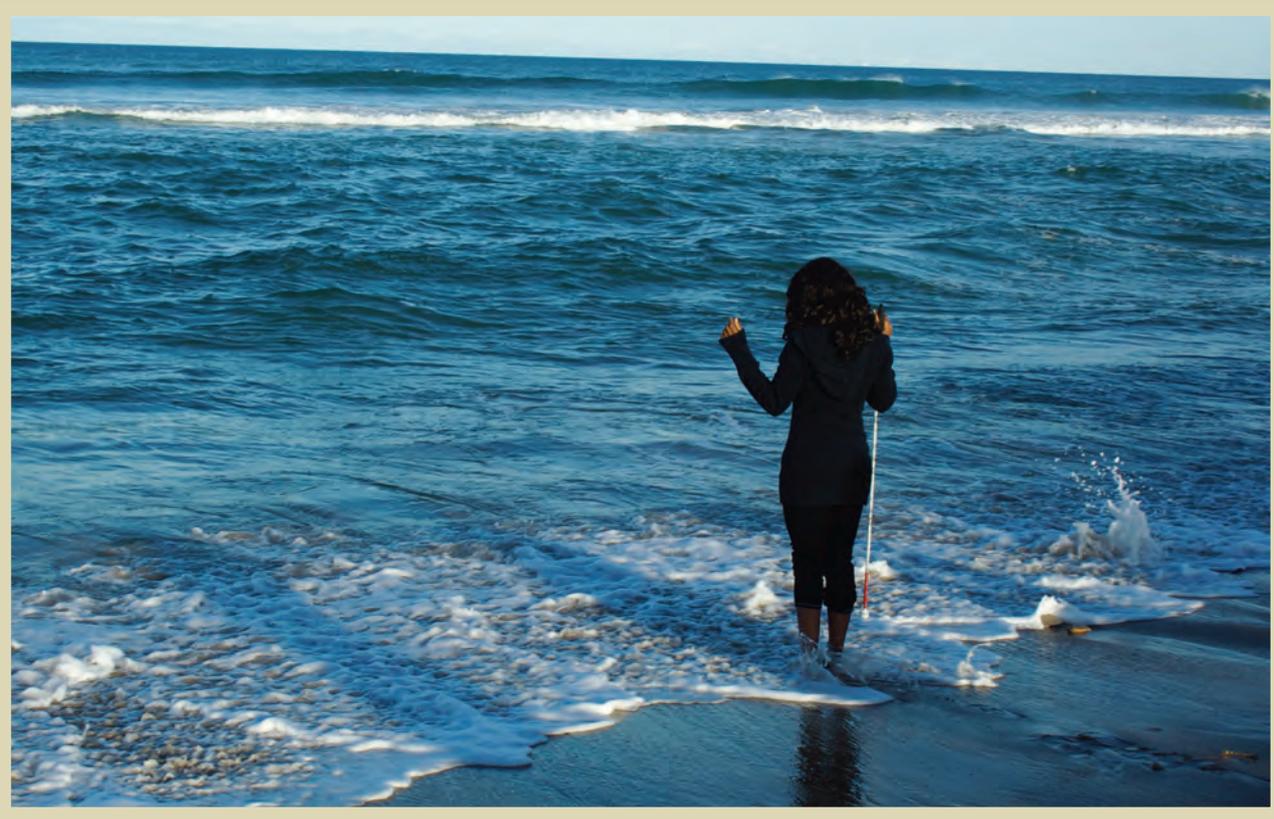




# *Science and Management*



At a retreat at Cape Cod National Seashore, a visually impaired young woman wades into the surf. See story, page 3. Photo courtesy Global Explorers.

Spring 2012

## *Connecting People to Parks*

Special Issue: Call to Action at Work

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# Connecting People to Parks

This issue of Science and Management has a somewhat different emphasis from earlier ones. The publication was created to provide natural resource staff in the Northeast Region with an opportunity to share the science and the stewardship challenges and strategies of the parks that they manage. This year, the National Park Service's 2012 Call to Action places emphasis on another aspect of their role: "Connecting People to Parks." Outreach has long been given a high priority in our region, and in this issue we highlight several outstanding programs already in place, programs that bring schoolchildren into parks to find not only the joys of the natural landscape, but the challenges of preserving it; that bring adults into the woods and fields and beaches as citizen scientists glimpsing wildlife as they collect data; and that bring people with disabilities into the parks making these special landscapes accessible to them.

Our region is home to Acadia National Park's Schoodic Education and Research Center (SERC) and the SERC Institute whose mission is "to guide present and future generations to greater understanding and respect for nature by providing research and learning opportunities... and innovative partnership programs." SERC is part of this issue's story about a high school class in Vermont that studied mercury deposition at Marsh-Billings-Rockefeller National Historical Park. A network of partnerships made this introduction to science in the field and laboratory a valuable experience for ninth graders. Similarly, programs developed by the Northeast Temperate Inventory and Monitoring Network bring schoolchildren into the parks to monitor salamanders and to learn the tracks and signs of wildlife.

Hundreds of volunteers, young and old, of the diverse races and ethnicities that reflect the population of New York City, have come to plant trees at Gateway National Recreation Area to restore degraded fields and to take pride in their role in ameliorating that landscape. The Mid-Atlantic Inventory and Monitoring Network invites birders to monitor breeding birds; many of these volunteers are involved in other activities at the parks for which they feel a strong connection. Volunteers also learn about and monitor horseshoe crabs at Fire Island National Seashore, doing science while they enjoy being out on the beach at night. Finally, many young volunteers and interns, like those featured in our stories from Saratoga National Historical Park and Richmond National Battlefield Park, who spend a season working in the parks, decide, as a result of that experience, to enter careers in natural science research or management.

The stories presented here represent a small sample of programs of the Northeast Region's NPS units that bring local communities into the parks for recreation, education, and an appreciation of the landscape and its history. With the impetus of the 2012 Call to Action, the region will see even more energy and creativity directed to the mission of "Connecting People to Parks."

# More to Cape Cod than Meets the Eye

Cape Cod National Seashore, through its Parks as Classroom program and Overnight program, seeks out and engages groups with disabilities. Last September, The Massachusetts Commission for the Blind, in partnership with non-profit organization Global Explorers, held an intensive weekend retreat for seven lucky participants, ages 18-24, at Cape Cod National Seashore (NS).

Through a partnership with Global Explorers, the National Park Service Natural Sounds and Night Skies Division is educating a diverse group of youth and educators nationwide in the management and understanding of soundscapes. Global Explorers is dedicated to inspiring responsible global citizenship by providing travel experiences to students and educators of all abilities and backgrounds, enabling young people to experience interaction with the natural world that might otherwise be unavailable to them. The seven visually impaired participants at this retreat were assisted by staff of Global Explorers, teachers of the visually impaired from the University of Massachusetts, and Cape Cod NS education specialist Barbara Dougan, who planned the activities, and ranger Dennis O'Neil.

The group stayed at a former Coast Guard station that overlooks the ocean and a large salt marsh system. Barbara



Sand castles are not only fun to build but fun to use to demonstrate how loose sand is easily washed away. Photo courtesy Global Explorers.

altered by sea level rise, and hands-on, feet-on, discovery of coastal vulnerability factors like sediment type, slope, and elevation. Although this group cannot see loose sand well, they could feel it with their fingers and sense it with their feet. They could also sense the change in slope and knew how many steps it took them to walk down from the higher terrain onto the lower beach elevation. They could hear the energy of the waves as sand and pebbles are knocked about and roll up and over each other with the incoming and retreat of each wave. They discussed the question of whether humans were influencing climate, but all agreed that climate change is happening and that this field trip was helping them learn more about potential responses to sea level rise.



Dougan and Dennis O'Neil spent one full day with the group to explore coastal vulnerability factors and share results of Cape Cod NS's Inventory and Monitoring studies and protocols.

The day was filled with sounds of movement and change on the high energy beaches, discussion about climate change impacts on coastal environments, walking shoreline edges that may be

With hands-on exploration of shell shapes, participants consider how shape contributes to animal survival in high energy surf zones. Photos: Global Explorers.

Participants also got their hands and feet wet in the salt marsh. To answer the question "How will climate change and sea level rise affect the salt marsh?," participants did a hands-on inventory of marsh plants and animals. Using dip nets they sampled for fish, crabs, and snails. They used clam rakes to dig for benthic organisms like worms and clams. They followed a transect through the salt marsh grass fringe to learn about plant zonation in response to tide



levels and predicted changes to the zone locations in response to sea level rise. They felt the plants' size, shape, and seed heads to distinguish species in order to determine changes in zones.

Other activities included listening to a talk by Bill Barkeley, a deaf-blind outdoor adventurer; riding a tandem bike; and, on the final evening, sitting round the campfire making music and roasting marshmallows.

For one participant the weekend was her first time to visit a beach and for many it was their first time holding fish, crabs, and snails in their hands. All learned something new about beaches, dunes, and salt marshes, and about national park science and park goals for managing resources and educating the public. The park staff hopes the experience of smelling salt air, hearing waves crash against the shoreline, and walking in squishy marsh peat will be permanent memories for these young people and inspire return trips and possibly careers in natural science and resource management.

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## High School Students Monitor Mercury

*Joan Haley, park education coordinator, in partnership with Shelburne Farms and Marsh-Billings-Rockefeller National Historical Park*

Mercury can conjure up many images: the messenger god with winged feet, the smallest planet in the solar system, the only metal that is liquid at standard conditions for temperature and pressure. For Marsh-Billings-Rockefeller National Historical Park (NHP) and Woodstock Union High School (HS) this unique element has provided an opportunity for high school students to explore the park, engage in inquiry-based learning, partner with high-level research scientists, and take a leadership role in improving community health.

In the spring of 2010, Dr. Sarah Nelson, from the Acadia Partners for Science and Learning at the Schoodic Learning Center at Acadia National Park, invited Northeast Region parks to help pilot mercury monitoring protocols that had been developed for high schools in Maine. Fortunately for Marsh-Billings-Rockefeller NHP, Woodstock Union HS science department chair, Jennifer Stainton, had just started working with the park through a National Park Foundation (NPF) Park Steward Grant, which provides support to connect high school teachers and students with national parks through curriculum and service-learning projects. Carefully looking for an appropriate integrating theme for her ninth grade environmental science course to illustrate key scientific con-

cepts and processes, Ms. Stainton immediately saw the potential in Dr. Nelson's monitoring program and all the planets (including Mercury!) started to align.

Ms. Stainton and her class are part of Marsh-Billings-Rockefeller NHP's larger park research program, which invites local teachers to submit proposals to use the park as their "learning laboratory." In its fourth year, the park has worked with over 30 teachers and over 700 students to explore such diverse topics as landscape change, art in the conservation movement, salamander monitoring, and forest ecosystems in the park. The park partners with the teachers and resource experts to co-develop curriculum and co-facilitate park visits so that students gain a deeper understanding of the park's natural and cultural resources and discover the connection between classroom learning and real-world application. Students are further engaged and empowered through service-learning activities and by sharing their research findings with community members.

Ms. Stainton used her NPF-funded summer internship with the park to plan her curriculum, research mercury, and become familiar with the monitoring protocols. She also initiated collaboration with additional partners such

as Dr. Celia Chen from Dartmouth College, a nationally recognized expert in mercury monitoring, and Stevens High School Teacher Erica Ferland, whose class would also be participating in the mercury monitoring program in New Hampshire. Partnerships with Dartmouth, the Schoodic Center, and Marsh-Billings-Rockefeller NHP helped students learn directly from experts in the field and demonstrate that they were not working in isolation. It also provided the opportunity to engage in authentic research on a topic that mattered to the world outside their classroom.

To provide additional context and relevance for the project, Ms. Stainton had her students begin their research by visiting the park to learn about the general environmental factors affecting their primary research site, a large scenic pond and popular park destination called the "Pogue." Chief of interpretation, Tim Maguire, also led the students on a tour to highlight the Marsh, Billings, and Rockefeller families' important roles in the conservation movement, helping them to see how their work could build upon this legacy of stewardship.

One of the greatest challenges for the students was to develop testable questions about mercury at the park. Ms. Stainton pushed them to think crit-



Woodstock Union High School student examining specimens from his dip net. Photo: Kathleen Robbins.

ically about what they wanted to know and how they would collect and analyze data to test their hypotheses. Fortunately, Dartmouth graduate student Bob Garr was often in the classroom helping the students design their research. Ms. Stainton notes that “His help was key in the completion of this project,” adding, “My students loved having him in my class!”

During the students’ second visit to the park, they collected dragonfly nymphs, leaf litter, and soil from the Pogue. They also collected hair samples from students and willing community members to compare the mercury levels in humans as well. The samples were then sent off to Dartmouth College where they were freeze-dried, digested in acid, nebulized, and analyzed by mass spectroscopy in the Trace Element Analysis Laboratory. Once the results were received, students used the data to determine if their hypotheses were correct.

Student Oliver Kaija’s hypothesis was that the mercury levels, through bioaccumulation, would increase from leaf litter to soil, to dragon fly larvae, to human hair. “Our hypothesis was not completely supported,” he reflected. It turns out there was more mercury in the soil than his team expected, but he noted that they only had three soil collection sites and more would likely have led to more concrete averages. “I really liked this project,” Kaija explains

adding, “It was nice to see it all come together. We got the entire picture of the scientific method.”

Elizabeth Kamb studied mercury levels in humans by analyzing human hair samples. “Our hypothesis was that the mercury level was different in omnivores vs. vegetarians. We thought it would be greater in omnivores.” While they essentially proved their hypothesis, she also noted that the sample size of just two omnivores and one vegetarian was really too small. Overall she greatly enjoyed the project, “It inspired the science in me.”

There was much excitement in the air as Ms. Stainton’s class prepared for their big night at Dartmouth’s Hopkins Center to share their research findings. The students, knowing that some VIPs would be at the event, wanted to make sure they thoroughly understood their research so that they could answer any hard-hitting questions that might come their way from experts in the field. Although the Center was filled to capacity with a wide variety of people (e.g., Dartmouth research scientists, representatives from Acadia NP, Marsh-Billings-Rockefeller NHP and the National Park Foundation, school district superintendents, principals, teachers, and parents), the students firmly held

Teacher and students from Sumner High School, Sullivan, Maine, and research scientist Sarah Nelson (center) checking the catch and removing a juvenile American eel from the net at General Cobb Stream, Franklin, Maine. Photo courtesy SERC Institute.



the spotlight with their palpable enthusiasm and professional poster presentations. Many participants noted that they were grateful to learn about mercury and its potential impact on their health and the environment.

Later that spring, four of the students went on to win state science and math competitions. Although the students did not find significantly high levels of mercury in the park, they agreed that it was important to continue the monitoring and began advising the eighth graders on possible hypotheses they might want to investigate for next year's work, emphasizing the use of greater sample sizes and sharing other lessons learned.

Armed with this information, the current freshmen have been building on the findings of last year's class and exploring new hypotheses. The project has expanded to include more teachers at Woodstock and Claremont High Schools, as well as Saint-Gaudens National Historical Site and the Vermont Institute of Natural Science. At a recent meeting with Vermont Senator Bernie Sanders, the current ninth grade students informed him of their work and invited him to their poster presentation at Dartmouth on February 15. Through these efforts and others in the mercury monitoring program, more data are being collected and the word is spreading about this important work. The messenger god would be proud.

## Million Trees Program Partnership at Gateway

*Doug Adamo, chief, Division of Natural Resources, Gateway National Recreation Area*

A joint effort to restore upland vegetative communities that are severely impacted by invasive plant species has developed into a well-known stewardship opportunity for all ages and ethnicities of volunteers. The partnership between the Natural Resource Management Division of Gateway National Recreation Area (NRA) and the New York City (NYC) Department of Parks and Recreation Natural Resource Group has fostered natural resource stewardship through the city's Million Tree Program. The native tree and shrub planting projects at Floyd Bennett Field of Gateway NRA's Jamaica Bay Unit have attracted volunteers from a variety of groups, including Girl Scouts, Boy Scouts, cheerleaders, sports teams, urban conservationists, corporations, and many more. Approximately



2,500 native trees and shrubs ready for planting at the 2.5 acre site at Floyd Bennett Field. NPS photo.



New York City Department of Parks and Recreation staff coordinating volunteer tree planters at Floyd Bennett Field, fall 2010. NPS photo.



Above: Following planting instruction, volunteers begin work at Floyd Bennett Field, October 2010.

Below: Nearly completed 1.5 acre planting at Floyd Bennett Field. NPS photos.



400 volunteers contributed their time and effort to plant within four restoration sites over the past three years. Mostly young people within the 12 to 30 age range, but also volunteers of all ages, from 6 to 75, and representing the wide spectrum of diverse ethnicity that comprises the population of New York City, have participated. They learn how to plant the native trees and shrubs (before actual planting), as well as why it is important to restore vegetative communities for habitat value and ecosystem function. The effort is expected to continue through the National Park Service's 100th anniversary in 2016.

Since 2008, four areas of Gateway NRA's Floyd Bennett Field have been replanted with over 5,500 native trees and shrubs through this partnership between NYC, local volunteers, and the National Park Service (NPS). The restoration of native plant communities is a high priority for Gateway NRA, with an estimated 50 percent of the park's uplands infested with non-native invasive plant species. The northern portion (approximately 125 acres) of Floyd Bennett Field contains some of the highest concentrations of non-native plant communities in the park. Therefore, the park and NYC staffs identified this location as a primary target area for transforming non-native invasive-plant dominated communities into a healthy native vegetative community that will be representative of an undisturbed mid-Atlantic coastal upland ecosystem.

Many other target areas, similar in condition to that of Floyd Bennett Field, have been identified through the park's draft Invasive Vegetation Management Plan. As the city and the park continue this long-term partnership, it is estimated that five or six additional projects will be completed by 2016. This translates to the involvement of an estimated total of 1,500 volunteers that will be critical to achieving the goals of restoring nearly half of Gateway NRA's 2,500 acres of uplands and freshwater wetlands that are currently degraded (at various levels) by non-native invasive vegetation. Both NPS and NYC staffs are enthusiastic and encouraged by the willingness, hard work, commitment, and inquisitive nature of the volunteers. This effort is also a learning experience for the agency staffs working with the volunteers in that many questions require light research in order to convey facts accurately. To enhance the educational value of the restoration effort, the Natural Resource Management Division at Gateway NRA plans to install interpretive wayside exhibits.

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# The Making of Citizen Scientists

In the summer of 2011, a team of two 17-year old students funded by the Youth Conservation Corps, and an intern funded through the Student Conservation Association inventoried a target list of non-native invasive plants at Saratoga National Historical Park (NHP). The intern, Joe Vuchak, tells his story at right.

The NPS Northeast Exotic Plant Management Team (EPMT) trained this seasonal team in the use of GPS units, and in conducting a systematic plant survey. The new team, led by the park's biological science technician Linda White, became adept at identifying 17 of the most problematic invasive plants at the park. They also learned about the impacts of invasive plants on natural resources, seeing the evidence first-hand. Before they left for school, the students compiled the results of their inventory and, with the help of Joe Vuchak, submitted papers in scientific-report format, another new learning experience. Joe Vuchak, who stayed on for a couple of months after the summer, produced a final report of the inventory, including maps that he created with assistance from the EPMT staff.

One of the teens, Patrick Coppens, was very interested in environmental science, which made this summer job a perfect fit for him. He had applied for early admission to the State University of New York's College of Environmental Science and Forestry, and Linda White provided a letter of recommendation based on his performance on the project. She recently got an email saying " I GOT IN!!!!!! I still can't believe it! I just wanted to say thank you again for everything you've done. I'm not sure how possible this would have been without your help, so thank you again!.... This is so perfect! This is honestly a dream come true."

Betsy Lyman, liaison for the Northeast EPMT, says that "...training and putting these two teens and the intern out in the field to do critical natural resource work has been an amazing boon for Saratoga NHP and us. Plus we know that the teens and the intern got a great deal out of the project and were very glad they got involved (we are too)." The results of the team's work will be used in the development of a new invasive plant management plan for the park.

## The Intern's Tale

I guess my situation was similar to many people's in today's economy: I was unemployed and hadn't received a response from an employer in quite some time. I knew that at 30 years old with a multitude of loans (including college and transportation) I had better do something to improve my financial situation or I was going to be one of those adults moving back with their parents. After an extensive search of employment in my area of northern Arizona, I realized I needed to expand my search to other areas of the country and possibly consider an internship. While browsing the internet I came upon a site for the Student Conservation Association, which offered natural resource internships through government agencies such as the National Park Service. My first impression was that the program looked to be oriented to the young: high school students and recent graduates

looking for a summer job. Discouraged, I did some further investigation and found that they also had a need for experienced individuals to lead the younger volunteers through the field season. I decided to give it a try.

The Student Conservation Association, or SCA, referred me to Saratoga National Historical Park in Stillwater, New York. It turns out the park was having an issue with the spread of invasive plants and needed someone to conduct an inventory of the problem. With no experience conducting plant inventories, no knowledge of what an "invasive plant" was, and major concern over the fact the park was 2,000 miles away from my home, I was a little unsure of the proposal. After a review of the job and a discussion with Betsy Lyman of the Northeast Exotic Plant Management Team, I realized that this might work and, so, off I went.

When I arrived at the park and got a tour by the staff biology technician, I was instantly surprised by how widespread the invasive plant problem was. I was expecting a few errant plants but nothing at the level I witnessed. There were honeysuckle (*Lonicera* spp.) and common buckthorn (*Rhamnus cathartica*) plants all throughout the park, almost interlocked along the entire tour road. When



Intern Joe Vuchak. Phot: courtesy J. Vuchak.

you ventured deeper into the woods the honeysuckle and buckthorn dissipated but then the multiflora rose (*Rosa multiflora*) and barberry (*Berberis thunbergii*) would take over. I knew this was going to be an extensive project.

The project consisted of three months of inventory using the assistance of two Youth Conservation Corps members to inventory a majority of the park. After this was complete we were expected to create maps and write an assessment which the park would use for their treatment recommendations. Overall, the inventory went well; 200 acres is a lot of area to cover in such a short amount of time, but we were able to get it all done. The excessive amount of invasive plants was staggering and it seemed like we had our GPS units recording the whole time. In all, we

recorded 17 invasive species: 9 woody and 8 herbaceous. The results of the inventory proved the suspicion that the invasive plants are spreading throughout the park. It is apparent that the park will need to focus on invasive plant removal to try to stem the tide in the future.

Now that I am back home in Arizona and have had time to reflect on my experience, I am happy that I decided to volunteer my services. The area was beautiful, the significance of the Saratoga battle in the Revolutionary War was fascinating, and the knowledge I gained in biology will likely help me with my job search. I guess you can say that the experience changed me: I cherish the friendships I made at the park and I still can't drive to the store without scanning the side of the road for invasive plants.

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## Small Parks, Big Experience

*Kristen Gounaris Allen, chief of natural and cultural resources, Richmond National Battlefield Park and Maggie L. Walker National Historic Site*

To an average college student looking for an internship with the National Park Service, the larger parks are no doubt what come to mind; however, smaller parks, such as Richmond National Battlefield Park (NBP), tend to have small resource management staffs with a large diversity of projects to oversee. Although these parks can have the same number of issues and projects as larger parks, they are often on a smaller scale. As a result, a significant percentage of the work can be accomplished each year by a few three-to-four month interns. At the same time, these parks have a unique opportunity to provide interns with a sampling of the full range of resource management projects and issues.

Richmond NBP has hosted four Student Conservation Association interns per year since 2003. The park funds these internships primarily through Public Land Corp grants, a program intended to allow land management agencies to provide youths with work experience while chipping away at their maintenance backlogs. At Richmond NBP, the funding

is then obligated to the Student Conservation Association (SCA), a non-profit youth organization that recruits suited applicants and coordinates travel and living stipends for successful interns. For most interns, these positions provide their first post-college

work experience, and within a single season include vegetative sampling, exotics inventory and treatment, trail work, macroinvertebrate sampling in park streams, native grass planting, meadow bird monitoring, reconnaissance for reptiles and amphibians, and



SCA Interns Karen Rice and Mikaela Boley collect a benthic macroinvertebrate sample at the Drewry's Bluff unit of Richmond BBP. NPS photo.



Left: SCA intern Jessie Howington conducts a spring beaver survey at the Malvern Hill unit. NPS photo.

Below: Megan Malone GPSing. NPS photo.

monitoring/management of Civil War earthworks. This is in addition to work with other park divisions such as Law Enforcement and Maintenance, and neighboring land management agencies such as the U.S. Fish and Wildlife Service.

The park has spent time over the years developing a series of peer reviewed protocols and standard operating procedures that are fairly easy for an inexperienced intern to follow and produce high quality work. These procedures, combined with organized project schedules and training tools that have been developed over the years, make the internship fairly low maintenance for park staff while accomplishing a great deal.

Megan Malone, a past intern at Richmond NBP, recently had this to say about her internship at the park:

Upon graduating from college I was undecided on how to apply my biology degree. On a whim, and hoping to gain some much-needed direction, I applied to work at Richmond National Battlefield Park as a SCA Intern. I spent the next four

months contributing to a wide variety of natural resources projects. During those months I discovered that I wanted to continue working in natural resources for the rest of my career. I have since completed a Master's of Science in Natural Resource Management and currently work as a restoration ecologist at an environmental consulting firm. In addition to helping me decide to pursue a graduate degree, this internship experience inspired the focus of my master's thesis on exotic plant species. I have discussed my time at Richmond NBP at every internship and job interview since then, because it is where I gained the vast majority of my hands-on fieldwork skills. I would not be where I am today in my natural resources career without my internship experience at Richmond NBP.

Richmond NBP interns go on to graduate school, additional SCA positions, seasonal work with the National Park Service, or a variety of other endeavors. Their time at the park provides life experience in a new place, a source of advice on their future, knowledge about resource management in a na-



tional park, and a fun few months. At the same time, the park is able to accomplish a tremendous amount of resource management work while creating a new generation of advocates for the park and the National Park Service.

# TSI: Track & Sign Investigations

## Using Kid's Senses to Learn about Their Environment

*Ed Sharron, science communication specialist, Northeast Temperate Network*

Mostly recognized for their cultural and artistic achievements and stories, the national parks of the Northeast are also home to many fascinating animals, and though tracking can be done in any season, there is no better time of year for following their movements than winter. This is an activity that kids love and that interests many adults. There's nothing quite like strapping on a pair of skis or snowshoes, heading out into the forest, and coming across fresh tracks left behind by a pack of coyotes only a few hours prior. The Northeast Temperate Network's (NETN) Track & Sign Investigation (TSI) program teaches students and the public to identify the tracks and sign of local mammals. Tracking offers a rare glimpse into the life of a wild animal. Much more than just looking at footprints, tracking can often tell how fast an animal was moving, what its mood was when it made the tracks, what it recently had for a meal (if you find scat), and more.

NETN is tasked with monitoring the ecological health of twelve of the Northeast's national parks. To do this, the network has identified several vital signs (water quality, forest health, phenology [the study of periodic plant and animal life cycle events and how these are influenced by seasonal and interannual variations in climate], etc.) that can be monitored by National Park Service (NPS) staff and citizen scientists alike to help park managers gauge the overall condition of park resources.

These vital signs are also important to the health of all mammals in the area as well. The Track & Sign Investigation program introduces participants to vital sign monitoring and citizen science data collection while they learn about the natural history of area mammals and to identify their tracks and sign. Volunteers hear about the program through NETN's website, direct contact with schools, and through postings in local newspapers. More than just an ID based program, TSI has students actually collecting data about signs found that will be uploaded to a NPS database and displayed on that park's Google Earth data set that is accessible through NETN's website. Data collected include species, track and trail measurements, GPS coordinates, track photos, animal gait, habitat description, and snow depth.

Like police investigating a crime scene, trackers can deduce what species of animal passed by and what it was doing by examining the clues that the animal left behind. But unlike the folks on the popular CSI television series, trackers do not need fancy equipment to read these clues.



Sixth-graders from Pomfret Elementary School, Pomfret, VT, and the author investigate red fox tracks. Photo: Rob Hansen, NPS.

All students need are their senses--eyes, fingers, and noses are more than enough for the job. The TSI program expands upon students' knowledge of the natural world, introduces them to how the NPS monitors the health of the national parks, and gets them out in the environment for some hands-on experience tracking the animals that live in their parks.

TSI is broken into two segments. The first is an indoor multimedia PowerPoint presentation that briefly introduces students to NETN and the NPS and, through video clips, sound recordings, and high quality photographs, shows them the different ways that animals can move. "Rap-sheets" (an overview of tracks and sign) for some of the Usual Suspects likely to be found in the area are then explored. The indoor portion usually lasts from about 45 minutes to an hour. Then the group heads outdoors for another hour or so to look for tracks and sign that will show them what the area's wild residents have been up to.

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# Silent Salamanders Speak Volumes About Ecosystem Health

*Ed Sharron, science communication specialist, Northeast Temperate Network*

Designed by teachers, for teachers, the Northeast Temperate Network's (NETN) Searching for Salamanders monitoring program is designed to utilize student "citizen scientists" to help park managers determine changes in forest amphibian populations and to better understand correlations between population size and forest health. Salamander monitoring works well for middle and high-school aged students because activities take place in fall and spring when school is in session and the techniques are simple and straightforward. Essentially, students go to designated spots in different habitats in the forest where 8x12 inch wooden "coverboards" have been strategically laid out on the ground in arrays. The coverboards attract a variety of amphibian species, do not disrupt habitat, are easily installed, and provide a consistent, standardized sampling unit. Student volunteers carefully lift up each board and identify, count, measure (without touching the salamander), and record data on each salamander found underneath.

Salamanders are familiar critters that citizen scientists can easily see and count. Their moist skin usually makes them dependent on habitats in or near water or underneath some kind of protection. They rely on moist chambers or channeled soils for retreats, because without direct soil contact, or rain-saturated litter, they quickly dry out. The word salamander means "fire lover," and numerous ancient legends have developed around this animal related to fire. The connection very likely stems from the fact that many salamanders dwell inside rotting logs, and if such a log were placed on or very near a fire, said salamanders

would likely attempt to escape from the log which could lend to the belief that they were created from flames.

Their ventures to the surface for the necessities of feeding, courting, and mating must coincide with the right conditions of cool, wet, calm weather. Uniquely among vertebrates, they are capable of regenerating lost limbs, as well as other body parts. Salamanders also cannot hear (though some species will hug the ground to pick up sound vibrations), nor can they make calls, chirps, or any other sound. Though they are silent creatures, they can still tell us a lot about the health of the ecosystem in which they are dwelling. Amphibians represent an important part of aquatic and terrestrial ecosystems in the northeastern United States. NETN monitors them to track population trends that may warn of ecosystem degradation and to direct conservation actions. The monitoring sites are co-located with forest health monitoring sites so that changes in salamander populations can be correlated to changes in forest health.

Searching for Salamanders brings young people into the parks who may otherwise never have been visitors. Local teachers hear about the program through NETN's website and from direct contact with schools by NETN or park staff. The monitoring done by Searching for Salamanders participants contributes to the database that informs park resource management. Salamander monitoring programs have been implemented at Acadia National Park, Marsh-Billings-Rockefeller National Historical Park, and Roosevelt-Vanderbilt National Historic Site.



Schoolchildren check the coverboards to monitor salamanders. NPS photo.

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# Birders are the Best Volunteers

During breeding season (May 25 to July 15), the Mid-Atlantic Inventory and Monitoring Network (MIDN) counts the birds in its parks. The more people out in field at this time looking and listening for birds, the better the data. Volunteers for this project are therefore very important to the success of the survey, and the network has found them by contacting local birding clubs such as Audubon. "The best volunteers" says Sarah Wakamiya, biologist and data manager for the network, "are people who are locally knowledgeable about the birds."

Sarah trains the volunteers to use GPS units to navigate to pre-determined points in the park where each will spend ten minutes counting all the birds and the number of species that he or she can see or hear, both within a 50 meter buffer and beyond it. Then the volunteer moves to the next point and starts again. In one morning, a volunteer can usually monitor ten points.

What kind of people come out to volunteer to do this kind of work? At Fredericksburg National Military Park, the breeding bird survey has been conducted for three years. The nine volunteers, who return each year belong to the Virginia Society of Ornithology and the Fredericksburg Birding Club. One is a professor of ornithology at the University of Mary Washington. Another is a botanist for the state, but most are not professionals, just locals with a love of birding.

At Valley Forge National Historical Park, the 11 devoted volunteers are enthusiastic about whatever is happening at the park and most have participated in all of the bird surveys since they started three years ago. At the other MIDN parks, some volunteers are retirees, some are husband and wife teams, and some are natural resource scientists. A few of these people also volunteer for other monitoring projects.

The network asks participants to fill out a volunteer feedback form where they can make suggestions for improving the program and comment on what they got out of the bird monitoring experience. The volunteers say it's fun to locate remote points in rarely visited areas of the park and, being birders, they enjoy finding the birds. They also feel good about making a contribution to environmental research and to the natural resource management of the parks. This is a practical opportunity to polish their bird watching and listening skills.



Fredericksburg Birding Club. Paul at far left. Photo courtesy of Paul Nasca.

## A Volunteer's Tale

Paul Nasca is an archeologist for the city of Alexandria, Virginia. He is also passionately into birding, a low-cost hobby he took up in grad school in the late 1990s at the College of William and Mary in Williamsburg. Coming from Buffalo, New York, he was struck by the lush, warm environment in Virginia, and the different birds in their particular local habitats, which he got to know on outings with experienced fellow birders. Now he is the "organizer" of the Fredericksburg Birding Club and that is how he met Sarah Wakamiya who was looking for bird monitoring volunteers for the MIDN monitoring project.

Paul volunteered and recruited other club members who had the necessary level of skill in recognizing birds by song and sight and a good sense of distance to the birds. Doing point counts can be difficult, he says. The points can be far off the paths, hard to reach, and it's hot and there are bugs. You have to stick to the protocol, start at dawn, keep moving, and stop by 11:00 AM. Volunteers can do point counts whenever they have a free morning as long as they complete the first round of point counts within the mandatory first few weeks of the breeding season. Monitoring is not a social activity, although volunteers get together for training and refresher courses each year.

Paul monitors the birds because he says he finds nature's beauty even in the birds that he sees every day. He likes being outdoors and welcomes the annual cycles reflected in the constant movement and migration of the birds. Being an archeologist, he thinks a lot about the past, and hearing bird songs like that of the song sparrow, he realizes that this is the same song that people have heard here for ages. (The poet Keats expressed the same thought in his Ode to a Nightingale, "The voice I hear this passing night was heard / In ancient days by emperor and clown....")

He feels that the bird data are being collected for a good cause. Fredericksburg is a bedroom community for Washington, D.C. The area is being rapidly developed and greenspace is vanishing. The Fredericksburg battlefields may become some of the last bits of greenspace to survive. Therefore, it's very important that they're managed in such a way that suitable habitat for the birds is preserved. All told, monitoring the birds for MIDN is a worthwhile activity for Paul, and even more so for the birds.

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# Not Just a walk on the Beach

*Patti Rafferty, coastal ecologist, NPS Northeast Region, and Mary-Jane James-Pirri, marine research associate, Graduate School of Oceanography, University of Rhode Island*

In an ancient ritual synchronized with high tides and the new and full moons, horseshoe crabs come ashore to mate and lay their eggs in shallow sandy nests along the waters' edge. Last spring volunteers were there to greet them at Fire Island National Seashore (NS). Guided by the glimmer of the moon and stars above, the volunteers walked the beaches of Great South Bay in search of these spawning ancients. As they strolled, they recorded the number of male and female crabs and took note of environmental conditions such as water and air temperatures, wave height and wind speed. During the day, volunteers walked these same beaches to place tags on horseshoe crabs as part of the U.S. Fish and Wildlife Service Cooperative tagging program. This national program gathers information on the size, sex, and location of tagged crabs and then provides data on recapture sightings to researchers and fishery managers so they can better understand horseshoe crab populations.

These volunteers are part of an effort to develop citizen-based horseshoe crab monitoring at four Mid-Atlantic coastal National Park Service units. The project started in 2011 at Fire Island NS where eighteen volunteers contributed 175 hours to complete 40 spawning surveys and tag 37 animals. The project will expand to Gateway National Recreation Area (NRA) Jamaica Bay Unit and Sagamore Hill National Historic Site (NHS) in 2012 and Gateway NRA Sandy Hook Unit in 2013. The goal is to establish long-term citizen monitoring of spawning horseshoe crabs that will increase the capacity of these parks to understand and manage this important marine species while engaging visitors in the stewardship of park marine resources.

The American horseshoe crab (*Limulus polyphemus*) – not really a crab at all but more closely related to spiders

and scorpions - is an important member of the marine ecosystem. Living on ocean and bay bottoms, they eat marine worms and clams, and are in turn eaten by loggerhead turtles and sharks. Further south in the mid-Atlantic, their eggs are a critical nutritional source for migrating shorebirds bound for nesting grounds in the Arctic, including the red knot (*Calidris canutus*), an endangered species candidate. Often called "living fossils,"



During spawning, one or more males will attach to the larger female. This female is towing a male into the surf zone where she will lay up to 20,000 eggs during one high tide. Over the course of one spawning season a single female may lay more than 90,000 eggs. Photo: P. Rafferty, NPS.

horseshoe crabs date back to more than 400 million years ago. The American horseshoe crab is one of only four species of horseshoe crabs that exist in our oceans today and is the only one in North America. They can be found along the Atlantic and Gulf Coasts from Maine to the Yucatan Peninsula.

American horseshoe crabs are harvested for conch and eel bait and their blue blood is prized by the biomedical industry. In these fisheries, female crabs are often preferred because they are larger and produce more bait and blood. The biomedical industry manufactures Limulus Amoebocyte Lysate (LAL) from their blood. LAL is

an extremely important pharmaceutical agent that detects fever-causing bacteria (pyrogenic endotoxins) in all injectable drugs, vaccines, and implantable medical devices. LAL is also used for the diagnosis of diseases such as spinal meningitis and in the future may be utilized to identify bacterially contaminated meat, fish, and dairy products. Currently, LAL can only be made from the horseshoe crab's blood as there is no synthetic equivalent.

Loss of spawning and nursery habitat due to coastal development and harvesting threaten horseshoe crab populations. Harvest quotas and monitoring requirements have been established by the Atlantic States Marine Fisheries Commission to protect horseshoe crabs and the shorebirds that feed on their eggs, and to sustain the economically important fishery. States that allow harvest must conduct monitoring to better understand the population dynamics of this species. With the exception of Plumb Beach at Gateway NRA, New York state monitoring programs have not included NPS beaches. Some states have further restricted the horseshoe crab fishery, thus increasing harvest pressure in nearby states like New York. Harvesting of horseshoe crabs is not allowed in Fire Island NS, Gateway NRA, and Sagamore Hill NHS; thus, the undeveloped beaches within these Mid-Atlantic parks may provide an important refuge for this ecologically and economically important species.

Horseshoe crab spawning peaks in late spring along the Atlantic coast. The spawning surveys are conducted during evening high tides over a five day period surrounding each new and full moon in May and June. The surveys provide information on the abundance and sex ratio of spawning crabs on park beaches which can be compared to future data to evaluate trends

in horseshoe crab populations for these coastal park units. The magnitude of spawning at individual beaches can identify important horseshoe crab habitat and changes in sex ratios may be a sign of over-harvesting or other changes in the population.

Implementation of this project at Fire Island NS was a collaboration among park resource management, interpretation, and law enforcement divisions; the NPS's Northeast Region; and Dr. Mary-Jane James-Pirri, a cooperater at the University of Rhode Island. Fire Island NS volunteers were recruited at the park's April 2011 volunteer recognition breakfast. Patti Rafferty, NPS coastal ecologist and project coordinator, presented at the event. Information about this volunteer opportunity was also posted on the park's web site. Interested volunteers attended training sessions in mid-April and monitoring began on Sunday May 1, 2011. During the first year, monitoring was conducted at two beaches. Volunteers worked in pairs or groups of three to ensure safety as well as accurate data collection. Since the volunteer breakfast last spring, additional volunteers have signed on, learning about the program from the first cohort of project volunteers, park interpretative programs, and local media coverage.

Many of the volunteers are life-long residents of Long Island and have volunteered at Fire Island NS for years, but some of the citizen scientists were first-time NPS volunteers who were looking for opportunities to get out and experience the park in new ways. Others enjoyed an opportunity to experience the park at night. One volunteer is a free-lance writer who runs a natural history blog and has written about horseshoe crabs. Another volunteer used to harvest horseshoe crabs and said this was his way of giving back. Karen Santino, a seasoned park volunteer said "I've lived on Long Island my entire life and this was a wonderful experience to go out and learn about a creature that used to be so abundant.... Hopefully this project will help them to become more abundant."



The prosomal width, sex, and location of each tagged horseshoe crab are recorded and submitted to the U.S. Fish and Wildlife Service Cooperative tagging database. This national program gathers information on tagged crabs and then provides data on recapture sightings to researchers and fishery managers so they can better understand horseshoe crab populations. Photo: P. Rafferty, NPS.



Volunteers and project coordinator show off their t-shirts at the September 2011 Volunteer Recognition Celebration. The t-shirts have the NPS volunteer logo on the front and are a way of expressing appreciation to the volunteers for their work in 2011 as well as outfitting them for monitoring in 2012. Photo: K. Santos, NPS.

Please note that the NERO web site is coming down sometime this spring and with it goes the NER Science web site, which included the page of links to all the issues of this publication. The Science and Management archive can now be found at <http://science.nature.nps.gov/im/units/NERO/index.htm>

The NER Science web site was an archive of natural resource technical reports started in 2001. Those reports are now part of a larger archive and can be accessed at <https://irma.nps.gov/App/Portal/Home>

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Please let *Science and Management* know of projects and practices at your park or network that might be useful to colleagues elsewhere. Contact the editor at [bmb4@psu.edu](mailto:bmb4@psu.edu).

Sound science is the foundation for good resource management decisions. The National Park Service invests in science programs to responsibly protect and manage the precious resources entrusted to our care. The power of this research is multiplied when the information is shared. This publication, *Science and Management*, is brought to you from the Northeast Region's Natural Resources and Science Division. Its goal is to share with park staff, scientists, and the public, the innovative resource management work being done throughout the region.