



5

For the Enjoyment of Future Generations

Employees of the National Park Service are well aware of the key management-related provision of the Organic Act of 1916, which concludes, “for the enjoyment of future generations.” The meaning of “enjoyment” may be as nebulous as the future.

Nevertheless, what is certain is that the act provides for the enjoyment of all U.S.

citizens: those who already visit national parks, those who appreciate them from afar, and those who might visit if invited and made to feel welcome. As a result the National Park Service strives to reach underserved segments of the population so they may venture outside the developed urban areas in which they live and experience national parks. Enjoyment includes derived benefits such as scientific

“Only with ... improved understanding of ecosystem structure and functioning can park stewards hope to restore the integrity and resilience of impaired parks, to protect nature unimpaired in parks, to mitigate internal and transboundary threats, or to connect people to their heritage with sufficient impact to engender the public commitment needed to preserve parks unimpaired for the enjoyment of future generations.”

—Gary E. Davis, David M. Graber, and Steven A. Acker

knowledge and inspiration. Thus the National Park Service and its partners are dedicated to implementing programs that will engage the public and increase the relevance of national parks in people’s lives. A 20th-century Congress recognized that ensuring the enjoyment of future generations could only be achieved if the quality of park resources and values is left unimpaired. Today park managers encourage neighbors and citizen scientists to transform their feelings of “caring about” into action of “caring for” parks by participating in volunteer and youth programs and internships. The articles and profiles that comprise this chapter highlight parks as training grounds for tomorrow’s resource managers; public engagement and citizen concern in protecting natural resources; and the virtues held in common by staff and collaborators to monitor, conserve, and improve park values for the future.



Managing natural resources that include humans

A profile of Superintendent Woody Smeck

SANTA MONICA MOUNTAINS NATIONAL RECREATION

Area in California encompasses 153,000 acres (61,943 ha), only 15% of which is owned by the National Park Service (NPS). Fifty percent of the acreage is privately owned and includes 300,000 people who live inside park boundaries. The rest is state and local parks. The landscape in which the park is situated is the coastal sliver of Mediterranean-type ecosystem found in just four other places on the globe. It contains unusually diverse flora and fauna, of which many species are threatened or endangered. In this context, carrying out the National Park Service mission of conserving resources for future generations and providing visitors with an enjoyable experience is a challenge. Woody Smeck received the Director's Superintendent of the Year Award for Natural Resource Stewardship in 2005 for his achievements in this setting. The award was presented in 2006.

Fire management is one important concern that requires collaboration with the several municipalities, landowners, and agencies that are stakeholders in the park. In the hot, dry summer, major fires have occurred as frequently as every 12 years because of human activities. Mediterranean vegetation requires fire; intervals of 85 years are optimal to regenerate the flora. The fire management plan recently devised for Santa Monica Mountains had to address the need to both reestablish a natural fire cycle and protect life and private property from catastrophic fire events. The park, under Woody's leadership, and local fire agencies took the opportunity to bring all the parties together. What emerged was a plan that everyone could accept. At the urban edges within the park, the plan ensures that vegetation will be kept thin, preventing fire from crossing park boundaries. The plan also includes educating the public to adopt fire-safe housing materials and landscaping. However, in the park's core wild areas, a natural fire cycle will be encouraged.

Outreach is important in protecting this special environment, which supports a large and growing human population. Woody was instrumental in the initiation of the California Mediterranean Research Learning Center and is on its board of directors. Current understanding of the science of Mediterranean-type ecology has some gaps. Through the Research Learning Center, scientists are brought together to collaborate and conduct research to fill these gaps. Then the center disseminates

the findings to urban audiences.

Unlike the other NPS Research Learning Centers, this one's focus is outreach. The center's staff goes to schools and other meeting places, presents formal lectures and informal talks, and produces and distributes brochures and audiovisual materials. As Woody says, "If we can get people to care about the environment, they will care for it."

Woody feels that the biggest challenge to the park is habitat fragmentation due to urban sprawl. Urban development sends fingers out into the wildland and disconnects areas of habitat. This can result in local extinctions of animals like bobcats and mountain lions, and even some plants whose seeds fall far from the parent. Fragmentation increases the presence of urban edge effects that harm life in natural areas. Water is polluted by road runoff, metals, and other toxins. Exotic species are introduced; a quarter of the 1,200 plant species at the park are nonnatives and some are problematic invasives. Feral cats, and even crayfish that are not native, escape into the ecosystem. Poison set out for rats builds up in the food chain and kills coyotes that eat the rats and even the mountain lions that eat the coyotes.

Mountain lions are indicator species that signal the health of the ecosystem. At Santa Monica Mountains, staff tracks mountain lions, coyotes, and bobcats using Global Positioning System–tagged radio collars to learn how the animals use their habitat and where they travel between areas of habitat broken up by areas of urban development. Parks like this one, where developed lands and nature are interwoven, represent what newly created national parks will look like in the future. The role of the national parks, Woody feels, is to inspire a stewardship ethic. In the Santa Monica Mountains, that begins with creating a shared responsibility for protecting natural systems so that species like mountain lions can coexist with people. ■

—Betsie Blumberg, Associate Editor, *Natural Resource Year in Review*



Superintendent Woody Smeck.

From the urban wilds to the wilderness of national parks: SAMO Youth program transforms lives and launches careers

By Antonio Solorio and John Tiszler

HABITAT REHABILITATION, NATIVE PLANT NURSERY work, trail construction, horse corral repairs, sign replacement, fence repairs, painting projects: these are all in a day's work for inner-city youths participating in the 2006 SAMO Youth program at Santa Monica Mountains National Recreation Area (California).



SAMO Youth program participants and staff enjoy being together on the last day of the 2006 summer program at Santa Monica Mountains National Recreation Area.

Too many teenagers growing up in the city lack an opportunity to venture outside of the developed urban area in which they live. The chaos and clutter of relentless traffic, sprawling malls, buzzing helicopters, and blaring billboards; the dangers of noxious air pollution and jarring noise pollution; and the stress of too many people and too few trees are all part of their daily urban experience. Even at night, when they head outside to take out the trash or catch a breath of air, light floods the sky to the extent that they can hardly experience enough darkness to look up and enjoy the stars.

The SAMO Youth program is part of an ongoing effort to provide a work experience in an environment different from the familiar sights and sounds of the city—where the asphalt ends and trails begin. Since 2000 the program has been providing summer jobs to college-bound high school students. The program reaches out to youths who are in the process of making career decisions, particularly inner-city students who may not otherwise consider the National Park Service as a career choice.

Each year juniors and seniors from high schools in Los Angeles and Ventura counties are recruited and hired as biological science aides for a six-week hands-on summer job. The group is kept small, with only 10 participants, to ensure a quality experience. These students already have an interest in science and the environment. The program couples their academic preparation with practical experience. The work assignments and projects expose the students to different career fields in a typical park operation. These opportunities are deemed essential in the summer, while the students are still in high school, so that they can ponder their own interests and career possibilities. As the student employees accomplish essential work for the park, they also broaden the relevance of the National Park Service (NPS) through inclusion of greater cultural diversity.

In addition to their resource management and maintenance duties, students are required to provide public interpretation. At the beginning of each summer, the youths receive interpretive training that enables them to give park visitors information relevant to the natural and cultural resources of the area. Three times last summer, the students worked with staff to develop a “hands-on, full of fun, family nature day.” These events were advertised to the public as “We Go Eco,” whereby participants were led by SAMO Youth on a short discovery hike or taught how to make a nature craft.



Emanuel Lara and Elizabeth Alonso, SAMO Youth student employees at Santa Monica Mountains National Recreation Area, perform native plant nursery work for restoration efforts at the park.

“Before my involvement with SAMO Youth, I never had been to the Santa Monica Mountains, Channel Islands, or Sequoia/Kings Canyon National Park. I don’t know if I would have ever experienced a trip to those places if it weren’t for SAMO Youth. This experience has changed my life and I would consider working for the National Park Service in the future because I have seen how the Park Service works and I like it.”

—Oscar Gonzalez, a student at East Los Angeles College working at Yosemite National park for his third summer

In 2006, SAMO Youth participated in numerous complex maintenance, construction, and repair projects, including the maintenance of an ethnobotanic garden at the Native American Culture Center. In addition they conducted reptile and small mammal surveys and stream surveys. They also developed, implemented, and presented group studies addressing wildlife and plant management questions.

In 2006, students also took a weeklong work trip to nearby Channel Islands National Park, where they performed exotic plant removal and habitat restoration in a remote backcountry island setting. During this adventure they were introduced to camping skills, shared their cooking knowledge, and looked out for each other—for some it was their first or longest period away from home and family. After long, hot, and dry workdays, they cooled off in La Cascada, a spring-fed swimming hole on Santa Cruz Island, or set off on a hike. When it was time to return to base, the students shared a warm crackling campfire and enjoyed the magic of stargazing under a dark night sky.

Over the course of the summer, SAMO Youth program participants experience profound transformations. Their physical and mental strength increases, as does their confidence, as a result of working in the outdoors. The youths receive new and specialized training and have an opportunity to put into practice many skills, including problem solving, peer interaction, enhanced communication, and teamwork. Program leaders find that students who join the program after their junior year in high school often return the following summer with confidence and pride, eagerly accepting leadership roles for the incoming juniors.

As students leave the SAMO Youth program and enroll in college, park staff helps place them at other national parks in seasonal jobs. A number of participants have gone on to choose college majors appropriate to environmental careers, and several have obtained jobs in these fields. One SAMO Youth program participant has already become a permanent NPS employee. All the students who participate in the program, regardless of their final career choice, enter the working world with

a greater appreciation of their natural heritage and the role of the National Park Service in its preservation. ■

antonio_solorio@nps.gov

Park Ranger, Santa Monica Mountains National Recreation Area, California

john_tiszler@nps.gov

Plant Ecologist, Santa Monica Mountains National Recreation Area, California



Juan Quezada, SAMO Youth program participant, interprets local wildlife for visitors at Santa Monica Mountains National Recreation Area.

Planting the seeds of the future: Engaging youth in invasive species eradication

By Elli Caldwell and Gary King

CARLSBAD CAVERNS, REDWOOD, SHENANDOAH.

The heritage of these national parks and of many other iconic landscapes across the country is threatened. The danger is not a headline-generating issue such as climate change, pollution, or drought—at least not directly. The culprit is invasive species: marauding weeds that siphon water supplies, choke off native plants, and upset the balance of ecosystems.

For the past several years teams of volunteers from the Student Conservation Association (SCA) have been inventorying, mapping, pulling, cutting, dousing, and uprooting invasive plants in these and other national parks as well as in national wildlife refuges and forests nationwide. And these efforts are now taking root.

The Student Conservation Association has engaged more than 100 college and graduate students in the Invasive Species Project in 65 national parks since its

inception in 2004, including 20 in 2006 alone. The project began as a partnership with the National Park Service's (NPS) Exotic Plant Management Teams, and now also includes the U.S. Fish and Wildlife Service, USDA Forest Service, and Bureau of Land Management. It aims to engage young adults in meaningful service learning opportunities that support resource managers in the restoration of native plant communities. The partnership of SCA and Exotic Plant Management Teams is ongoing, and will continue in 2007.

Linda Drees, NPS Invasive Species Branch chief, says: "The contributions of SCA to our exotic plant management program are invaluable. [SCA volunteers] are a vital component of our strategy, a dependable extension of park resources, and a pleasure to work with."

Department of the Interior Secretary Dirk Kempthorne formally recognized the Invasive Species Project in



Student Conservation Association interns head to work fighting invasive plants at Pictured Rocks National Lakeshore in Michigan.

“[SCA interns] provide excellent service for parks that have limited natural resource staffs.”

September 2006 when he presented SCA with a Take Pride in America Award. “Through your stewardship,” Kempthorne said, “you are creating a lasting legacy.”

To date, SCA volunteers have surveyed more than 26,000 acres (10,520 ha) and treated more than 2,000 acres (800 ha) of infested public land, including 20,000 acres (8,090 ha) surveyed and 1,500 acres (600 ha) treated in the National Park System. Techniques include physical and chemical control involving chain saws, pole saws, brush cutters, loppers, and sprayers. Logging a total of 77,000 service hours, SCA teams have contributed much-needed assistance to public land agencies whose staffs would be unable to complete these projects on their own.

“SCA teams have assisted us over the past two years and have done an outstanding job in removing exotic species,” says Stones River National Battlefield Superintendent Gilbert Backlund. “They cleared 17 acres in our park and have helped protect the integrity of the globally rare cedar glade ecosystem. These teams have been a great success from our point of view. They provide excellent service for parks that have limited natural resource staffs.”

Tangible accomplishments like those at Stones River in Tennessee are bolstered by the underlying objectives that focus on community outreach, public education, and volunteer enrichment. In addition to rehabilitating the land, each team of interns is charged with educating individuals in surrounding communities about how citizens can contribute to and sustain these efforts. Interns have led field trips for school groups, conducted community events, and hosted volunteer service days. In addition, teams have generated media attention that has raised awareness of invasive species and highlighted the commitment that land management agencies are making to combat this ecological threat.

Over the course of their involvement, SCA volunteers have benefited from the hands-on conservation experience gained by working alongside resource management professionals in the field. Many interns, arriving with undergraduate degrees in biology or ecology, leave with the experience necessary to propel their professional careers. As with many SCA alumni, this year’s interns will become land managers of the future. Often the agency supervisors and project managers

with whom these volunteers work become invaluable mentors, references, and teachers.

“I now have a better understanding of the connection between local resources and people of all kinds, including politicians, natural resource managers, and members of the surrounding community,” says project alumna Faith Sternlieb. “I have been able to apply what I learned as a member of the Invasive Species Project to my education, as well as to my professional endeavors.” Faith is working on a master’s degree in agriculture with a focus on international natural resource conservation at Colorado State University in Fort Collins, Colorado.

The Student Conservation Association and the Invasive Species Project have led many other young people on similar paths, and if they eventually lead back to their roots at Carlsbad, Redwood, or Shenandoah or to other public lands with urgent conservation needs, we can be sure that these lands will be in good hands. ■

ecaldwell@thesca.org

Public Relations Associate, Student Conservation Association, Charlestown, New Hampshire

gking@thesca.org

Eastern Partnership Development Director, Student Conservation Association, Charlestown, New Hampshire



At Shenandoah National Park in Virginia, SCA volunteers treat invasive plant species using the foliar spray method, a management technique commonly used when mechanical removal is not practical. The foliar spray method involves spraying targeted plants with a low concentration of herbicide.

Citizen concern protects integrity of Hot Springs

By Stephen Rudd

ON 1 MARCH 2006 A LOCAL ARKANSAS RESIDENT made a phone call that would forever change resource management at Hot Springs National Park. This caller reported that his residential well, almost 5.5 miles (9 km) from the park, was now producing water with temperatures as high as 93°F (34°C). Normal groundwater temperatures in the area average 50°F or 60°F (10°C or 16°C) in March, and no geothermal springs had ever been reported outside the park. Two days after the call, investigators from the U.S. Geological Survey confirmed the presence of geothermal water in this residential well.

Prior to this phone call, scientists and resource managers had believed that all the geothermal springs in the park were fed by a single groundwater reservoir that was structurally and stratigraphically constrained within park boundaries. In addition, most of the surficial recharge area was thought to fall within the confines of the park. Under this scenario the risk of contamination from surface sources was low. The recent discovery of geothermal water in a private well

outside the park now casts considerable doubt on the simplicity of this model.

At the most fundamental level the thermal waters of Hot Springs National Park are valued as a unique and healthy source of drinking water for local and commercial consumption and as a recreational and therapeutic water resource. The park, cultural setting, and local tourism-based economy depend upon these waters. In 1832, 40 years before the establishment of Yellowstone National Park, Congress took action to preserve and protect the springs for the enjoyment of future generations as Hot Springs Reservation, later to become Hot Springs National Park. Originally some 47 individual point sources—part of a remarkably small, oval-shaped belt approximately 1,300 feet (400 m) long and only 300 feet (90 m) wide along the southwestern slope of Hot Springs Mountain—were believed to be the extent of the geothermal springs. Scientists now think that all of the mountains in the park are part of a structurally complex regional arch that hosts the park's geothermal reservoir and extends far beyond the current park boundary to the north and east. The geothermal recharge zone consists of highly deformed and fractured Bigfork chert, Arkansas novaculite, and Hot Springs sandstone, which typify the upland ridges and hilltops.

The new and compelling evidence of the location of the park's recharge zone was the basis for a reevaluation of the potential threat to springs in the park. This new information also casts considerable doubt on the conclusions drawn in an environmental assessment for the construction of a four-lane beltway and its attendant infrastructure, which are poised to traverse the anticlinal complex. Growth in the city of Hot Springs and greater Garland County, which now boasts a population in excess of 95,000, is the impetus for construction. Powerful explosives were used during construction of interchanges of a completed portion of the highway. Though investigators have not yet verified a direct connection with the appearance of thermal water in the residential well, recent highway and interchange construction near the well site provides a high-visibility mark in terms of potential explanation. The proposed footprint for the next phase of construction would employ similar techniques to penetrate the highly resistant novaculite ridges. Explosive charges generate strong shock waves that can seismically



Preserving the water resources in Hot Springs National Park requires citizen involvement, multiagency cooperation, and rethinking a long-held scientific model of surficial recharge. The thermal springs feed the recreational and therapeutic baths of Bathhouse Row in the park. Each of these buildings is on the National Register of Historic Places, and all were successful bathhouses for many decades. The Hale Bathhouse (second from the far end) was built in the late 1800s. In its heyday the Fordyce Bathhouse (in the foreground) was very upscale, catering to well-off clientele; it now serves as the park visitor center. Today visitors primarily drink the clean, healthy waters. With the resurgence of spa destinations, however, the National Park Service plans to reopen and lease a number of additional bathhouses along Bathhouse Row.

propagate to great depths, creating additional fractures or altering existing ones, and ultimately changing the flow dynamics of the park's geothermal "plumbing system." Also, highway construction and associated development would introduce impervious surfaces; remove soil, regolith, and rock strata; and alter vegetation type and density, thereby causing changes in the characteristics of surface recharge and the quality of water that recharges the system.

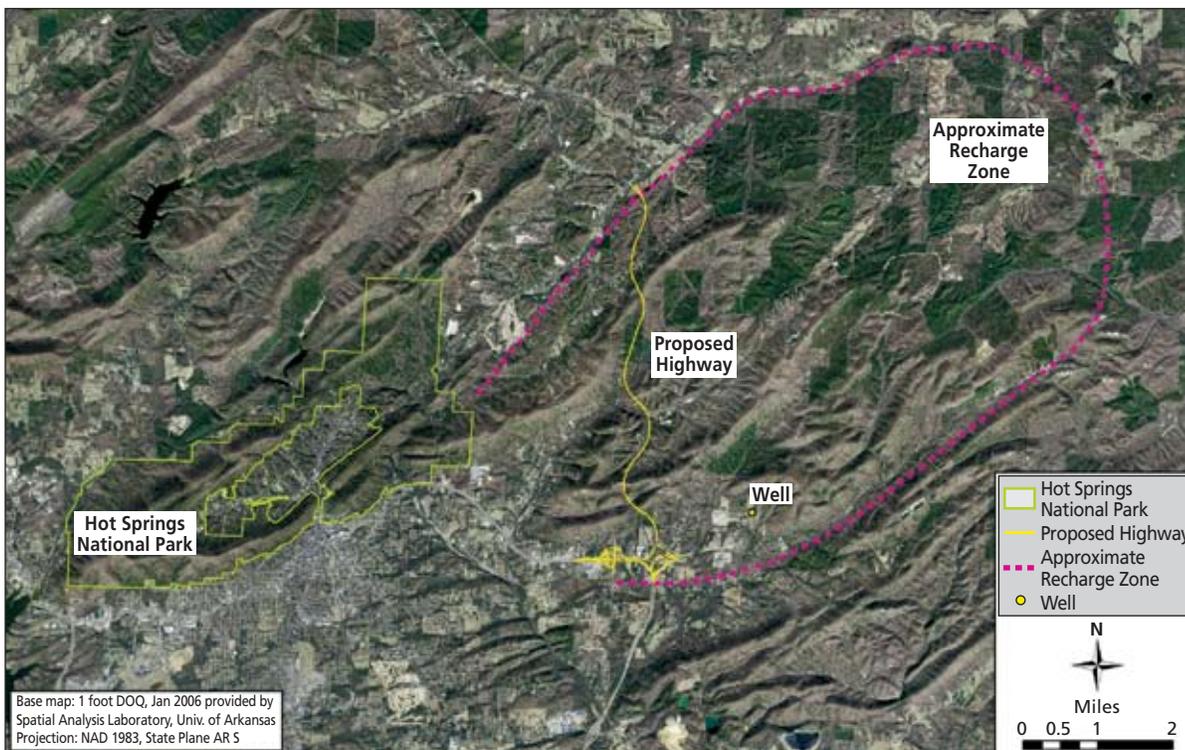
The Arkansas Highway and Transportation Department, Federal Highway Administration, U.S. Geological Survey, and National Park Service have now forged a cooperative partnership striving to avoid impairments to the geothermal springs within the park. The two respective highway departments have agreed to temporarily suspend all construction activities and right-of-way purchases and to fund a three-year research effort to better understand the hydrodynamic mechanisms in the area. The U.S. Geological Survey

The recent discovery of geothermal water in a private well outside the park now casts considerable doubt on the simplicity of this model.

initiated the study at the beginning of fiscal year 2007 with significant NPS input and oversight. The spirit of cooperation among the four agencies has diverted a potentially devastating impact on the primary natural resource of the nation's oldest National Park Service unit. That one fateful call, tendered by a concerned citizen, may well prove to be the key to saving one of America's great treasures. ■

stephen_rudd@nps.gov

Natural Resources Program Manager, Hot Springs National Park, Arkansas



Approximate extent of hydrothermal recharge zone and proposed highway near Hot Springs National Park, Arkansas (February 2007).

Investing in the future with Bandelier birds

By Stephen Fettig

THE FUTURE IS VERY UNCERTAIN: CLIMATE CHANGE and other environmental threats loom as profound challenges for national park preservation. According to Superintendent Darlene Koontz of Bandelier National Monument (New Mexico), cultivating an intellectual and emotional understanding of the value of national parks in our citizenry provides the best hope for addressing an insecure future and for keeping national parks relevant. Hence the Park Flight Migratory Bird Program at Bandelier is making an investment in the future, using close-up experiences with wild birds.

During songbird banding, visitors of all ages learn about bird/habitat relationships, bird migration, the geography of Central America, and research techniques for answering bird-related questions. In 2006 a total of 344 students, 19 teachers, and 33 other adults participated in the field trips, including traditionally underserved students from local Indian pueblos and Latino communities.

Carina Echave

Since the first year of the project in 2004, René and John Echave have involved their daughter Carina in Bandelier's Park Flight program. Carina is homeschooled, so her parents have the flexibility to address her individual interests. On her first visit to the Bandelier banding station, Carina (second grade at the time) was at the banding table asking questions of Ruby Zambrano, an International Volunteers in Parks participant from Panama. Carina would ask, "What is the weight of the bird?" and "How old is the bird?" She would then record the information in her own notebook with plans to explain the details at the dinner table that evening. In her voice you could hear interest in learning about the birds of Bandelier.

In 2005, Carina returned each week and started learning how to hold and release birds safely. In 2006 she started to systematically record information onto her own data forms to use with other homeschool projects. At the end of the 2006 season, Carina and her family made a special trip to Carlsbad Caverns National Park (New Mexico) to help band cave swallows (*Petrochelidon fulva*). Carina helped carry the cave swallows from the large mist net to the recorders for data processing. She also helped disentangle a few of the birds from the net. Now Carina is at the point of being able to show and explain birds to her younger brother, Giovanni, and to other park visitors. She has already expressed interest in learning more advanced skills at Bandelier, such as measuring wings and tails and determining a bird's age by its color and feather patterns. In slow times at the banding station, Carina and Giovanni create drawings that show a deep emotional connection to birds and the landscape. These spontaneous drawings suggest that the Park Flight experience is making lasting memories for Carina, which may translate into a lifelong commitment to conservation and national parks and even influence her choice of a career.



Carina Echave, a homeschooled student visiting Bandelier National Monument, began learning about bird banding as a second grader in 2004. She loves seeing a bird up close and holding it in her hand ("feeling the beat of its tiny heart"). Returning year after year with her family, Carina has become proficient at holding birds and recording technical data.

“Bandelier and its birds will be forever in my heart and mind.”

Mary Ristow

The Park Flight Migratory Bird Program relies heavily on the help of local citizens. Mary Ristow, a Volunteers in Parks participant at Bandelier, has been involved in the banding project since the beginning in 2004; she has become a major contributor of volunteer time and a key citizen scientist in the project. The expectation of setting up and taking songbirds out of the capture nets and the anticipation of intellectual challenges, such as determining the age of birds by primary feature growth bars and technical details of molt sequences, keep Mary looking forward to getting up at 4:30 a.m. and making the 75-minute drive to the banding station. Many times, when bad weather prevents park staff from opening the nets, Mary speaks of missing the birds, the park, and “not getting her emotional batteries recharged for the week.” For Mary the principal motivation for donating hundreds of hours and thousands of miles on her vehicle is caring for and learning about these birds.

The Park Flight international interns are a close second as a motivating force for Mary. Talking with biologists and educators from Panama, Costa Rica, Honduras, Nicaragua, and Guatemala about how birds connect Bandelier and the National Park System to conservation areas in Latin America has sparked a new international interest: Mary has been studying Spanish in order to better work with Bandelier’s international interns. She now talks about traveling to Mexico or Central America, where some of Bandelier’s migratory birds spend half the year, to learn about their wintering grounds. On more than one occasion Mary has commented, “It’s hard to remember back to when Bandelier wasn’t a major part of my life. I would be lost without the birds of Bandelier to fill many of my days each fall. Bandelier and its birds will be forever in my heart and mind.” ■

stephen_fettig@nps.gov

Wildlife Biologist, Bandelier National Monument, New Mexico

On 1 October 2004, Ruby Zambrano, a Park Flight international intern from Panama, bands a gray-headed junco (*Junco hyemalis caniceps*) while Carina Echave takes notes. Park Flight, which works to protect migratory birds in national parks and protected areas throughout the Western Hemisphere, is a partnership among the National Park Service, the University of Arizona, and the National Park Foundation with the support of American Airlines, a “Proud Partner of America’s National Parks.”



Having banded the first sharp-shinned (*Accipiter striatus*) and Cooper’s hawks (*A. cooperii*) of the season made the morning of 8 August 2006 an exciting one for Park Flight volunteers at Bandelier National Monument. Here Mary Ristow, who has been part of the banding crew since 2004, holds a hatch-year Cooper’s hawk just before its release. The brown back features with rusty edges help identify it as a hatch-year bird. The relatively large size and the raised hackles on the back of the neck distinguish this bird from a sharp-shinned hawk.



Monitoring and managing resources in the sea

A profile of Fisheries Biologist Jeff Miller

INVENTORY AND MONITORING NETWORKS OF THE National Park Service are charged with monitoring their parks' resources. For much of the South Florida/Caribbean Network, resource monitoring has to be done under water. "More than half of this planet is under water," says Jeff Miller, "so I have the 'majority' view." Jeff, a fisheries biologist for the network, received the 2006 Director's Award for Professional Excellence in Natural Resources for work performed in 2005 for, among other accomplishments, developing a scientifi-

cally rigorous methodology for monitoring coral reefs. He developed the sonar-based random sample selection protocol for establishing long-term coral reef monitoring sites. This protocol was one of only three that satisfied the rigorous sampling criteria of reviewers for the *Journal of Coral Reefs*, who examined 119 such monitoring techniques from around the world.

The value of this permanent monitoring protocol was aptly demonstrated when high water temperatures



NPS Fisheries Biologist Jeff Miller.

The value of this permanent monitoring protocol was aptly demonstrated when high water temperatures initiated a coral bleaching event in 2005 that was thoroughly documented at Buck Island Reef National Monument and Virgin Islands National Park.

initiated a coral bleaching event in 2005 that was thoroughly documented at Buck Island Reef National Monument and Virgin Islands National Park (see article, page 43). This detailed video record of a bleaching event not only is of great interest to scientists but also suggests that there is a way to manage these events. The data revealed that when the corals were stressed by temperature, disease took advantage and was responsible for almost all the death that occurred. Managers of marine parks cannot turn back record warm water temperatures that may be related to global warming, but research may enable them to control the disease that wreaks destruction under excessively warm conditions.

The enabling legislation for Virgin Islands National Park mandates park protection of the coral reefs. In the 2005 event, 51% of the coral was lost from the study site, about 25 acres (10 ha) of what had been some of the most diverse, complex, and coral-rich reefs in the area, growing since about the time that Christopher Columbus was sailing the Caribbean. “We need to raise the alarm that we are rapidly losing this resource,” Jeff says, “and we need to focus a whole lot of effort to addressing this situation. There are things that we can

do right now to protect the reefs, like control sedimentation, reduce overfishing, eliminate anchor damage, and participate in the public debate. But with bleaching and disease, there is more we need to learn.”

Jeff’s work is used in marine parks throughout the National Park System. He first saw the need for an inexpensive alternative to the sonar-based protocol while working with monitoring programs in other Caribbean countries, and responded by developing a protocol using handheld Global Positioning System (GPS) units that also produce results that meet scientifically rigorous standards. This system is used in U.S. national parks wherever the sonar-based technology is infeasible. His training sessions in dive physics, physiology, and in-water accident response have been filmed and are used throughout the National Park Service.

In addition to tracking the condition of corals, Jeff was involved in developing methodology and surveying large areas of Virgin Islands National Park to map anchorages that are safe for both vessels and resources. To aid local fishers in navigating those waters, he developed a program to teach them the use of GPS so that they can identify park boundaries and no-fishing areas and increase their safety at sea.

Jeff’s work contributes to understanding the marine environment in his network, throughout the National Park Service, and internationally. But he is quick to recognize that he is part of an enormous team effort involving the whole network, the U.S. Geological Survey, and the Student Conservation Association. “When we started monitoring the bleaching event, monitoring quadrupled, and keeping up with that schedule took a whole dedicated team to accomplish.” ■

—Betsie Blumberg, Associate Editor, *Natural Resource Year in Review*

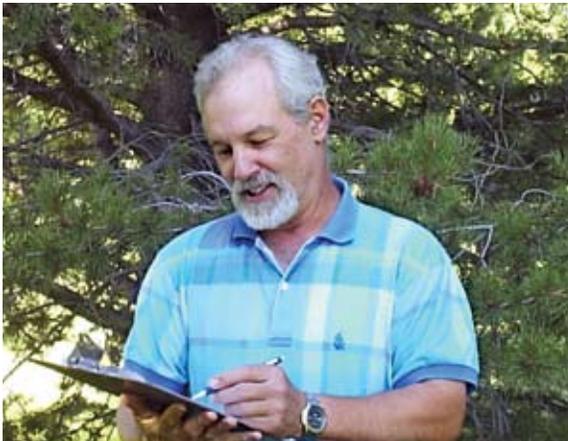
Studying the grizzlies at Yellowstone

A profile of Biologist Charles Schwartz

IN SPRING 2007 THE U.S. FISH AND WILDLIFE SERVICE released the final rule to remove the grizzly bear (*Ursus arctos*) from the endangered species list. The population of grizzlies in and around Yellowstone National Park (Wyoming, Montana, and Idaho) has grown to about 600 from a low of a few hundred in the early 1970s. Recovery reflects the will and efforts of many people; one of them is the leader of the Interagency Grizzly Bear Study Team (IGBST) and recipient of the 2005 Director's Award for Natural Resource Research, Dr. Charles Schwartz of the U.S. Geological Survey. The award was presented in 2006.

The IGBST, established in 1973 and led by Chuck Schwartz since 1998, has been responsible for centralized research and monitoring of the Greater Yellowstone Ecosystem's grizzly bear population. The recovered bear population descends from a small number of bears that survived European settlement of the West and was dependent upon the rich garbage pits of Yellowstone. When the dumps were closed in the 1960s, bears, numbering about 300, became a problem in the park and 229 were killed through management action. A few years later, in 1975, grizzlies were listed as threatened by the U.S. Fish and Wildlife Service. Findings of the IGBST helped establish goals for grizzly bear recovery. A report, "Conservation Strategy for the Grizzly Bear in the Yellowstone Ecosystem," currently guides management of the bears at Yellowstone National Park.

The research involves more than studies of the bears. It includes many plants and animals that share their



Chuck Schwartz of the Interagency Grizzly Bear Study Team.

habitat and whose well-being affects them. Chuck is on the faculty of Montana State University and conducts projects with graduate students. He was aware, for example, that naturally occurring mercury in Yellowstone Lake is taken up by fish, and that when cutthroat trout (*Oncorhynchus clarkii bouvieri*), a key high-protein food for grizzlies, are consumed by bears, mercury is deposited in their fur. Chuck obtained funding to support a student whose research revealed that by analyzing hair for mercury, it was possible to make assessments of how many fish bears ate, and which bears ate them. With these data, investigators can assess the impact of fish loss on grizzly bear demographics. Similarly, he supported a student who discovered a method of quantitatively determining the consumption of whitebark pine (*Pinus albicaulis*) nuts by bears. Such research enables park managers to understand how grizzlies exploit their environment.

Of the IGBST Chuck says: "We work for the resource and our job is science. We learn what we can about what's best for the resource, and we are objective. Our data have been used both by the Fish and Wildlife Service to argue for delisting and by environmental groups that oppose it."

The recovery of the grizzly bear at Yellowstone is one of many efforts in understanding large mammals in which Chuck has been a leader. Other parks that have benefited from his expertise in bears and moose are Grand Teton, Glacier, Kenai Fjords, Katmai, Glacier Bay, and Denali national parks, and other units in Alaska and the Rocky Mountains. He has also participated in projects in Canada, Japan, Pakistan, and Russia and produced many publications, which, among others, can be accessed at the IGBST Web site (<http://nrmsc.usgs.gov/research/igbst-home.htm>). His leadership and innovative approaches are invaluable to managers who need scientific insight into the resources they steward. Chuck is gratified to observe the efforts of the natural resource managers at Yellowstone with whom he has worked for several years. They work hard to keep human food sources away from bears and also to keep people out of bear foraging areas. He says: "This park exemplifies good grizzly management. The staff really does it well." ■

—Betsie Blumberg, Associate Editor, *Natural Resource Year in Review*

Making the most of a small park

A profile of Integrated Resources Program Manager Jason Lott

MANAGERS CAN ACCOMPLISH MUCH MORE BY

partnering with agencies that have missions similar to the park's than they can with only the park's resources. This strategy is particularly important at small national parks. Jason Lott is especially gifted at leveraging a park's resources to take advantage of the assets of partners. He exercised this skill as the first Integrated Resources Program manager at Lyndon B. Johnson National Historical Park (Texas), earning the Trish Patterson–Student Conservation Association Award for Natural Resource Management at a Small Park in 2005. He has since become superintendent at an even smaller park, Casa Grande Ruins National Monument in Arizona.

Jason's work with partners at Lyndon B. Johnson has resulted in productive research on control of exotic grasses, a greatly expanded water quality monitoring program, and the park's membership in the Gulf Coast Exotic Plant Management Team.

In pursuit of the park's vision for prairie restoration, Jason contracted with the Lady Bird Johnson Wildflower Center to develop a prairie management development plan. This relationship grew into a cooperative project in which the park hosted plots for research designed by the Wildflower Center to study the effectiveness of various treatments to control King Ranch bluestem, a widespread invasive nonnative grass species. Balcones Canyonlands National Wildlife Refuge assisted the project by conducting the fire treatments. Research results were used for the park's prairie restoration plan and for projects involving fire management.

Jason enhanced the park's water quality monitoring program, working with the Lower Colorado River Authority (LCRA), by doubling the number of monitoring sites to four, encompassing the park's entire surface watershed. To expand the monitoring objectives, he negotiated an agreement with LCRA to host a Hydromet system, equipment that collects data on water flow, depth, temperature, and speed. He also fostered a partnership with the Texas Council on Environmental Quality to place additional equipment at the Hydromet site that monitors pH, conductivity, and dissolved oxygen. He brought in another partner, the Lyndon B. Johnson State Park and Historic Site, to sponsor one of the new sites. Jason personally trained park personnel to operate the monitoring equipment and ensured that they were certified by the LCRA.



Jason Lott at Casa Grande Ruins National Monument, Arizona, where he is now superintendent.

Limited park funds could not support membership in the Gulf Coast Exotic Plant Management Team, but Jason made this possible by arranging housing for three members of the team. Their activities were a great boon to the prairie restoration program. The local presence of the team members also enabled them to work on projects at neighboring San Antonio Missions National Historical Park.

Jason's accomplishments are felt beyond the nearby park. Results of the King Ranch bluestem research are published and will aid prairie management at many National Park System and other federal land management units as well as on private holdings. Jason was instrumental in the inclusion of the Wildflower Center into the Gulf Coast Cooperative Ecosystem Studies Unit. The water quality monitoring program serves as a model for protocols developed by the Southern Plains Inventory and Monitoring Network.

Along with these and other accomplishments in natural resource management at Lyndon B. Johnson, Jason was responsible for managing the park's cultural resources. "My background is in cultural resources and my knowledge about natural resources was limited when I started at this park," he says. "I really enjoyed learning about natural resources, and when you're having fun, you can get a lot done." ■

—Betsie Blumberg, Associate Editor, *Natural Resource Year in Review*

Park maintenance as natural resource management

A profile of Chief of Maintenance Bruce Hancock

IN OCTOBER 2006, WHITMAN MISSION NATIONAL Historic Site in Washington received three certificates of recognition from the regional U.S. Environmental Protection Agency's Champions of Environmental Leadership and Green Government Innovation Recognition Program. This program recognizes federal employees who are "showing leadership by going above and beyond the call of duty in working to improve the environment and protect natural resources." That definition perfectly suits Bruce Hancock, chief of maintenance at the site and recipient of the Director's Award for Excellence in Natural Resource Stewardship through Maintenance. Bruce has been with the National Park Service for 24 years and not only has accepted its mission to protect natural and cultural resources for future generations, but also practices park maintenance as another aspect of resource management.



Bruce Hancock with three sustainable park features: a maintenance vehicle powered by B20 biodiesel, an off-grid solar light, and a park sign made from recycled plastic.

One resource that he conserves is energy. Under Bruce's guidance, Whitman Mission National Historic Site installed a grid-tied photovoltaic power plant on the roof of the park maintenance building. The 60-panel system has the potential to generate 17,975 kilowatt-hours of renewable energy per year. It has reduced the park's electric bill by 30% annually. When this solar system is generating electricity, the excess is fed back into the Pacific Power and Light utility grid, thus reversing the electric meter and offsetting the park's electrical use by that amount.

Another sustainable practice Bruce leads is the park's use of biodiesel. Because the park does not have its own fleet of vehicles, heating oil was the place to start working with renewable fuel. Bruce and his team decided to test a B20 blend, consisting of 20% soybean oil and 80% diesel fuel, to heat the maintenance shop. B20 was not available locally; however, pure B100 soybean oil was available from a supplier 250 miles (403 km) away. The team brought a load of this back to the park and blended their own. It worked so well that

they expanded its use to heating the 6,800-square-foot (632 sq m) visitor center and all diesel-powered equipment parkwide. As a result, annual fuel costs have been reduced by 10%, and emissions of carbon dioxide, nitrogen oxide, sulfur dioxide, and particulate matter released into the environment have also been decreased. Ultimately, Bruce encouraged a local fuel supplier to carry biodiesel.

Under Bruce's management, the park's water consumption was reduced by 25% in an area with a limited water supply. When the park residences' heating and cooling system needed replacing, Bruce reviewed many alternatives and settled on a high-efficiency propane system that saved 600,000 gallons (2.3 million liters) of water annually. He also retrofitted park restroom facilities with low-flow and waterless flushing fixtures. Landscaping features native, drought-resistant plants irrigated using timers set to minimize water loss through evaporation.

These are only some examples of the green practices employed at the national historic site. The park has become a showcase for sustainable practices in daily operations. In rural eastern Washington, Bruce frequently had to educate contractors and suppliers about conservation technologies. Seeing these technologies in operation, local contractors, private individuals, and city and county government departments have requested assistance in implementing similar measures.

Bruce is stewarding resources in all of his maintenance operations. His team also often performs natural resource conservation work because the park does not have a natural resource staff. At Whitman Mission National Historic Site maintenance and natural resource management are complementary, which the name of this director's award suggests. "We're all here to protect natural and cultural resources for future generations," he says. "That idea was instilled in me long ago when I first started working for the National Park Service." ■

—Betsie Blumberg, Associate Editor, *Natural Resource Year in Review*

Protecting air, aquatic, and wilderness resources at Mount Rainier

A profile of Natural Resource Manager Barbara Samora

IN 2005 THE DIRECTOR'S AWARD FOR NATURAL

Resource Management went to Barbara Samora, who came to Mount Rainier National Park (Washington) in 1988. Barbara manages three programs at the park: the Aquatic Program, the Atmospheric Program, and the Social Science Program. These seemingly disparate areas of expertise grew, in a logical sequence, out of her training with the National Park Service (NPS) and her experience at Mount Rainier.

Barbara participated in the first natural resources training program offered by the National Park Service, from 1982 to 1984. When she came to Mount Rainier from Cape Cod National Seashore, her position was Wilderness and Aquatic Program coordinator. Through her wilderness responsibilities, she encountered issues of visitor experience versus visitor impacts on natural resources. Her aquatic responsibilities led her to focus on one of the threats to the park's lakes: air pollution.

Mount Rainier's lakes are affected by acidic compounds of sulfur and nitrogen from atmospheric sources. These compounds are harmful to aquatic life such as plankton, macroinvertebrates, and amphibians. Many of the lakes have low acid-neutralizing capacity, so their ecosystems are very vulnerable to acid deposition, including compounds that enter the lakes through snowmelt. To better understand the fluctuating levels of these deposits and to relate that information to the condition of the living systems in the water, Barbara develops and oversees several projects that involve compiling data on physical, chemical, and biological variables for park lakes. The condition of the lakes is a "vital sign" of ecological health, so designated by the North Coast and Cascades Inventory and Monitoring Network, which Barbara advises.

Having already concerned herself with air quality as it relates to water quality, Barbara became manager of the park's Atmospheric Program when another staff member retired. An early challenge was to reduce atmospheric sulfur coming from several industrial sources, the major one being a coal-fired power plant in Centralia, Washington. The park worked with staff from the NPS Air Resources Division and the USDA Forest Service, using data collected from the lakes to make the case that air pollution was threatening water quality as well as visibility. In the late 1990s, the power

plant reduced its discharge of contaminants by 70%, and this improvement is beginning to be reflected in the air quality monitoring data for the park.

A committed scientist, Barbara understands what information needs to be gathered and designs and supervises multiple projects and personnel. Beyond Mount Rainier, she is an important contributor to such regional programs as the Western Airborne Contaminants Assessment Project and the North Coast and Cascades Inventory and Monitoring Network, and works with the NPS Air Resources and Water Resources Divisions, as well as with many federal, state, and academic partners.

Finally, with her social scientist's hat on, Barbara is currently coordinating the Visitor Experience and Resource Protection (VERP) planning for the park. When she came to Mount Rainier, she was assigned to write the park's first wilderness plan, which included addressing visitor experiences and recreational use effects on natural resources. Barbara is now working with other park staff to update the 1989 plan to incorporate an evaluation of current conditions impacted by recreational use, such as vegetation trampling, soil erosion, wildlife habituation, and water quality. With these impacts identified and standards for the acceptable conditions of the resources defined, the park can better manage recreational use and natural resources. The VERP framework will include all zones of the park. The scope of this project is unique, says Barbara. "It's never been applied on the scale of an entire park." ■

—Betsie Blumberg, Associate Editor, *Natural Resource Year in Review*



Natural Resource Manager Barbara Samora.