GLCA did not receive Vanishing Treasures project funding this year.



Panoramic view of Glen Canyon National Recreation Area, Glen Canyon National Recreation Area.

Photo: Randall Skeirik

Golden Spike National Historic Site

VT Challenges and Successes: After two years without a cultural resource specialist, our biggest challenge in FY 2010 was to develop an accurate picture of the overall condition of the park's historic structures. We were able to get a baseline condition assessment for the railroad grade and its associated culverts and trestles, thanks to the help of the Vanishing Treasures Structural Engineer, Preston Fisher. With his input we were able to establish a list of priorities that will enable us to focus on "in need" resources.

Consultation: Golden Spike enjoys a good working relationship with the Utah State Historic Preservation Office (UTSHPO). Consultations with the UTSHPO and with our affiliated tribes in FY 2010 were all related to categorical exclusion projects. Golden Spike's Archeologist Scott Whitesides was invited by our Department of Defense neighbors, Hill Air Force Base and the Dugway Proving Ground, to participate in their annual American Indian Consultation Meeting. At that meeting Scott gave a demonstration on using wetland/marsh resources to produce traditional tule duck decoys and cattail watercraft.

Safety: Golden Spike did not have any safety-related problems in FY 2010. One challenge that Golden Spike faces each year is communication between work crews and park staff. We are working on



Part of the alignment of the first transcontinental railroad known as the "big fill", Golden Spike National Historic Site.

Photo: Courtesy Golden Spike National Historic Site.

developing new communication protocols for our more remote trail locations.

VANISHING TREASURES STAFF

**Scott M Whitesides, Archeologist/
Curator**

FY 2005 Position

Skills: Scott has a diverse background with

over 20 years of experience in cultural resources management. His areas of specialization include Great Basin prehistoric archeology, historical archeology, maritime history and underwater archeology, historic preservation of wooden structures, and traditional tool use.

Accomplishments: In addition to serving as the park's archeologist, Scott also serves as the Museum Curator. A big push this year was the revision and implementation of a new Scope of Collections statement. This effort was completed over the summer and has allowed the park to begin planning new exhibits for its Visitor Center. With the help of volunteers and Youth Conservation Corps crews, Scott was able to implement important erosion controls and complete trail work along 1.5 miles of historic railroad grade trails.

Training: During his first full year on the job, Scott had a very active training schedule. He completed courses for the National Environmental Policy Act and Section 106, collections management, NPS Fundamentals III, and a myriad of other online courses

VANISHING TREASURES PROJECT FUNDING

Golden Spike National Historic Site did not receive VT project funding in FY 2010.



A 19th century trestle on the alignment of the transcontinental railroad, Golden Spike National Historic Site.

Photo: Courtesy Golden Spike National Historic Site.

Hovenweep National Monument

Hovenweep National Monument is part of the Southeast Utah Group (SEGU), which also includes Canyonlands and Arches National Parks, and Natural Bridges National Monument.

VANISHING TREASURES ACCOMPLISHMENTS AND CHALLENGES

VT Challenges and Successes: N/A

Consultation: N/A

Safety: N/A

VANISHING TREASURES STAFF

Noreen Fritz, Archeologist
FY 2003 Position

Skills: Noreen is skilled at site documentation and condition assessment and is the ruins stabilization expert for the Southeast Utah Group. She is essentially in charge of the cultural resource program at Hovenweep (HOVE) and Natural Bridges (NABR) National Monuments.

Accomplishments: Hovenweep received American Recover and Reinvestment Act funding to conduct cultural cyclic stabilization work on some of our Vanishing Treasures resources. Noreen was the project lead for a project that involved the Cutthroat and Cajon Units at Hovenweep and the Bare Ladder Ruin at Natural Bridges. The scope of work included the collection of legacy stabilization data, pre-stabilization documentation, repointing of eroded masonry joints, replacement of eroded masonry stone, and repairs to the concrete wall caps. Noreen supervised a crew of four Hopi masons on this project. Scaffolding was utilized to complete the work.

Training: Noreen did not participate in any VT-related training this year.

Laura Martin, Exhibit Specialist
FY 2002 Position

This position was vacant during part of FY 2010. Laura left the HOVE Exhibit Specialist position in August to become the Canyonlands National Park (CANY) VT Archeologist. Lapse salary was spent on moving costs and upgraded equipment.

Skills: See NABR and CANY for a full description of employee skills

Accomplishments: See NABR and



*The Holly Site, Hovenweep National Monument.
Photo: Randall Skeirik*

CANY for a full description of employee accomplishments

Training: Laura did not participate in any VT-related training this year.

VANISHING TREASURES PROJECT FUNDING

Hovenweep National Monument did not receive VT project funding in FY 2010.



Hopi American Recovery and Reinvestment Act crew constructing scaffolding on the exterior of Cutthroat Castle, Hovenweep National Monument.

Photo: Courtesy Hovenweep National Monument

Natural Bridges National Monument

Natural Bridges National Monument is part of the Southeast Utah Group (SEGU), which also includes Canyonlands and Arches National Parks and Hovenweep National Monument.

VT Challenges and Successes: Backcountry projects are logistically complex and require careful planning and implementation. Even then, weather, bugs, illness, or injury can wreak havoc on a project's schedule. The Natural Bridges Site Documentation and Condition Assessment project was successful in spite of those issues and it is in large part thanks to our great crew.

Consultation: N/A

Safety: N/A

VANISHING TREASURES STAFF

Natural Bridges National Monument has never received funding for a Vanishing

Treasures position.

VANISHING TREASURES PROJECT FUNDING

Project Name: Natural Bridges Site Documentation and Condition Assessment

PMIS Number: 115154

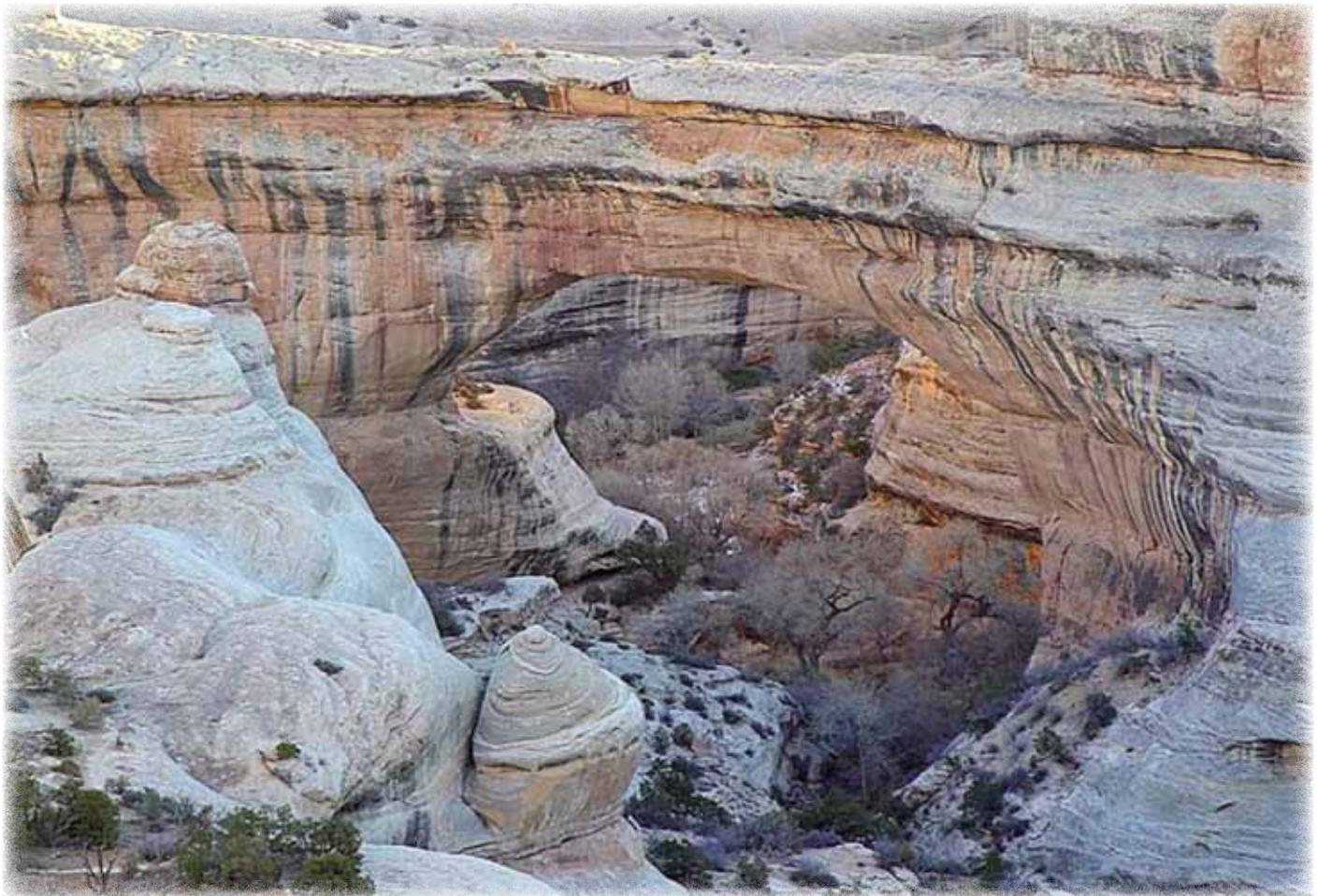
Project Summary:

The purpose of this project was to update information on, and assess the condition of at least 10 sites within the canyons of Natural Bridges National Monument. The project resulted in a total of 25 sites recorded and assessed. Significant, but poorly documented, prehistoric architecture and rock art sites located within the canyons were the primary focus of this project. Data on these sites were sparse or incomplete, often limited to 4x6 index cards. Furthermore, conditions at these sites had not been updated or professionally assessed for human and natural impacts since the early 1960s. Baseline information on the condition of the architecture was lacking and information concerning ongoing deterioration

from the natural and human impacts that threaten the resources and their associated data potential had not yet been collected. Consequently, appropriate management of these sites had been deferred for more than 40 years.

Field work was conducted over a three-month period with a three-person crew performing the site relocation and documentation work. Site documentation consisted of mapping, photography, and recording of archeological, environmental, and management-relevant attributes according to park, state, and national cultural resource standards. Fieldwork, initial data entry, and map creation were all completed in FY 2010 and resulted in the documentation of 25 sites containing 82 architectural features. The final report will be completed in FY 2011.

The project was staffed by two seasonal Archeological Technicians, Hannah Russell and Sharyl Kinnear-Ferris, and a permanent subject-to-furlough Archeologist Laura Martin (VT position). This core



*Sipapu Bridge, Natural Bridges National Monument.
Photo: Copyright-free-images.com*

staff was joined intermittently by Natural Bridges staff and Volunteers-in-the-Parks, providing staff and volunteers the opportunity to observe how visitation and natural events impact cultural resources and to learn methods for monitoring these impacts. The objectives of this project included performing a thorough records search to consolidate legacy data and incorporate information into existing base files; updating site documentation to meet current state and national standards; submitting sites for inclusion in the existing listing for the Natural Bridges Archeological District; creating an updated base map of archeological resources; establishing a cultural resource data layer of known archeological sites for the monument; developing a baseline of archeological site conditions for monitoring purposes; and producing management recommendations for sites in need of preservation treatments or preventative maintenance. Work was conducted to comply with National Park Service preservation guidelines, including DOI NPS-28 and the *VT Preservation and Management Guidelines*, and it followed documentation protocols established by the Southeast Utah Group (SEUG) cultural resource division.

Project Budget:

Total VT Project Funding:	\$96,700
Personnel:	\$67,866
Vehicles:	\$2,463
Travel/Training:	\$3,977
Supplies/Materials:	\$718
Equipment:	\$909
Services/Contracts:	\$13,740
Other:	\$7,007

Project Accomplishments: As a result of this project, work was completed at a total of 25 sites in Armstrong and White Canyons. This exceeded the original project target by 60%. Documentation of 23 previously known sites was updated to reflect current conditions and professional standards, and two new sites were discovered and recorded. Baseline architectural details were recorded, for a total of 82 structures, and they were all assessed for condition. Management recommendations were produced for each site that will be used to 1) formulate a monitoring plan for the most heavily visited sites, 2) prepare two preservation project proposals that will be submitted during the next Service-wide Comprehensive Call, and 3) develop a proposal to partner with regional researchers to perform additional ceramic analysis and clay sourcing that will better define local pottery manufacture within the Natural



Herschel Talashoma repointing the exterior of a kiva wall, Natural Bridges National Monument.

Photo: Courtesy Natural Bridges National Monument

Bridges area.

Over 600 archeological resources are known to exist within the monument, reflecting a human prehistory ranging from the Archaic (ca. 5500 – 400 BC) through the Ancestral Pueblo III (1150 – 1300 AD) time periods. Previous archeological inventories conducted at the monument include the Hobler survey of 1960-1962, in which over 190 sites were recorded in the canyons and on the mesa tops (Hobler 1978); the Head and Head survey of 1976 (Head 1977), in which an additional 56 sites were recorded in the canyons; and the McVickar survey of 1997-1998 (McVickar 2001), in which approximately 427 sites were recorded on the mesa tops. The McVickar survey resulted in the nomination of the Natural Bridges Archeological District to the National Register of Historic Places (NRHP). Although several other inventory surveys have been conducted since, most have focused on mesa-top areas where development activities related to monument facility improvements were undertaken.

Recommendations to the National Register of Historic Places:

All 25 sites recorded during this project were evaluated for eligibility to the National Register of Historic Places and 24 have been recommended for inclusion within the existing Natural Bridges Archeological District. These recommendations will be submitted to the State Historic Preser-

vation Office for review of their eligibility status upon the completion of the final project report in 2011. Unfortunately, the vast majority of the more than 80 known archeological sites that are located within the canyons of Natural Bridges are not included in the District listing. Since these are sites that are more likely to contain standing architecture that could “embody the distinctive characteristics of a type, period, or method of construction” (Criterion C, Department of the Interior 1997:37) and contain significant cultural deposits which could yield important information (Criteria D), further work is needed to ensure that these important resources are fully protected.

Site and Structure Condition:

Condition assessments were completed both on a site-wide basis and on individual structures. Overall site condition was determined by using established Intermountain Antiquities Computer System (IMACS) values for evaluating depositional integrity and extent of site disturbance in combination with archeological site management information system (ASMIS) values for evaluating change in condition and adequacy of current management policy. Legacy data, such as documentation and photography from NPS Ranger monitoring, were evaluated against in-field observations to determine whether new threats or disturbances had occurred or whether existing threats had further degraded the

site's condition. Any new data, or changes in previously observed conditions, were noted on the form and photographed and, when appropriate, added to the base site plan.

Of the 25 sites assessed, 11 were evaluated as being in "good" condition with most interpreted as retaining moderate to substantial depositional integrity and were evaluated as less than 50% disturbed. Thirteen sites were evaluated as being in "fair" condition with seven interpreted as retaining moderate to substantial depositional integrity and six as being in "poor" condition or as lacking depositional integrity. Most of the 25 sites were evaluated as being less than 50% disturbed but were recorded as having moderate to severe ongoing disturbances that could degrade the site's overall condition to "poor" if left unmanaged. One site was evaluated as being in "poor" condition because of severe ongoing disturbances which threaten the single architectural feature of the site.

Condition assessments on individual structures were completed using the SEUG Baseline Architecture and Condition form. Of the 82 architectural features recorded, four were assessed as being stable to grade and did not contain enough architectural detail to warrant additional documentation. The remaining 78 architectural features were recorded for basic architectural attributes and condition.

Six of the 78, located in five sites, were found to be in nearly pristine condition, remaining at nearly 100% of their original construction. Of these six, four are storage structures, one is a habitation room, and one is a kiva. All retain their original roof structures, which contain intact structural wood, and two had been previously sampled for dendrochronology. These resources were observed as changing very little since original documentation, with few ongoing disturbances of minimal impact noted. Two of these structures, located in two separate sites, appear to receive visitation and so were recommended for regular monitoring and possible future stabilization.

Of the other 72 standing structures, eight were evaluated as remaining at between 61-91% of their original construction, 19 at 31-61%, and 28 at 11-30%. The other 17 structures were found to be mostly collapsed but retained at least 5-10% of their original construction, enough to be evaluated for condition and minimal baseline architectural attributes. Not surprisingly,

those structures that have retained a greater percentage of their original construction were assessed as being in mostly stable condition and minimally threatened by ongoing disturbances. Of the 27 structures retaining more than 30% of their original construction, only five were assessed as being unstable and in need of preservation activities including preventative maintenance and/or stabilization treatments. These structures were also on sites that exhibited ongoing visitation and visitor-related impacts. Of the 28 structures that retain less than 31% of their original construction, 11 were assessed as either unstable or stable, but moderately threatened by ongoing disturbances. All 11 structures were initially recommended for preservation activities which require preventative maintenance or stabilization treatments; however, eight of these structures are not visited and do not retain enough integrity to warrant stabilization. In these cases, more detailed architectural documentation in lieu of invasive stabilization treatments may be the most appropriate preservation action. Therefore, management recommendations for preservation work was divided into two groups: 1) stabilization of visited sites to ensure visitor safety and enjoyment of the resource and, 2) data recovery in the form of detailed architectural documentation of pristine back-country sites that did not exhibit ongoing visitation and where invasive stabilization work (and the introduction of foreign fabrics) would degrade the site's integrity. In the latter case, sites that were evaluated as containing unique archi-

tectural features that could shed light on cultural and/or temporal sequences were also recommended for further testing and sampling of datable materials.

Initial Findings:

Of the 23 previously known sites, 16 were identified as habitations, six were interpreted as storage sites, and one was interpreted as a special use site. The two new sites consisted of artifact scatters likely associated with the occupation of nearby habitations.

Of the non-habitation sites, five consisted of multiple storage structures with associated artifact and corn scatters located within well-protected overhangs. These structures varied in construction from above-ground thin, shaped upright-slab structures (bins) to subterranean pits lined with shaped upright slabs set in mortar and roofed with log cribbing (cists). Further analysis of the data from these sites may indicate a temporal or functional difference between the upright slab storage bin feature type and subterranean pit feature type.

Most of the habitation sites were small (< 500m²), with only five sites containing kivas and three containing 10 or more rooms. The largest site, 42SA6654, is an extensive Late PII-PIII Ancestral Pueblo multi-unit habitation situated across multiple tiers of narrow ledges and cliff base talus. It covers an area greater than 5000m² and consists of at least four loci, defined both topographically and from discreet scatter boundaries.



"Turtle-Back" style adobe construction at 42SA6815, Natural Bridges National Monument.

Photo: Courtesy Natural Bridges National Monument

Overall, the site contains 12-15 rooms, four kivas, four rock art panels, several remnants of retaining wall that enclose the narrow ledge areas of the site, two hand-and-toe hold trails, two series of awl grooves, a bell-shaped storage cist, and a general refuse deposit reflecting lengthy residential use. This habitation, as well as five others, contained evidence for multiple episodes of occupation and the potential for deep, relatively intact cultural deposits, and so were interpreted as long-term habitations. Additional work to perform limited testing of deposits, sampling of intact structural wood for dendrochronology, and historic inscription studies have been recommended at these sites to help establish more concrete occupational sequences for these significant canyon habitations.

Of the habitation sites without kivas, seven consisted of structures with associated residential debris and features (fire blackening along alcoves, charcoal and ash deposits, ground stone, hearths, grinding surfaces, etc.) that indicate short-term or seasonal use. Three consisted of storage structures with dense artifact deposits and evidence of thermal features that could indicate long term use, but of a seasonal nature, or uses related to non-residential activity areas. Architecture of the first group consisted of multiple rooms either built onto each other as room blocks or built as freestanding structures. Stylistically, this group of sites demonstrated the highest variability. Five of these exhibited classic “Mesa Verde” style masonry room block construction, and two exhibited the adobe “turtle-back” construction that has been attributed to both Kayenta and Fremont culture groups. Four sites exhibited both oval and rectangular structures made of a mix of jacal and masonry, and three sites exhibited the use of horizontal wood beams as coursing within masonry walls. Initial C14 dates from collected samples from these structures does seem to support that the “turtle-back” construction occurred during earlier occupations.

Initial Accelerator Mass Spectrometry Carbon-14 analysis:

Twenty-six corn cobs and one mortar sample containing wood were collected from 13 sites for the purposes of accelerator mass spectrometry (AMS) C14 dating. Additionally, two snips from previously collected sandals were also submitted for analysis. The purpose of procuring datable material from these sites was both to support previous work completed through dendrochronology and to provide tighter

temporal designations for sites that had previously been unassigned or assigned as only “prehistoric NFS”. Funding from this project was utilized to submit 24 samples for analysis. A contract was awarded to Beta Analytic to process, analyze, and report on the results from these submitted samples. The following table reflects the 2 sigma calibrated date range (95% probability) for each sample by site as compared to previously recorded temporal affiliations.

Site #	Previous Temporal Affiliation / Based On? (Researcher)	Confidence (L,M,H)	2010 AMS C-14 2 Sigma Calibrated Result (95% probability)	New or Enhanced Temporal Affiliations
42SA 6650	Early PIII / "few grayware sherds" (Head)	L	(FS26) AD 640 - AD 770 (FS27) AD 660 - AD 670	Late BMIII – Mid PI
42SA 6654	PII – PIII / few sherds (Head), architectural style	L	(FS31)AD 1050 - AD 1090, AD 1130 - AD 1140, AD 1140 – AD 1260 (FS33) AD 1210 – AD 1290	Late PII – PIII, should be supported by Dendro samples
42SA 6781	PII-PIII / ?	L	(FS14) AD 1010 – AD 1170 (FS15) AD 420 – AD 610 (FS16) AD 640 – AD 710, AD 750 – AD 760 (FS5)AD 1060 – AD 1080, AD 1150 – AD 1270	Mid to Late BM III, with possible re-occupation during Mid to Late P II.
42SA 6782	BM II, PII-PIII / 11 ceramics and architectural style (Hobler)	L	(FS6) AD 1160 – AD 1270 (FS7) AD 1020 – AD 1210	Late P II-P III, but future dendro sampling of intact wood from storage cists may indicate earlier component
42SA 6783	Prehistoric NFS (Hobler)	L	(FS10) AD 670 – AD 880 (FS11) AD 640 – AD 770	Mid to Late PI, possible Late BM III component?
42SA 6785	PII-PIII / 16 ceramics (Hobler)	L	(FS 2) AD1260-AD1310, AD1360-AD1380	Late PII – PIII
42SA 6786	PII-PIII / 9 ceramics, dendros (Hobler, Windes)	H	(FS3) AD1260-AD1310, AD1360-AD1380	Late PII – PIII, supports current dendrochronology results
42SA 6789	PII-PIII / 18 ceramics and architectural style (McVickar)	M	(FS19) AD1050-AD1090, AD1130-AD1140, AD1140-AD1260 (FS20) AD1160-AD1270 (sandal snip of Hobler collection) AD1220 – AD 1300	Late PII – PIII
42SA 6798	Pueblo NFS / 3 ceramics (Hobler, McVickar)	L	(FS9) 60 BC – AD 80	?? Suspect result. Could be “old wood” phenomenon, additional sampling of architectural materials or pigment analysis recommended. San Juan Anthropomorphic style Rock Art elements suggests a BM II-BM III Component.
42SA 6815	BM II, PII-PIII / 6 ceramics (Hobler)	L	(FS22) AD 640-AD 770 (FS23) AD 980- AD 1160	Mid to Late BM III, with possible re-occupation during Mid to Late PII – PIII.
42SA 6960	PII – PIII / 11 ceramics, Dendros, architectural style (Head, Windes)	H	(FS29) AD 1170 – AD1280 (sandal snip of Hobler collection) AD 1210 – AD 1290	Late PII – PIII, supports current dendrochronology and current temporal affiliation.
42SA 23351	PII-PIII / ceramics (McVickar)	L	(FS24) AD 620 – AD 690	Mid to Late BM III component added
42SA 28865	PII-PIII / 42 ceramics and architectural style (McVickar)	M	(FS8) AD 1220 – AD 1290	Late PII-PIII, supports current temporal affiliation

Table 1. 2010 AMS C-14 results

Initial Recommendations for Further Study:

The vast majority of the sites listed on the Natural Bridges Archeological District are of the Ancestral Pueblo era. Settlement of

the area during this time was sporadic and non-continuous, characterized by patterns of occupation and abandonment by groups expanding from the core culture areas of the Kayenta group to the southwest and of the Mesa Verde group to the east. Previous archeological investigations of Cedar Mesa (Matson et al. 1988) indicate that occupational hiatuses occurred during a 250-year span preceding the late Basketmaker III period (AD 650 - 725), then again between late Basketmaker III (AD 725) and mid-to-late Pueblo II (AD 1060). McVickar (2001) concluded that this observation holds true for Natural Bridges. However, the later pattern is less distinct due to the fact that the ceramic styles used to date the sites have long temporal ranges that could skew affiliations toward earlier dates.

One result of this project was the recognition that additional ceramic studies are needed to appropriately assign both temporal and cultural affiliation to sites at Natural Bridges. This project utilized “in field” analysis to type ceramics. More often than not, ceramics found at Pueblo II sites within the canyons of Natural Bridges exhibit properties that do not fit well within the “classic” ceramic type series for the southwest and so could only be assigned to broad generic categories. Instead, they appear to fit more closely with a variety described by other regional researchers as being locally produced. Given that collections were made during previous surveys which did not take into account the properties of the locally produced variety, many of the sites at Natural Bridges may have been incorrectly assigned cultural or temporal affiliations. Additionally, standardized laboratory analysis would be a more appropriate and accurate method for typing ceramics of this locally produced variety and would allow regional experts to further compile its technological traits. Since local ceramic manufacture would have had a significant influence on settlement patterns, additional work in this area is warranted. As a result of this project a proposal is currently under development to undertake a detailed study of ceramics from both previous collections and new collections from sites at Natural Bridges and to further investigate production areas within, and adjacent to, the monument. Results would not only permit more accurate temporal and cultural designations to be assigned to these sites, but could also lead to a deeper understanding of the decision-making processes used by ancestral pueblo people living on the margins of their core culture areas.

Zion National Park

VANISHING TREASURES ACCOMPLISHMENTS AND CHALLENGES

VT Challenges and Successes: The greatest challenges for managing our VT-resources include the difficult access to sites and the protection of wilderness values. See the Vanishing-Treasures-funded project described below for a more detailed discussion.

Consultation: No issues to discuss.

Safety: See the Vanishing Treasures funded project described below for a more detailed discussion.

VANISHING TREASURES STAFF

Zion National Park has never received a base increase to fund a Vanishing Treasures position.

VANISHING TREASURES PROJECT FUNDING

Project Name: Stabilization of Cable Mountain Draw Works

PMIS Number: 133729

Project Summary: This project entailed the full structural stabilization and rehabilitation of this small, but significant, historic structure. VT funding was used to pay for materials, equipment, and transportation. Transportation for this project, which was located high on a mesa top and in a designated wilderness area, required helicopter lifts and four separate trips of a mule pack train to haul materials and equipment to the site. Federal Lands Recreation and Enhancement Act (FLREA) funds, which were also used to fund the project, were obligated last year through the Colorado Plateau Cooperative Ecosystem Study Unit (CPCESU), but all the field work occurred this year. The field work included an initial site visit in November, 2009 to assess structural conditions and the integrity of the wooden members and to collect details for a preservation work plan. Field work continued with the actual stabilization during September, 2010.

Stabilization was completed by a crew of timber framers, wood craftsmen, and an architectural conservator, working through the University Of New Mexico (UNM) School Of Architecture and Planning, as per the CPCESU task agreement. Students from the university also participated.

Project Budget:

Total VT Project Funding:	\$42,250
Personnel:	\$20,252
Vehicles:	\$0
Travel/Training:	\$383
Supplies/Materials:	\$14,572
Equipment:	\$4,871
Services/Contracts:	\$0
Other:	\$2,172

Project Accomplishments: The Cable Mountain Draw Works is an aerial cableway that was historically used to move harvested timber and sawn lumber from East Mesa, down 2,000 feet to the Zion Canyon floor below. Established in 1901, the Draw Works was used to move hundreds of thousands of board feet of lumber before its closure in 1926. Prior to construction of the Draw Works, movement of timber from the mountains and mesas to settlements on the canyon floor typically took several days of arduous travel.

The Draw Works was originally conceived and constructed by David Flanigan, a young, hard-working resident of Springdale, Utah. He regarded the Draw Works as a fulfillment of an 1863 prophecy by Brigham Young, then leader and prophet of the Church of Jesus Christ of Latter Day Saints (the Mormons), that lumber would



*Mist in Zion Canyon, Zion National Park.
Photo: Courtesy Zion National Park*



The Cable Draw Works before and after rehabilitation.
Photos: Randall Skeirik

one day be transported from the canyon rim “as the hawk flies.”

The system Flanigan employed was a single-rope tramway. Components included an upper, or loading, terminal at the canyon rim that was outfitted with a breaking mechanism, and a pair of towers on the canyon floor. All three structures were constructed as open frameworks of heavy timber. A continuous wire cable (or rope) ran over sheaves mounted on the terminal structures, with gravity used to lower loads to the canyon floor.

Today, the upper terminal is all that survives of the Cable Mountain Draw Works; the towers on the canyon floor were removed by the NPS a few years after the Draw Works operations closed in 1926. The structure was listed in the National Register of Historic Places in 1978. Its significance lies in the role that it played in settlement and development of the upper Virgin River drainage area, the innovative resource extraction technology that it represents, and its iconic value for members of the Church of Jesus Christ of Latter Day Saints.

The stabilization of the Draw Works represented a highly collaborative undertaking--from the initial planning stages; to consultation, design, funding acquisition; and finally to implementation. Zion Cultural Resource staff worked closely with VT Historical Architect Randy Skeirik and Structural Engineer Preston Fisher to determine the most feasible approach to the structure’s stabilization, conducted several site visits, and prepared funding proposals. Ultimately, the funding for the project came from two sources. First, FY 2010 Vanishing Treasures program funding was used for cultural resource staff to

work with the structural assessment team, to conduct detailed project documentation before, during, and after treatments; for ranger staff who provided on-site safety measures (including required Occupational Health and Safety Administration fall protection); for the stabilization crew; for materials and equipment purchases; and for the transportation of gear, equipment, and materials to and from the site. Then, we used FLREA funding, obligated through the CPCESU, to develop a cooperative agreement with the University of New Mexico School of Architecture and Planning to execute the stabilization work.

The UNM team, led by Architectural Conservator Doug Porter, Ph.D., included master woodworkers and timber framers Mike Cotroneo, Paul Ide, Chris Patton, and Jason Norris, all from Vermont; and UNM Architecture student Keri Stevenson. Early in FY 2010, and prior to starting fieldwork, a structural assessment team visited the site. This team consisted of Zion staff, VT Program staff, UNM staff, and staff from Anthony & Associates, Inc., (a wood consulting firm). The assessment included a thorough evaluation of the Draw Works timber elements including methods of connections, agents of deterioration, and foundations and anchorage; a wood assessment based in part on resistance drilling to locate and quantify remaining sound wood; a determination of the allowable grade and identification of wood species and characteristics used to establish repair requirements; identification and prioritization of stabilization and repair needs; and the preparation of a repair plan, with preservation options, that included narrative descriptions, annotated photographs, and architectural drawings.

The structure stabilization occurred in September, 2010. (Note to self and colleagues: Unless it is simply unavoidable, never undertake a major project in the last few weeks of the fiscal year.) After failed elements were stabilized, the structure was completely dismantled using a gin pole and block and tackle to lower timbers and framing bents safely to the ground. Severely decayed portions of the primary elements were cut away, and traditional joinery was used to scarf replacement timber onto the historic wood. This meant that portions of nearly all of the surviving structural members were retained, including the east and west columns, the plate timbers, and the girts. The east and west bents were partially assembled on the ground and hoisted into position on new sill timbers; and the girts were installed. Replacement sheave support timbers and historic elements associated with the drive and braking mechanisms were then put into place. To improve the durability of timber elements where they are in contact with the ground, borate rods were installed. In addition, during a planned post-stabilization inspection, an application of liquid borates will be applied to both new and old timbers. The UNM team is currently preparing a preservation report on the preservation effort.

In 2009, the US Congress signed the Omnibus Public Land Management Act (PL 111-11) and along with other areas within the state of Utah, officially designated most of the back country of Zion National Park as wilderness. In accordance with the new legislation, Zion began to develop and implement new management practices that promote and protect wilderness values. The Cable Mountain Draw Works site is located in this newly designated wilderness area.

To promote and protect our newly designated wilderness, we greatly modified how the work for this project was to be accomplished. All power tools, except for those that were absolutely necessary, were replaced with traditional hand tools. While this change presented some interesting and even positive challenges, and added a new dimension to the training and learning opportunities for the project, it also greatly increased the number of person-hours needed to accomplish the work since traditional hand tools are often more labor-intensive than their power-tool equivalents.

Access to the site also presented a range of challenges since the Draw Works is located at the end of a four-mile-long hiking trail. Transporting the crew, gear, equipment, materials, and enough water for a three-week project was no small feat. Relying on a Zion all-employees call for help, we organized several "human pack mule" hiking trips, each limited to 12 people, as our Back Country Management Plan stipulates. We also hired a local wrangler for four mule pack trips. Some materials, however, such as the 32-foot-long, 1000+ pound, specially milled replacement timbers could only be transported via helicopter. Zion Helitack assisted us in this effort.

Creating a safe working environment throughout the entire project was a top priority. Working on a structure like the



Doug Porter, Mike Cotroneo, Paul Ide, Jason Norris, and Chris Patton reconstruct the Draw Works, lifting the top brace of the east bent using a gin pole and block and tackle, Zion National Park.

Photo: Courtesy Zion National Park



Paul Ide splicing a new end on one post of the Cable Draw Works, Zion National Park.

Photo: Courtesy Zion National Park

Draw Works presents significant hazards because the structure is remotely located and situated precariously on the edge of a 2000-foot sheer cliff, with publicly accessible hiking trails directly beneath. Without closing the trails below, there was no margin for error; even dropping a small hand tool could have had catastrophic results. In order to identify, plan for, and mitigate the dangers, we conducted two GARs (Green-Amber-Red) operational risk assessments. In the process, we consulted with Barry Clark, Grand Canyon National Park Safety Specialist to implement appropriate OSHA-compliant fall protection. We also addressed emergency communications, rescue ops, inclement weather (lightning in particular), appropriate tool operation training, proper PPE (personal protective equipment), work camp hygiene, and many other issues.

This project was exciting and exhilarating. It provided the opportunity to work with, and to learn from, a wide array of technical experts who were enthusiastic and love what they do. It also offered us an opportunity to spend three weeks working, hiking, and camping in the spectacular backcountry of Zion National Park. It was great! At the same time, this project was a tricky and often dangerous undertaking that could not have succeeded without the dedication and professional performance of all involved. The UNM team of wood

scientists, conservators, and timber framers worked together like a well-oiled machine, competently and efficiently removing, repairing, and replacing thousands of pounds historic wooden timbers. As in previous years, the entire Zion workforce showed great commitment to the important task of preserving and protecting cultural resources. Staff in our Budget and Purchasing/Procurement offices worked miracles to get a high volume of equipment and material purchases accomplished at a very late date in the fiscal year. Our Roads and Trails Foreman never hesitated when asked to provide drivers and big trucks to transport several tons of materials from Las Vegas. Our Trails crew eagerly assisted with fall protection installation, training, and equipment hauling. Our Fire Management Program stepped in with their support, making the Zion Helitack Crew available for multiple air deliveries. Visitor and Resource Protection rangers were on-site each day ensuring that key safety measures were implemented. They assisted with setting ropes and rigging for the gin pole and block and tackle, making fall protection adjustments, and anchoring the structure during dismantling and reconstruction to prevent it from tumbling over the edge and onto hiking trails below. Absolutely vital in the successful and safe completion of this project was the steady-handed commitment of the Zion Cultural Resource Management crew.

V a n i s h i n g T r e a s u r e s

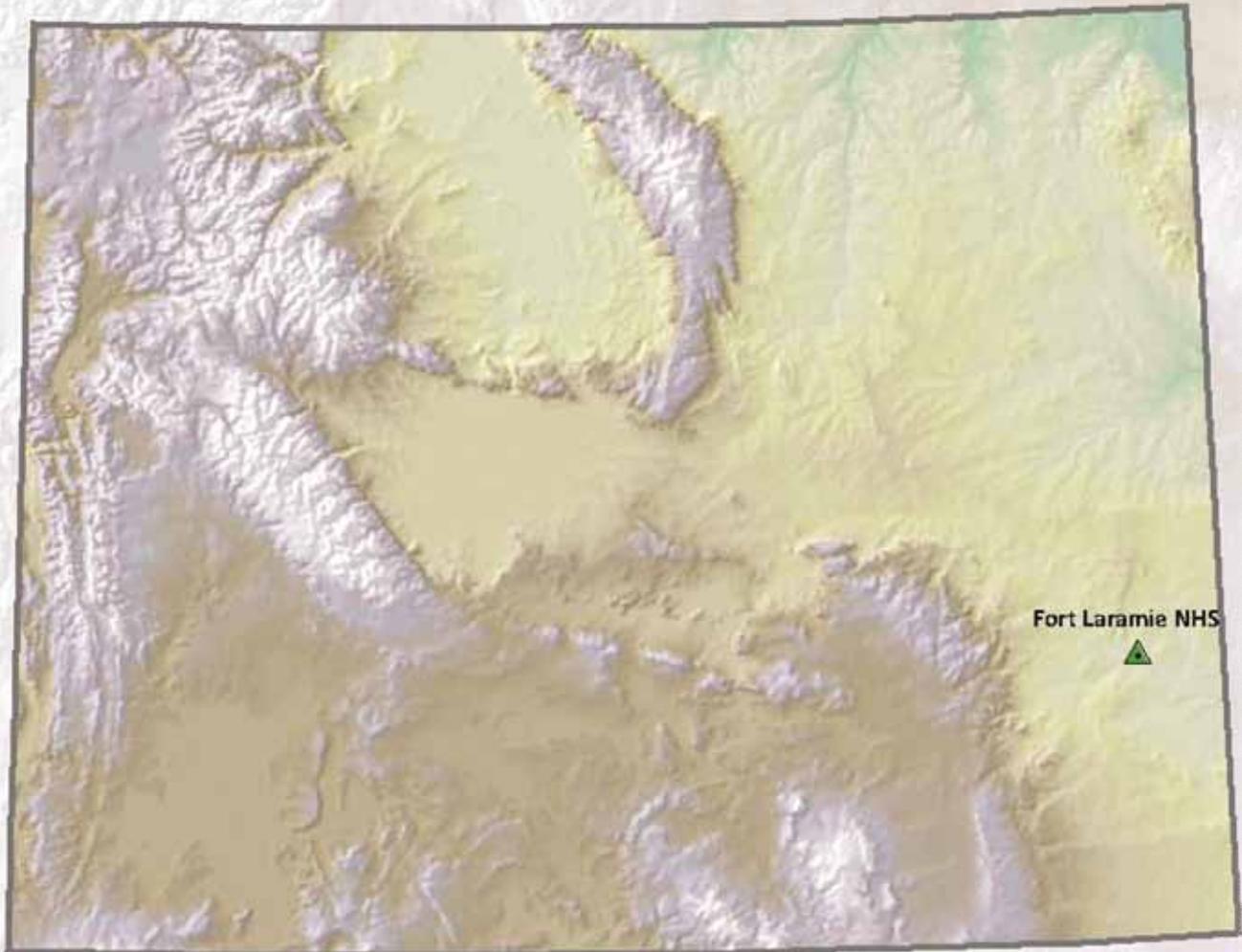
W y o m i n g



Wagons and military equipment on the parade grounds, Fort Laramie National Historic Site.

Photo: Randall Skeirik

◆ Fort Laramie National Historic Site ◆



**Wyoming Fiscal Year 2010
Project Funding Summary**

Funded Projects:

No Wyoming parks received Vanishing Treasures project funding this year.



Fort Laramie National Historic Site

VANISHING TREASURES ACCOMPLISHMENTS AND CHALLENGES

VT Challenges and Successes: The VT crew's primary project this year was the repair of damage to the exterior adobe brick walls on the Sutler's Store (HS-2) that had resulted from emergency preservation work executed in the 1950s.

In that early project, the adobe walls were covered with metal wire mesh and covered with Portland cement. Through the years, moisture collected behind the cement stucco and, through expansion and contraction, the stucco shell was fractured and forced away from the brick. A large void also developed in the center of one wall and, in an attempt to stabilize the area, a fissure developed leaving the adobe exposed to the elements and creating a roosting area for bats. Water and a large amount of entrapped bat guano were causing the soft adobe bricks to dissolve.

To address these conditions, the crew removed the Portland cement and wire mesh, executed necessary repairs to the adobe brick, and replaced the Portland cement with naturally hydraulic lime (NHL), which was used historically. Naturally hydraulic lime is a softer, more flexible, and more porous stucco that will allow moisture to migrate through the shell and evaporate keeping the adobe dry. A mixture of



Fort Laramie with the Sutler's Store on the left and Old Bedlam on the right, Fort Laramie National Historic Site.

Photo: Courtesy Fort Laramie National Historic Site

1 part NHL-3.5 and 2 parts masonry sand, along with coloring agents and water was applied. This mixture was troweled directly onto the adobe and built out in ¼- to ½-inch layers until the last coat could be finished with a sponge float. Form boards were installed every 8 feet which allowed for the last coat to be screed off, leaving a very flat surface for the sponge float process.

Portions of the walls on this structure are constructed of stone and, in addition to receiving the Portland cement stucco, they had also been repointed with a Portland cement mortar. The crew removed both the Portland cement stucco and mortar and re-pointed the stonework with a hydraulic lime mixture. The stucco was not reapplied to the stone since it does not need the same protection from the elements as the adobe, and it allows the visitors to view the construction of the structure. All wood

surfaces on the structure were scraped and freshly painted, and several windows and doors were repaired.

This project was led by Exhibit Specialist, Barry Hadsell. The crew consisted of seasonal employees Mark Vigen, Spencer Miller, Spencer Faber, and Randy Brown.

Consultation: This project met a categorical exclusion for National Environmental Policy Act compliance.

Safety: Our VT crew did not experience any negative safety issues this year.

VANISHING TREASURES STAFF

Barry Hadsell, Exhibit Specialist (Ruins Preservation)

FY 2007 Position

Skills: Barry has been a professional carpenter and mason for 31 years with three years' experience as a Preservation Carpenter and Mason at Yosemite National Park. Through diligent work, Barry led a productive preservation crew at Fort Laramie that executed outstanding craftsmanship on several projects that enhanced the longevity of the historic structures in the park.

Accomplishments: Barry successfully planned and executed preservation work on the Sutler's Store, supervising a crew of four seasonal employees.

Training: Barry graduated from the NPS Fundamentals program this year (including Fundamentals II, III, IV and V) and also completed the Preservation and Skills Training (P.A.S.T.) Program and the Introduction Facility Management Software System (FMSS) training.

VANISHING TREASURES PROJECT FUNDING

Fort Laramie National Historic Site did not receive Vanishing Treasures project funding this year.



Masons repointing stonework on the Sutler's Store, Fort Laramie National Historic Site.

Photo: Courtesy Fort Laramie National Historic Site

A p p e n d i c e s



Appendix A:
Definition of Vanishing Treasures Resources *i*

¹ con·di·tion \ken-'di-shen/noun
Etymology: Middle English condicion, from Anglo-French, from Latin condicio-, condicio terms of agreement, condition, from condicere to agree, from com- + dicere to say, determine -- more at DICATION
1 a : a state of being <the human condition> b : social status : RANK c : a usually defective state of health <a serious heart condition> d : a state of physical fitness or readiness for use <the car was in good condition> <exercising to get into condition> e plural : attendant circumstances <poor living conditions>

Appendix B:
Terminology..... *i*



Appendix C:
Leadership Committee *ii*

Appendix D:
Working Groups..... *ii*



Appendix E:
Annual and Cumulative Program Funding *iii*

Appendix F:
VT Fiscal Year 2011 Project Funding *iv*



Appendix G:
Chronology and Status of Vanishing Treasures Funded Positions *v*

Appendix A: Definition of Vanishing Treasures Resources

Vanishing Treasures Resources are defined as a structure or grouping of related structures that:

- Are in a “ruined” state.
- Have exposed intact fabric (earthen, stone, wood, etc.).
- Are not being used for their original function.
- Occupation and utilization have been interrupted or discontinued for an extended period of time.
- Are located in the arid West.
- Are the resources, or part of the resources, for which the park was created, are a National Historic Landmark, or listed on, or eligible for listing on, the National Register of Historic Places.

Examples of Vanishing Treasures Resources:

- Architectural remains that have intact historic fabric exposed at or above grade including: wall alignments, upright slabs, foundations, bins, cists, constructed hearths.
- Sub-grade architecture exposed through excavation or erosion (i.e., pithouses, dugouts, cists, etc.).
- Native American architectural structures (i.e., pueblos, cliff dwellings, hogans, wickiups, ramadas, corrals, earthen architecture, etc.).
- EuroAmerican architectural structures (i.e., churches, convents, forts, ranch-farm structures/homesteads, mine buildings, acequias or related features, kilns, etc.).

Examples of Non-Vanishing Treasures Resources:

- Sites with no exposed architecture or structural remains, (i.e., collapsed, buried, mounded, or otherwise not evident).
- Archeological or other sites with no architectural remains (i.e., lithic scatters, dumps, campsites, etc).
- Civilian Conservation Corps (CCC) and Civil Works Administration (CWA) buildings and features.
- Historic structures that are regularly maintained, and/or adaptively used, and fit within the Historic Structures/List of Classified Structures (LCS) definitions.
- Structures in use as National Park Service facilities (i.e., administrative buildings, trails, bridges, ditches, canals, etc).
- Mineshafts or caves, that do not have architectural/structural features.
- Pictographs, petroglyphs, rock art, etc., except if found in or on architectural structures.
- National Park Service or other reconstructed buildings or ruins (i.e., Aztec Great Kiva, Bents Old Fort).

Note: Many of the traditionally associated communities to whom Vanishing Treasures resources/archeological sites hold importance, do not consider those sites to be unoccupied, out of use, or abandoned. “Ruins” are considered by some groups to be spiritually inhabited and are considered to be “in use” by virtue of being invoked in prayers, songs, stories, etc. They are considered dynamic parts of active cultural systems. While we use the term “ruins” and the associated definition, it is recognized that some communities do not use the term “ruin” nor consider the places to be unoccupied or out of use.

Appendix B: Terminology

Condition

Good - The site shows no clear evidence of major negative disturbance and deterioration by natural and/or human forces. The site’s archeological values remain well-preserved, and no site treatment actions required in the near future to maintain its condition.

Fair - The site shows clear evidence of minor disturbance and deterioration by natural and/or human forces, and some degree of corrective action should be carried out fairly soon to protect the site.

Poor - The site shows clear evidence of major disturbance and rapid deterioration by natural and/or human forces, and immediate corrective action is required to protect and preserve the site.

Intensity of On-Site Erosion

Severe - The site will be significantly damaged or lost if action is not taken immediately.

Moderate - For an impact to be considered moderate, it must meet at least one of the following criteria:

The site will be significantly damaged or lost if action is not taken in the immediate future.

The site has been damaged and some integrity has been lost.

Low - The continuing effect of the impact is known but it will not result in significant or irreparable damage to the site.

None - The site has not been obviously impacted.

Integrity - Integrity refers to how much of the structure remains standing and intact. For example, a structure with only one intact, standing wall, would be given a value of 20% . A structure with all four walls standing and intact, plus an intact roof and floor, a 100% value would be given.

Stability - Stability refers to a wall or structures’ state of equilibrium.

Stable - A structure that maintains consistency of composition and components with little or no sign of erosion that would lead to any form of structural degradation. The term stable can also be applied to structures that have essentially deteriorated to grade and thus have little or no standing structural remains above the ground surface that would be subject to further deterioration.

Partially Stable - A structure that exhibits signs of whole or partial degradation of the existing composition and components such that structural stability is threatened.

Unstable - A structure that has suffered damage from erosion such that structural collapse or complete degradation is imminent.

Appendix C: Leadership Committee

Vanishing Treasures Leadership Committee: 2010				
Representing	Name	Term	Start Date	End Date
New Mexico/Texas	Kayci Cook Collins, Chair	3 Years	May 2009	May 2012
Arizona (North)	Kathy Davis	3 Years	May 2009	May 2012
Arizona (South)	Lisa Carrico	3 Years	May 2008	May 2011
California/Nevada	Andy Ferguson	3 Years	May 2009	May 2012
Colorado/Utah/Wyoming	Mitzi Frank	3 Years	May 2007	May 2013
Colorado/Utah/Wyoming	Corky Hays	3 Years	May 2008	May 2011
New Mexico/Texas	Marie Frias Sauter	3 Years	May 2008	May 2011
IMR	Sande McDermott	Permanent		
PWR	Hank Florence	Permanent		
VT Program	Virginia Salazar-Halfmoon	Permanent		
VT Program	Preston Fisher	Ex-officio		
VT Program	Randall Skeirik	Ex-officio		
VT Program	Lauren Meyer	Ex-officio		

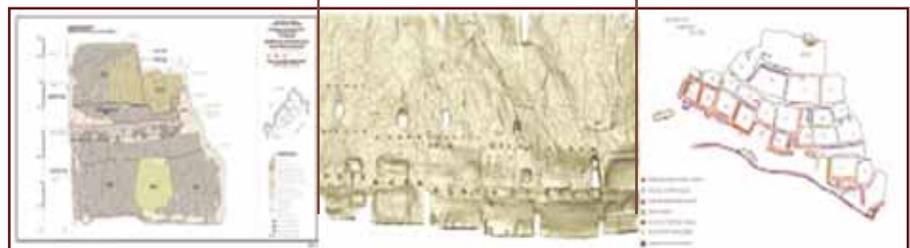
Appendix D: Work Groups

As a result of the costs associated with maintaining the advisory group and the difficulty of arranging meetings, the VT Leadership Committee voted in FY 2007 to dissolve the advisory group. Instead, ad hoc Work Groups will be created to address specific needs or problems.

In FY 2009 two work groups were formed, and both have continued through FY 2010. One is investigating standards for documenting VT resources and one aims to create a series of technical notes documenting preservation issues particular to VT resources.

The Documentation Work Group, led by VT Structural Engineer Preston Fisher and Materials Conservator Lauren Meyer, has been formed to help establish standards for the documentation and recordation of VT sites. If you are interested in joining this work group please contact Preston at 970.529.5004, preston_fisher@nps.gov or Lauren at 505.988.6861, lauren_meyer@nps.gov.

This work group has a web page on the VT Sharepoint web site: http://inpniscsmoss:3000/sites/NPS2/VT/doc_std/default.aspx



The Technical Notes Work Group, under the direction of VT Historical Architect Randy Skeirik, will attempt to collect and centralize the specialized knowledge associated with the stabilization and preservation of VT sites (sometimes termed “ruins”). We will investigate the potential for the publication of a series of these technical notes that will build upon the work done by the Technical Preservation Services (TPS) program in Washington, DC. The resulting documents will address preservation topics specific to the challenges found in VT park resources.

The format will be similar to the NPS/TPS *Tech Note* series. The series is tentatively titled *Preservation Prescriptions* and a banner has been designed (right). The topic of the first issue is expected to be a general discussion of the unique challenges of preserving buildings, sites, and structures that are no longer physically occupied and are in a state of deterioration (ruins).

While progress is being made in producing the first volume, it will take the collective, specialized knowledge of the VT staff to produce a comprehensive and useful series. We encourage you to participate in this process whether through helping to vet potential topics, assisting with document production, providing peer review, or by writing or collaborating on an issue. Please contact Randy at 928.821.2992 or randall_skeirik@nps.gov if you are interested.

This work group also has a web page on the new VT Sharepoint web site: <http://inpniscsmoss:3000/sites/NPS2/VT/technotes/default.aspx>



Appendix E: Annual and Cumulative Program Funding

Vanishing Treasures Annual and Cumulative Funding										
FY 1998 through FY 2010										
		VT Program Components			Total VT Program Expenditures	VT Park Base Increases		Total Base Increases	One-Year Personnel Funding ³	Grand Total (Program plus Base)
		Projects	Training ²	Management		Personnel	Additional ¹			
FY 1998	Annual Budget	505,300	31,700	10,000	547,000	453,000	0	453,000	0	1,000,000
	Cumulative Total	505,300	31,700	10,000	547,000	453,000	0	453,000	0	1,000,000
FY 1999	Annual Budget	627,600	40,000	44,000	711,600	585,000	237,000	822,000	0	1,533,600
	Cumulative Total	1,132,900	71,700	54,000	1,258,600	1,038,000	237,000	1,275,000	0	2,533,600
FY 2000	Annual Budget	814,600	0	56,000	870,600	795,000	0	795,000	0	1,665,600
	Cumulative Total	1,947,500	71,700	110,000	2,129,200	1,833,000	237,000	2,070,000	0	4,199,200
FY 2001	Annual Budget	973,000	0	60,000	1,033,000	236,000	0	236,000	0	1,269,000
	Cumulative Total	2,920,500	71,700	170,000	3,162,200	2,069,000	237,000	2,306,000	0	5,468,200
FY 2002	Annual Budget	1,038,000	0	60,000	1,098,000	435,000	0	435,000	0	1,533,000
	Cumulative Total	3,958,500	71,700	230,000	4,260,200	2,504,000	237,000	2,741,000	0	7,001,200
FY 2003	Annual Budget	1,031,000	0	60,000	1,091,000	600,000	0	600,000	0	1,691,000
	Cumulative Total	4,989,500	71,700	290,000	5,351,200	3,104,000	237,000	3,341,000	0	8,692,200
FY 2004	Annual Budget	997,400	0	60,000	1,057,400	375,000	0	375,000	0	1,432,400
	Cumulative Total	5,986,900	71,700	350,000	6,408,600	3,479,000	237,000	3,716,000	0	10,124,600
FY 2005	Annual Budget	1,030,700	0	60,000	1,090,700	0	0	0	300,000	1,390,700
	Cumulative Total	7,017,600	71,700	410,000	7,499,300	3,479,000	237,000	3,716,000	300,000	11,515,300
FY 2006	Annual Budget	1,024,000	0	60,000	1,084,000	0	0	0	260,000	1,344,000
	Cumulative Total	8,041,600	71,700	470,000	8,583,300	3,479,000	237,000	3,716,000	560,000	12,856,300
FY 2007	Annual Budget	1,024,000	0	60,000	1,084,000	0	0	0	0	1,084,000
	Cumulative Total	9,065,000	71,700	530,000	9,667,300	3,479,000	237,000	3,716,000	560,000	13,940,300
FY 2008	Annual Budget	1,024,000	0	60,000	1,084,000	0	0	0	0	1,084,000
	Cumulative Total	10,089,000	71,700	590,000	10,751,300	3,479,000	237,000	3,716,000	560,000	15,024,300
FY 2009	Annual Budget	972,257	0	60,000	1,032,220	0	0	0	0	1,032,220
	Cumulative Total	11,061,257	71,700	650,000	11,783,520	3,479,000	237,000	3,716,000	560,000	16,056,520
FY 2010	Annual Budget	1,007,220	0	57,980	1,065,200	0	0	0	0	1,065,200
	Cumulative Total	12,068,477	71,700	707,980	12,848,720	3,479,000	237,000	3,716,000	560,000	17,121,720

Notes:

¹ \$156,000 base increase for one park for personnel and an \$81,000 park base increase.

² Between FY 1999 and FY 2004 training costs were added to the total cost for personnel and included in base increases. Beginning in FY2005 training funds will be deducted from project funds.

³ In FY 2005 and FY 2006 personnel funding was for one year only and did not represent a permanent increase in park base funding. After FY 2006 the Program no longer provided money of any kind for personnel.

Appendix F: FY 2011 Funded Projects

FY 2011 PROGRAM STATUS					
VANISHING TREASURES PROGRAM-FUND 01					
TOTAL PROGRAM PROJECTED ALLOCATION				\$1,076,000.00	
Less Region Assessment of 1% (1,077,994.00 x .01 = 10,10,800)				\$10,800.00	
TOTAL AVAILABLE				\$1,065,200.00	
Park	PMIS Number	Project Name	PMIS Allocation	Adjustment Increase/Decrease	
IMRO	136825	VT Program Management	\$57,980.00	\$ 0.00	
ZION NATIONAL PARK	122540	Backfill Site 42WS122	\$88,880.00	\$ 0.00	
FORT BOWIE NATIONAL HISTORIC SITE	116502	Condition Assessment of the First Fort Bowie	\$81,500.00	\$ 0.00	
FORT BOWIE NATIONAL HISTORIC SITE	1166503	Condition Assessment of the Second Fort Bowie	\$123,630.00	\$ 0.00	
WUPATKI NATIONAL MONUMENT	124003	Condition Assessment and Evaluation of 20 Backcountry Architectural Sites	\$119,420.00	\$ 0.00	
GRAND CANYON NATIONAL PARK	115238	Compete Condition Assessments of Architectural Sites on the Walhalla Plateau	\$79,660.00	\$ 0.00	
CASA GRANDE RUINS NATIONAL MONUMENT	116964	Treat Weather, Rodent, and Bird Impacts	\$111,440.00	\$ 0.00	
MOJAVE NATIONAL PRESERVE	120267	Conduct Condition Assessment and Prepare Treatment Plan for Providence Townsite	\$56,100.00	\$ 0.00	
FORT UNION NATIONAL MONUMENT	132431	Preserve, Restore, and Rehabilitate Masonry and Wooden Structural Elements	\$29,200.00	\$ 0.00	
PETRIFIED FOREST NATIONAL PARK	134125	Prepare Condition Assessments and Treatment Plan for Sivu'ovi	\$123,700.00	\$ 0.00	
GOLDEN SPIKE NATIONAL HISTORIC SITE	134896	Condition Assessment and Documentation for Trestle #2 (LCS#054526)	\$10,440.00	\$ 0.00	
GOLDEN SPIKE NATIONAL HISTORIC SITE	171140	Emergency Stabilization of Trestle #1 LCS # 054527	\$71,560.00	\$ 0.00	
CHACO CULTURE NATIONAL HISTORICAL PARK	114694	Conduct Condition Assessment and Emergency Treatments at Chacra Mesa Structures	\$33,510.00	\$ 0.00	
IMRO	165017	Prepare Administrative History of the Vanishing Treasures Initiative	\$78,180.00	\$ 0.00	
TOTAL ALLOCATED			\$1,065,200.00		
AMOUNT UNALLOCATED			0		
TOTAL PROJECT FUNDING FOR FY 2011 (\$1,065,200 less \$57,980 Program Funds)			\$1,007,220.00		

Appendix G: Chronology of Vanishing Treasures Funded Positions (continued)

1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Chaco Culture National Historical Park												
	Rachel Anderson Archeologist Perm FT			Roger Moore Archeologist GS-193-11 Perm FT								
	Paul Tso Masonry Worker WG-3603-08 Perm FT									James Yazzie Masonry Worker WG-3603-08 Perm FT		
	Jack Trujillo Masonry Worker WG-3603-08 Perm FT							Earl Johnson Masonry Worker WG-3603-08 Perm FT				
	Leo Chiquito Masonry Worker WG-3603-08 Perm FT											
			James Yazzie Masonry Worker WG-3603-08 Perm FT									
					Lewis Murphy Masonry Worker WG-3603-05 Perm FT							
								Garry Joe Masonry Worker WG-3603-05 Perm FT				
										Harold Suina Masonry Worker WG-3603-08 Perm FT		
El Malpais National Monuments												
	Rory Gauthier Archeologist GS-193-11 Perm FT	Jim Kendrick Archeologist GS-193-11 Perm FT										
		Calvin Chimoni Masonry Worker WG-3603-08 Perm FT										
El Morro National Monuments												
			Debra Popham Archeological Tech. GS-193-09 Perm FT		Melissa Powell Archeologist GS-193-09 Perm FT		Vacant Archeologist Perm FT	Steve Baumann Archeologist GS-193-09 Perm FT				
Fort Union National Monument												
				Vacant Exhibit Specialist GS-1010-09 Perm FT	Linda Richards Exhibit Specialist GS-1010-09 Perm FT			Greg Phillipy Exhibit Specialist GS-1010-09 Perm FT			Sean Habgood Exhibit Specialist GS-1010-09 Perm FT	
							Theodore Garcia Craft Specialist GS-1010-9 Perm FT					

In Memoriam

Brian Culpepper

2010 was a sad one for the cultural resource community with the loss of Vanishing Treasures alumni, Brian Culpepper.

Brian William Culpepper was born in California on February 17, 1963. As an "Airforce brat" he moved around to California, Hawaii, and South Carolina, until his parents settled near Wright Patterson Airforce Base in Ohio so that Brian and his brother Alex could grow up in one place. After high school, Brian enlisted in the army and was a member of the 82nd Airborne Division where he was involved in two combat missions: the Panama invasion and the first Gulf War.

After the army, he moved to Minneapolis where he completed a Bachelors Degree in anthropology (archaeology) at the University of Minnesota. In 1995 he moved to Flagstaff where he completed a Masters Degree in anthropology (archaeology). Brian was especially drawn to Plains archaeology and paleoindian and archaic lithics, but was interested in all aspects of archaeology.

Over the span of his career Brian worked at the Museum of Northern Arizona, for a contract archaeology firm on an excavation in Montana, for the Northern Arizona University, the Kaibab National Forest Tusayan District, the Bureau of Land Management (BLM) out of the Worland, WY district, and Canyon de Chelly National Monument. In 2001, Brian was hired as the first Supervisory Archaeologist at Aztec Ruins National Monument where he was the third person to be hired at Aztec through the Vanishing Treasures Initiative. Brian worked at Aztec from 2001 until 2003, after which he moved to Navajo National Monument, also as Supervisory Archeologist in a VT funded position. In 2008 Brian left the VT program and the National Park Service to take a position with the Bureau of Land Management at Agua Fria National Monument in central Arizona. While at Agua Fria, Brian discovered a Jay point in the field which pushed back the known occupation of the area by several thousand years.



*Brian Culpepper with the red rocks of Navajo National Monument in the background.
Photo: Self-portrait*

At Aztec Ruins, Brian's major accomplishment was to begin building a strong Preservation Division that ultimately evolved into a full-fledged Cultural Resource Division. When he arrived, there were two permanent Vanishing Treasures-funded Masonry Workers and a seasonal Archeologist and Archeology Technician, all supervised by the Chief Ranger. Brian sought funding to hire term employees that would provide continuity in the park's preservation and archeological expertise. This strategy remains central to the Aztec Ruins Cultural Resource Division today. During occasional conversations with Brian after his departure from Aztec Ruins, he expressed satisfaction to hear how the enterprise that he initiated had grown in breadth, size, and staff.

Many of us in the Park Service remember Brian, and his wit and pranks will be remembered by all who knew him. Known as a jokester, even a trickster, even those who never met him have heard stories about him or have encountered his name in one context or another.

Aside from archaeology, Brian was an avid San Francisco 49ers fan and loved all things football, having played the position of linebacker in high school. He also had an amazing aptitude for computers. Brian passed away in November, 2010. He is survived by his mother Jene Ellingson, his brother Alex Culpepper, and three nieces, Claire, Chloe, and Carson Culpepper.

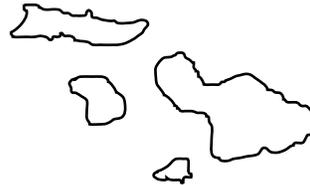
Through his work, Brian has left a lasting legacy at the parks where he worked, and he will be missed.



The Vanishing Treasures logo is based on the logo from the 1920s for the National Park Service Southwest Monuments (right). The saguaro and rattlesnake, along with the mission church at Tumacácori (correctly oriented) have been retained and other representative VT resources are being incorporated.



At press time, the new logo remained a work-in-progress.



Hawaii

1. Pu'ukohola Heiau National Historic Site
2. Kaloko-Honokohau National Historical Park
3. Pu'uhonua o Honaunau National Historical Park
4. Alka Kahakai National Historic Trail (The trail is proposed to run along the coast from Pu'ukohola Heiau to Hawaii Volcanoes National Park)

*If you have questions about the Hawaiian Legacy Program,
please contact Adam Johnson
(Adam_Johnson@nps.gov)*



Hawaiian Legacy Parks

Partners and Cooperators

The Vanishing Treasures Program works cooperatively with many groups both within and outside the National Park Service. These groups include:

Universities:

University of New Mexico, University of Arizona, University of Pennsylvania, University of Vermont, University of Alaska - Fairbanks

Non-profits:

Cornerstones Community Partnerships, Southwest Conservation Corps (Ancestral Lands Division), Student Conservation Association

Public/Private Partnerships:

National Heritage Areas, Landscape Conservation Cooperatives

National Park Service Programs:

Archeology Programs, History Programs, Hawaiian Legacy Program, National Trails Program, Fire Programs, Facility Management

Inter-governmental Cooperators:

Bureau of Land Management, Department of Homeland Security, US Forest Service, State Historic Preservation Offices, Tribal Historic Preservation Offices/ Tribes

Arizona

1. Canyon de Chelly National Monument
2. Casa Grande Ruins National Monument
3. Coronado National Memorial
4. Fort Bowie National Historic Site
5. Grand Canyon National Park
6. Montezuma Castle National Monument
7. Navajo National Monument
8. Organ Pipe Cactus National Monument
9. Petrified Forest National Park
10. Saguaro National Park
11. Tonto National Monument
12. Tumacacori National Historical Park
13. Tuzigoot National Monument
14. Walnut Canyon National Monument
15. Wupatki National Monument

California / Nevada

16. Death Valley National Park
17. Joshua Tree National Park
18. Mojave National Preserve
19. Manzanar National Historic Site

Colorado

20. Colorado National Monument
21. Dinosaur National Monument (Also Utah)
22. Mesa Verde National Park

New Mexico

23. Aztec Ruins National Monument
24. Bandelier National Monument
25. Chaco Culture National Historical Park
26. El Malpais National Monument
27. El Morro National Monument
28. Fort Union National Monument
29. Gila Cliff Dwellings National Monument
30. Pecos National Historical Park
31. Salinas Pueblo Missions National Monument

Texas

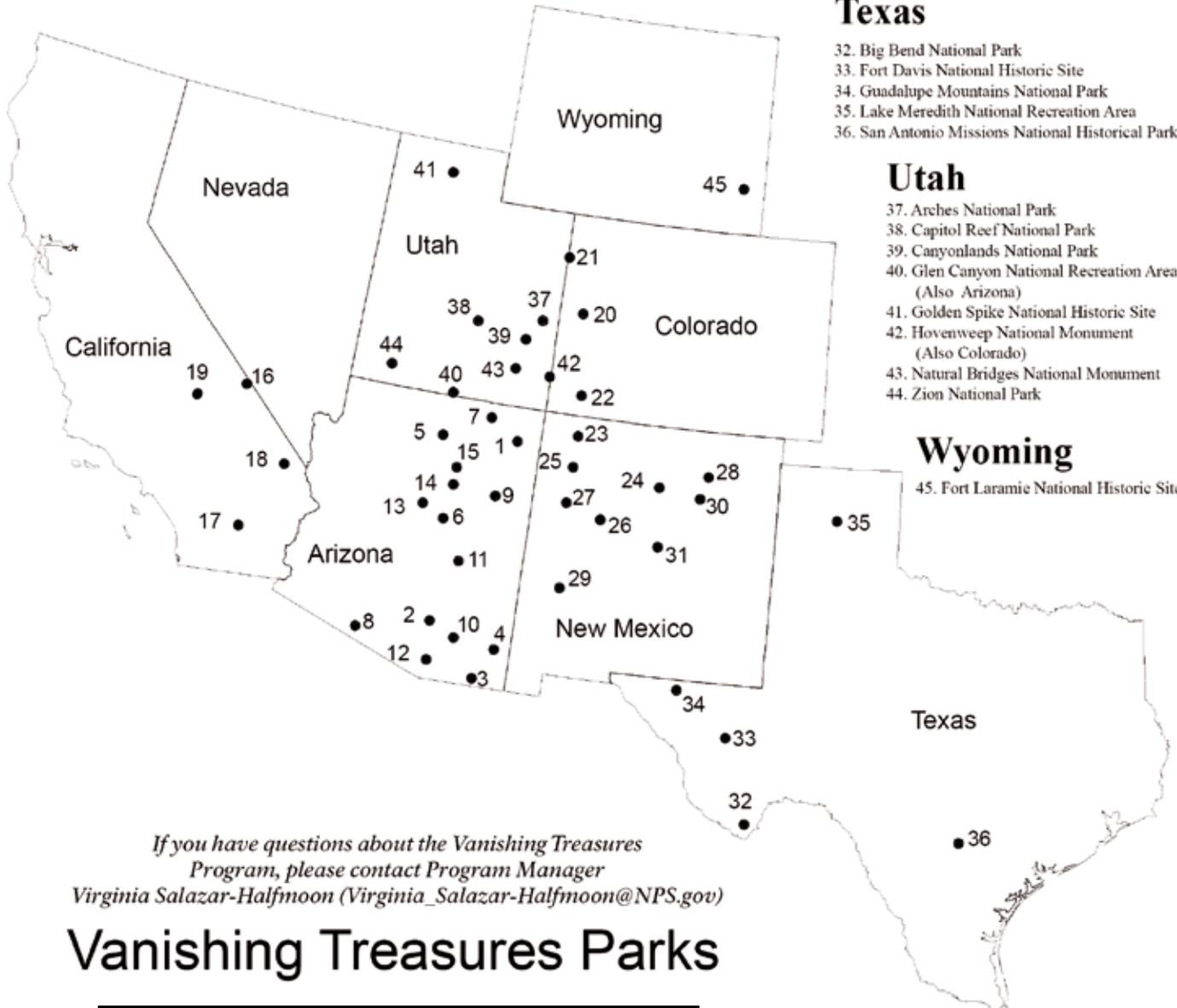
32. Big Bend National Park
33. Fort Davis National Historic Site
34. Guadalupe Mountains National Park
35. Lake Meredith National Recreation Area
36. San Antonio Missions National Historical Park

Utah

37. Arches National Park
38. Capitol Reef National Park
39. Canyonlands National Park
40. Glen Canyon National Recreation Area (Also Arizona)
41. Golden Spike National Historic Site
42. Hovenweep National Monument (Also Colorado)
43. Natural Bridges National Monument
44. Zion National Park

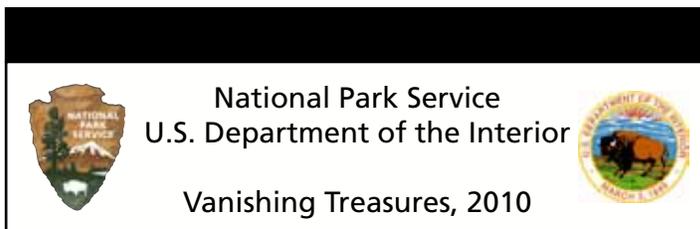
Wyoming

45. Fort Laramie National Historic Site



If you have questions about the Vanishing Treasures Program, please contact Program Manager Virginia Salazar-Halfmoon (Virginia_Salazar-Halfmoon@NPS.gov)

Vanishing Treasures Parks



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