THE GEOLOGICAL SOCIETY OF AMERICA®

2014 Annual Report

MOSAICS in Science

The National Park Service
The Geological Society of America®

Table of

Contents

Supporting Diverse Youth in STEM Careers with the National Park Service:

An Introduction to the Mosaics in Science Program 2

What is the Mosaics in Science Program? 2

The Mosaics in Science Mission 2

Delivering Opportunities to Learn, Serve, & Work

The Impacts of Mosaics in Science in 2014 4

Mosaics in Science Projects 4

2014 Mosaics in Science Project Highlights. 7

Mosaics in Science Participant Experiences 11

Diversity in Mosaics in Science 13

Outcomes for the National Park Service 16

Mosaics in Science Participants and the Public 16

Preparing for the Next Step

The 2014 Mosaics in Science Career Workshop & Supporting Early Careers 17

Supporting Early Careers. 19

Mosaics in Science Success Stories 20

The Future of Mosaics in Science 21

Short Term Goals. 21

Long Term Goals 21

Mosaics in Science Organizational & Financial Overview 22

Structure and Staffing 22

Financial Overview 22

How to Get Involved 23

Aspiring Participants 23

National Parks Interested in Participating. 23

Aspiring Partners and Donors 24

Acknowledgements 25

Participants 25

Mentors. 29

Partners and Sponsors 30

Work Cited 31

Supporting Diverse Youth in STEM Careers with the National Park Service

An Introduction to the Mosaics in Science Program

2014 Mosaics in Science participant setting up an Anabat acoustic monitor.

What is the Mosaics in Science Program?

The Mosaics in Science program was established in 2013 by the National Park Service (NPS) Geologic Resources Division in close collaboration with The Geological Society of America (GSA) and the NPS Youth Programs office. The program provides youth aged 17–35 who are typically underrepresented in science career fields with on-the-ground, science-based work experience in the National Park Service.

Mosaics participants are offered short-term volunteer positions focusing on STEM (Science, Technology, Engineering, and Math) inventory and monitoring, conservation and management, research, and education and outreach projects in National Park Service sites across the United States. This multidisciplinary program provides opportunities for youth to utilize STEM skills on scientifically rigorous projects focusing on air resources, biological resources, climate change science, geologic resources, natural sounds, night skies, scenic resources, social science, and water resources science fields. Many projects require participants to live in remote locations for the duration of their project. The participants are compensated for this with a living allowance. Housing and travel costs are fully covered by the program.

A career workshop for all of the program participants is held in Washington, D.C., at the beginning of August. During the workshop, the participants have the opportunity to present the results of their work through oral and poster presentations, are exposed to different science careers, and develop skills to apply for, and obtain, a job with the federal government.

During its pilot year, the Mosaics in Science Program provided opportunities for twelve participants. In 2014, twenty-one participants worked on a variety of natural resource science projects in parks across the National Park Service.

The Mosaics in Science Mission

The mission of Mosaics in Science is to encourage today's diverse youth, especially those underrepresented in STEM fields, to pursue careers in science in the National Park Service and beyond through providing unique and relevant hands-on work experience in our National Parks.

The program seeks to achieve this mission through the following objectives:

- Encourage diverse youth (17–35 years old) to pursue studies in STEM fields;
- Introduce youth to science careers in the National Park Service;
- Provide meaningful and relevant science-based work experience in parks; and
- Increase diversity and inclusion in the NPS workplace.

"After this summer, and everything it has taught me about science and about myself, I do not think the National Park Service has seen the last of me yet."

—Sarina Patel, Lava Beds National Monument

The mission and objectives of the Mosaics in Science program serve multiple Department of the Interior (DOI) strategies and initiatives. The DOI STEM Education and Employment Pathways Strategic Plan has a five year goal that "youth and the American public become scientifically literate stewards of our natural and cultural heritage and that today's youth, especially those underrepresented in STEM fields of study, become inspired to choose career paths at DOI or related agencies and partners" (U.S. Department of the Interior, 2013). Mosaics in Science more specifically engages with two of the key strategic areas highlighted to help meet this goal: "engaging students and citizens" and "strengthening career training and workforce development" (U.S. Department of the Interior, 2013). The DOI Youth in the Great Outdoors Initiative has objectives to get American youth outside engaging in recreation (play), using nature's classroom (learn), volunteering to care for public lands (serve), and developing the skills to turn them into a diverse, up-and-coming generation of conservation stewards (work). (U.S. Department of the Interior) This program supports the work and serves the objectives of this initiative.

The Mosaics in Science program gives its participants an opportunity to gain valuable work experience and on-the-ground training for a STEM career with the National Park Service. The long-term goal of the program is to develop the talents of its participants and hire the best and brightest into careers with the NPS, helping to support a diverse workforce that more accurately reflects the diversity of the United States. The program participants also do their part to inspire a younger generation, their peers, and park visitors. Many of the Mosaics participants are engaging citizens through tours, talks, and citizen science projects. Through their interactions with park visitors, participants are helping citizens to learn about the natural and cultural resources on America's public lands and teaching them to see these lands as their playgrounds to use, preserve and protect. In an extra effort to contribute to the success of these DOI initiatives GSA has become a member of the 21st Century Conservation Service Corps (21CSC), a partnership developed to put youth and veterans to work protecting, restoring, and enhancing America's Great Outdoors.

2014 Mosaics in Science participant inventorying for fossils.

The Mosaics in Science program also supports the primary Goals of GSA's Strategic Plan. The opportunity for budding scientists from diverse backgrounds to work alongside NPS professionals on natural resource research and education projects meets GSA's goals of advancing "geoscience research and discovery," strengthening "public recognition of the relevance of geoscience education and practice to societal needs and Earth stewardship," and developing and fostering "a robust, diverse, and sustainable professional geoscience community"(The Geological Society of America, 2012). Thus, GSA perceives a large intrinsic value in partnering with NPS on the Mosaics in Science program.

2014 Mosaics in Science participants at the Franklin Delano Roosevelt Memorial, Washington, D.C.

Delivering Opportunities to Learn, Serve, & Work

The Impacts of Mosaics in Science in 2014

Mosaics in Science Projects

In 2014, the Mosaics in Science program included 21 projects, almost doubling in size compared to the previous year. This large increase in the number of completed projects demonstrates the program's relevance. Many more parks submitted project proposals than those participating in the program, and additional funding from the National Park Foundation allowed the program to expand, even beyond the growth that was anticipated.

The 21 projects completed this year spanned the United States, from Alaska to Florida, including participants in every NPS region. The projects included inventory and monitoring, conservation and management, research, and education and interpretation. The project disciplines represented a wide range of the sciences, engaging in topics important to the stewardship and protection of individual national parks, and which are relevant to the world beyond the United States.

2014 Mosaics in Science Project Disciplines

Archaeology

Biology

Caves & Karst

Climatology

Environmental Science

Geology

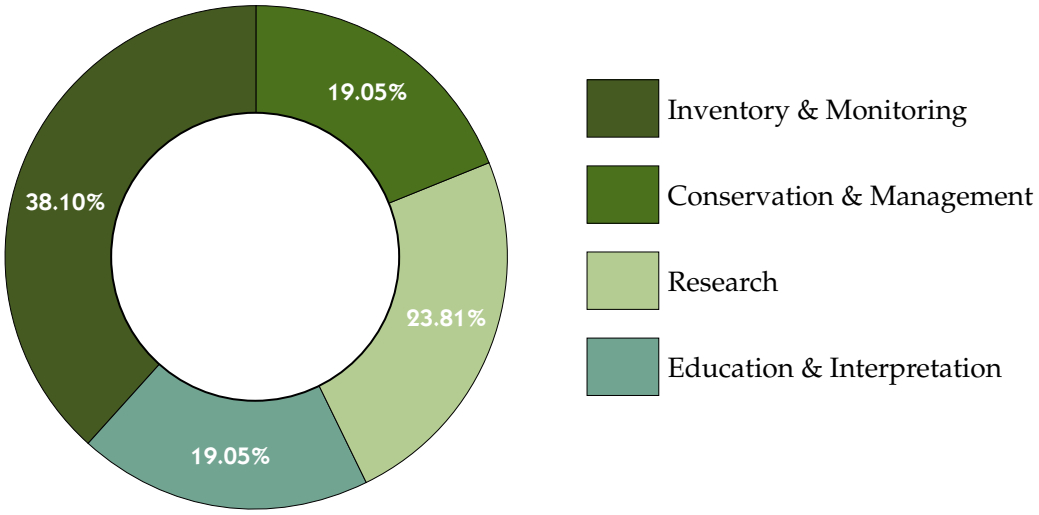
GIS & Cartography

Hydrology

Paleontology

Multi-Disciplinary

Mosaics in Science 2014 Projects by Type



Mosaics in Science participant monitoring vandalized speleothems at Coronado National Memorial.

2014 Mosaics in Science Projects

Archaeological Impacts of Climate Change, Jeneva Wright, Biscayne National Park (FL)

Field Research Technician, Binal Rana, Congaree National Park (SC)

Speleologist, Rachel Lopez, Coronado National Memorial (AZ)

Water Quality Research Assistant, Yeyzy Vargas, Cuyahoga Valley National Park (OH)

Digital Research Communicator, Chelsea Lewis, Denali National Park and Preserve (AK)

Bat and Cave Biology Research Assistant, Roxanne Pourshoushtari, El Malpais National Monument (NM)

Paleontology/Museum Assistant, Gabriella Rossetto, Florissant Fossil Beds National Monument (CO)

Natural Resources Intern, Madeleine Pluss, Fort Union National Monument and Pecos National Historical Park (NM)

Interdisciplinary Science and Education Technician, Anton Yelk, Grand Teton National Park (WY)

Paleontology Inventory Assistant, Kaytan Kelkar, Great Basin National Park (NV)

Phenology Monitoring and Climate Change, Salvador Amador, Guadalupe Mountains National Park (TX)

Natural Resources Assistant, Stephen Roethle, Hopewell Culture National Historical Park (OH)

Science Communications Assistant, Sarina Patel, Lava Beds National Monument (CA)

GIS/Viewshed Technician, Nyambura Njagi, Manassas National Battlefield Park (VA)

Science Engagement Specialist, Justin Tran, North Cascades National Park (WA)

Cave and Karst Interpreter, Alianora Walker, Ozark National Scenic Riverways (MO)

Paleontologist, Shelby Matsuoka, Petrified Forest National Park (AZ)

GIS/Stream Morphology Technician, Darius Naraine, Prince William Forest Park (VA)

Desert Hydrology Research Assistant, Kristan Culbert, Saguaro National Park and Sonoran Desert Network (AZ)

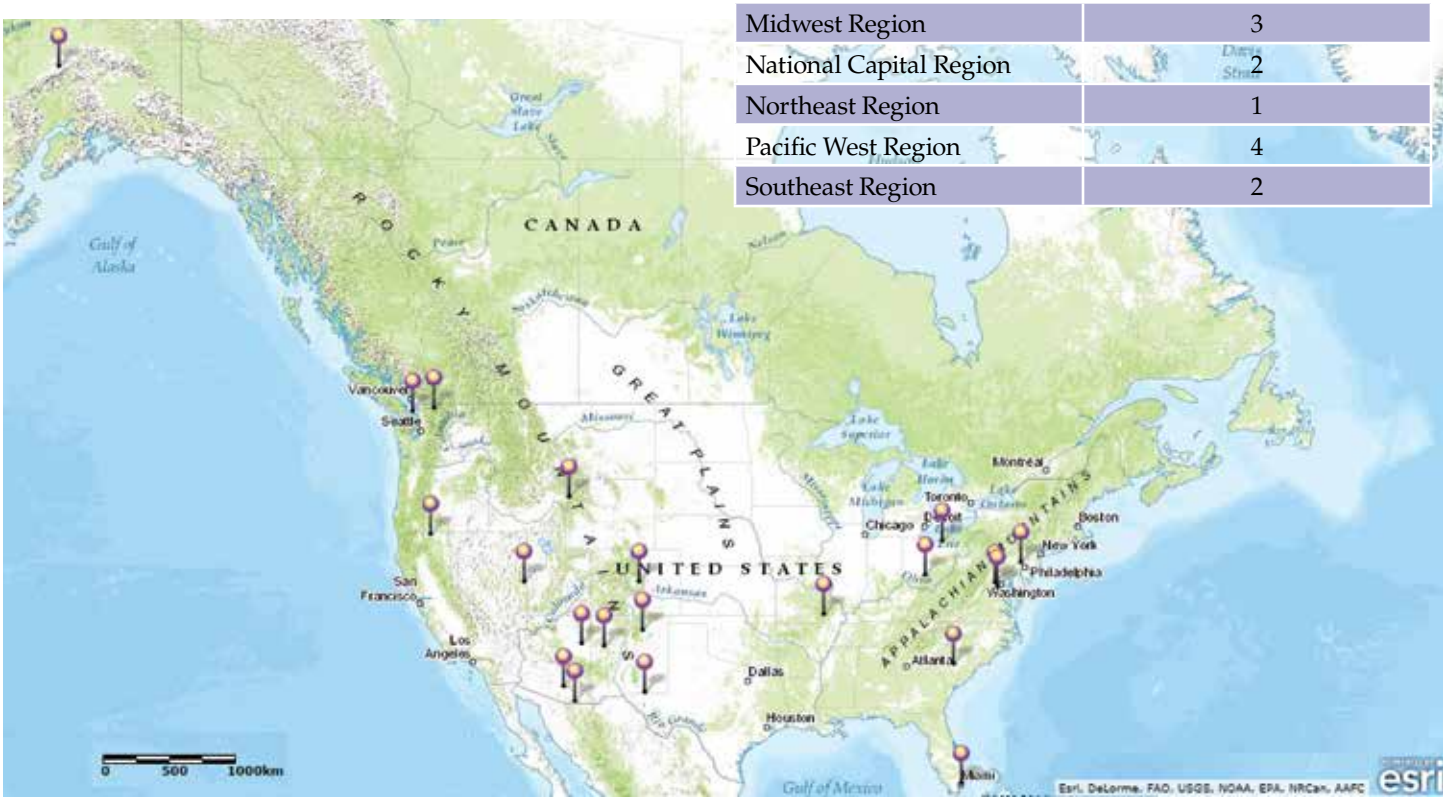
Prairie Restoration Assistant, Graham Crawbuck, San Juan Island National Historical Park (WA)

Natural Resource Conservation Assistant, Sydney Mathis, Valley Forge National Historical Park (PA)

The Impacts of Mosaics in Science in 2014

2014 Mosaics in Science Projects by National Park Service Region

REGION	NUMBER OF PROJECTS
Alaska Region	1
Intermountain Region	8
Midwest Region	3
National Capital Region	2
Northeast Region	1
Pacific West Region	4
Southeast Region	2



2014 Mosaics in Science Project Locations.

2014 Mosaics in Science Project Highlights

The 21 projects completed through the Mosaics in Science program in 2014 represent a wide range of work to improve both our understanding and enjoyment of the resources offered by national parks. Each project's purpose is to provide a valuable life, work, and learning experience for the participant—a hands-on opportunity to gain important technical skills and work experience that will make them more competitive applicants when they enter the job market. In addition, the projects provide the national parks with valuable resources and research that will improve park resource management and the overall quality of the experiences available to park visitors. The four highlighted projects that follow provide a glimpse of the unique experiences that program participants are gaining and the invaluable work they are completing for the NPS.

Gabriella Rosetto, Paleontology Intern, FLFO.

Gabriella Rossetto

Paleontology Intern

Florissant Fossil Beds National Monument (FLFO), Colorado

Gabriella Rossetto worked on inventory and monitoring of paleontological resources at Florissant Fossil Beds National Monument and started research and data collection for her undergraduate thesis. The inventory and monitoring project that Gabriella worked on began in 1992. Since 2001, participants from the GeoCorps America/Geoscientists-in-the-Parks Program have been involved in the project. Gabriella's work consisted of photographing, evaluating, and documenting the resource condition of 72 individual paleontological sites at Florissant. Photo monitoring of the sites was completed using the same location and angle as baseline photographs. Each site also had to be evaluated and scored to determine whether the fossils at the site were deteriorating. Once Gabriella collected this information and returned from the field, she would upload the photographs and scoring into the inventory database. After completing the monitoring of most the paleontological sites, Gabriella began another project to update the inventory and monitoring manual and protocol. She made the manual more appropriate for fieldwork, addressed the subjectivity of some of the past scoring, and refined site evaluation criteria to be more specific to the unique characteristics of the paleontological resources at Florissant Fossil Beds National Monument. She also added some important data that were missing in the manual and, with the help of a GeoCorps/Geoscientists-in-the-Parks Guest Scientist, updated the maps showing the site perimeters using photogrammetry.

Gabriella also had the opportunity to work on her undergraduate thesis project. She became interested in studying paleoelevation during geology classes at Colorado College, and with the help of her Mosaics in Science mentor, Dr. Herb Meyer, she has made paleoelevation the focus of her thesis. Gabriella's time as a Mosaics in Science participant has allowed her to make progress on the research phase of her thesis, selecting rock units and sampling locations, and sampling three sites and six rock samples. She has also submitted an application and proposal for a research permit in Big Bend National Park, Texas, to complete more research for her thesis.

Nyambura Njagi

GIS and Viewshed Technician

Manassas National Battlefield Park (MANA), Virginia

Nyambura Njagi, GIS and Viewshed Technician, MANA.

As a GIS and Viewshed Technician, Nyambura Njagi's project was to create a viewshed model that could predict where proposed development would be visible from within Manassas National Battlefield Park using high-resolution LiDAR data and GIS. In recent years, urban sprawl from the Washington, D.C., metropolitan area has threatened to compromise the historic character of the landscape in and around Manassas National Battlefield Park by obstructing natural features and by making structures, such as cell phone towers, visible from historical sites. The goals of Nyambura's viewshed project were two-fold: (1) to create a model that would more accurately predict areas that are visible from historical points within the park and up to 2.5 miles outside the park boundary, and (2) to predict the height at which buildings, cell phone towers, and other modern structures could be constructed before they would become visible from historic sites.

After conducting a literature review, Nyambura found that a British consulting company had completed a similar project last year. One of the drawbacks to the UK project, however, was that it had utilized Digital Elevation Models (DEMs) on which to conduct their viewshed analyses. Earth surfaces, however, are typically characterized by many features other than terrain, such as vegetation, buildings, and standing water bodies, that impact visibility. DEMs do not take these additional features into consideration. In GIS, these additional features are often captured by a remote sensing technology called LiDAR (Light Detection and Ranging), which uses an airborne laser to calculate distances to objects on Earth's surface. One of the important aspects of Nyambura's project was to use LiDAR-derived data to create a model that would capture other features on Earth, called a Digital Surface Model (DSM), to produce more accurate viewshed prediction and analyses.

When a developer provides the location and elevation of a proposed construction project, a park GIS technician can overlay a geographic representation of those sites onto the viewshed surface and compare it to the model that Nyambura created. If the proposed structure was taller than the predicted minimum visible height for that area, it would be visible from the historical site of interest—indicating that other locations should be considered for the proposed construction. Nyambura's project resulted in a user-friendly tool that any park GIS technician could use to create customizable viewshed models for their respective parks. Detailed methods and procedures for the creation of the viewshed modeling tool were written in a manuscript and submitted to Park Science Magazine for publication to provide access to the tool to other units of the National Park Service.

Salvador Amador

Phenology Monitoring and Climate Change Interpreter

Guadalupe Mountains National Park (GUMO), Texas

Salvador Amador developed a plant and animal life-cycle–monitoring citizen science program at Guadalupe Mountains National Park. The overall goal of the project was to provide a way to collect data to determine the impact that climate change is having on the park's wildlife. The initial phase of Salvador's project involved extensive research and fieldwork on what plants or animals common within the park would be the best for the citizen science project, considering the sensitivity of the plant or animal species to climate change, and how easily the plant or animal could be identified and recorded by park visitors. Guadalupe Mountains National Park contains a variety of ecosystems, and there were many plants and animals from which to choose. Salvador eventually chose to focus on monitoring the life cycles of certain plant species within the park, as they were sensitive to a changing climate, and their static nature would make it easier for visitors to record observations during different seasons and over a number of years. Salvador then had to decide on the species of plants that would form the study. This involved research on the life cycles of plants within the park, to determine which plants would be going through obvious cycles during the peak visitor times.

The second phase of Salvador's project involved developing a system for citizen scientists to record their observations. A number of factors needed to be considered when making this decision, including how much staff time would be required to monitor the system, how accessible the system would be to the public, and the system's overall ease of use. The eventual decision was that the easiest system to use would be a preexisting phone or tablet application called Nature's Notebook. Nature's Notebook, which is a part of the National Phenology Network, is an application that allows people to make life cycle observations of different flora and fauna. Salvador organized the creation of a Nature's Notebook group called Guadalupe Mountains National Park. He then created two different observation sites: one on the Pinery Trail and the other on the Devil's Hall Trail. After a few successful test runs, the sites were made public so that visitors could start participating in the program. Each plant was marked with colored tape to make them easily observable.

Salvador Amador (left), Phenology Monitoring and Climate Change Interpreter, GUMO.

The final phase of Salvador's project was outreach to visitors and NPS staff, with the purpose of explaining the citizen science project and encouraging their participation. A poster was created to show visitors the different plants to be observed and where the plants were located. Over the next three years, the information collected by these citizen scientists will be analyzed and compared. The end result will be information that Guadalupe Mountains National Park will be able to share with the public about how the life cycles of certain plants within the park are being affected by climate change and how these effects could also be detrimental to other flora and fauna within the park.

Graham Crawbuck

Prairie Restoration Intern

San Juan Island National Historical Park (SAJH), Washington

Graham Crawbuck, Prairie Restoration Intern, SAJH.

Graham Crawbuck's experience as a Mosaics in Science participant was unique; he had the opportunity to participate in work at a national park in his hometown. While still in high school, Graham successfully advocated for the creation of the San Juan Island National Monument and volunteered at San Juan Island National Historical Park. Now an undergraduate student at George Washington University in Washington, D.C., Graham returned to the park with the task of expanding a native plant nursery to be used for prairie restoration.

Graham's project was to manage and expand the native plant nursery, which would need to be significantly expanded in order to provide propagules for future prairie restoration efforts. His goals included doubling the size of the nursery, creating protocols for propagation and seed collection of native plants, establishing a schedule for nursery propagation for the next two years, and creating partnerships with local agencies. 70% of Graham's project involved fieldwork, including planting in the nursery, collecting native plant seeds, and leading conservation crews in building nursery facilities. In the office, Graham created a multitude of databases and protocols to document what actions were being taken in the nursery and created a native plant propagation guide. A project to rear Island Marble butterflies intersected with Graham's prairie restoration project. In order to produce large amounts of the butterflies' main food source, the expansion of the nursery needed to take place much faster. Graham also dedicated time to clearing out space for butterfly larval rearing, as well as feeding and measuring the larvae twice a day.

Graham's work contributed not only to an expanded nursery and detailed planting and nursery resources, but also created a larger conservation community for the park. Through his own outreach, as well as through family and community connections, Graham worked with the San Juan County Land Bank and the San Juan Preservation Trust. He also established a relationship between the park staff and some Washington State University Master Gardeners.

Mosaics in Science Participant Experiences

> "The memories and benefits I've reaped from having this opportunity over the summer will stay with me for a lifetime."
>
> —*Justin Tran, North Cascades National Park*

In order for the Mosaics in Science program to successfully encourage the diverse youth taking part to pursue a STEM career and to encourage them to consider a career with the NPS, this early work experience must be valuable and positive. An evaluation of each participant's experience and the overall program is key to ensuring that we are providing this positive experience. The program evaluation focuses on accurately assessing the skills that our participants are gaining, the impact that their experience has or will have on their career goals and aspirations, and the overall quality of their experience.

In 2014, all of the participants responded that the program had helped them to grow, develop, or enhance some connection or skill; 95% of the participants responded that the program had helped them develop valuable job skills; and 90% responded that the program had helped them develop valuable life skills.

In addition to the opportunity to develop life and job skills, the Mosaics participants also have the opportunity to learn the ethics of resource stewardship as they are applied to their daily work and projects. The Mosaics in Science Program strives to have its participants complete the project with a stronger understanding of resource stewardship and preservation and the value of public service. The evaluation provides a tool to determine whether these core principles are being accomplished by gauging participant agreement with four statements before and after the Mosaics in Science projects take place. These four statements are:

1) It is our duty to preserve the integrity, stability, and beauty of ecosystems.

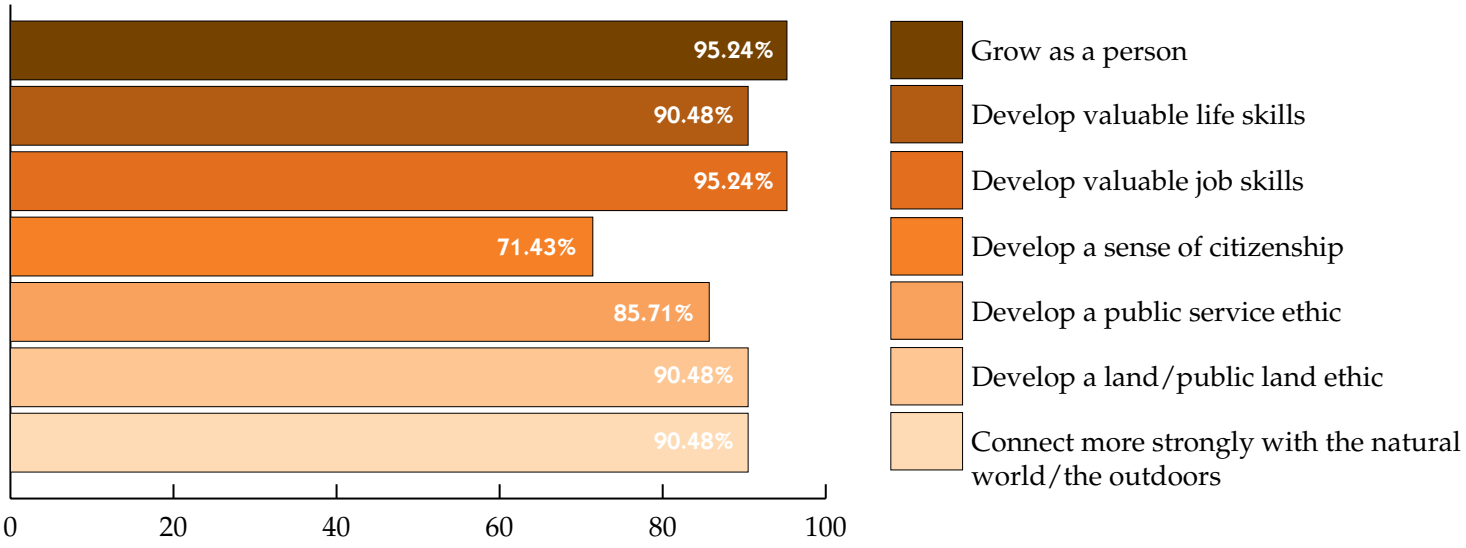
2) Land should be reserved for the greatest good of the greatest number in the long run.

3) Land is best viewed as a community, of which we are a part, versus a commodity, of which we have ownership.

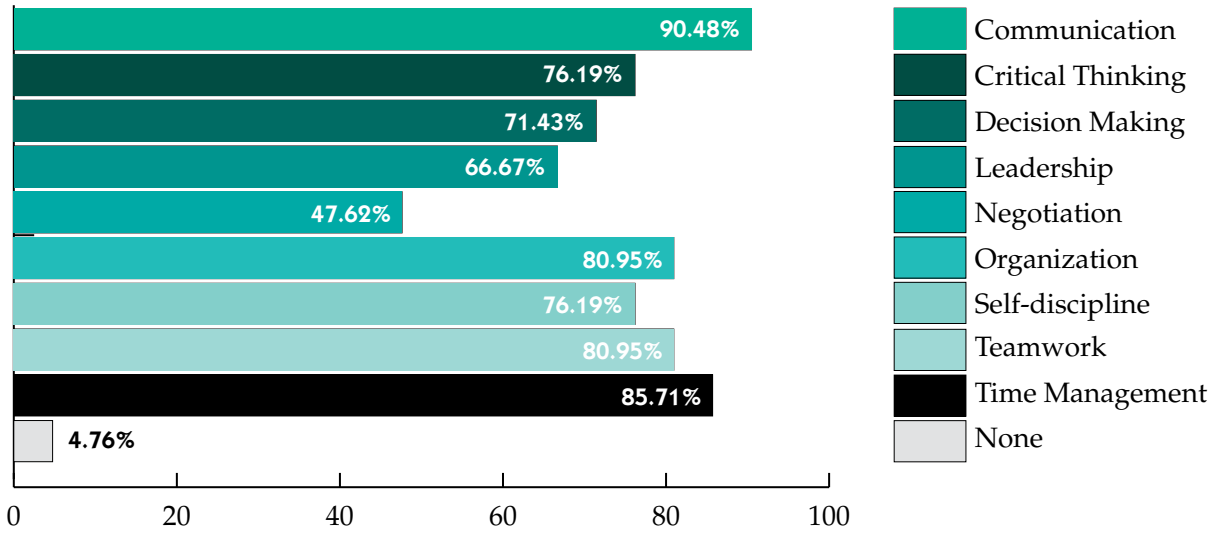
4) Cooperation between organizations and communities in planning and the management of natural and cultural resources is essential to facilitating long-term sustainability.

The majority of the participants indicated agreement with these statements prior to beginning their Mosaics in Science project. It is clear that the program currently attracts participants who are already committed to stewardship of public lands. However, those few participants who indicated disagreement with these statements prior to starting their

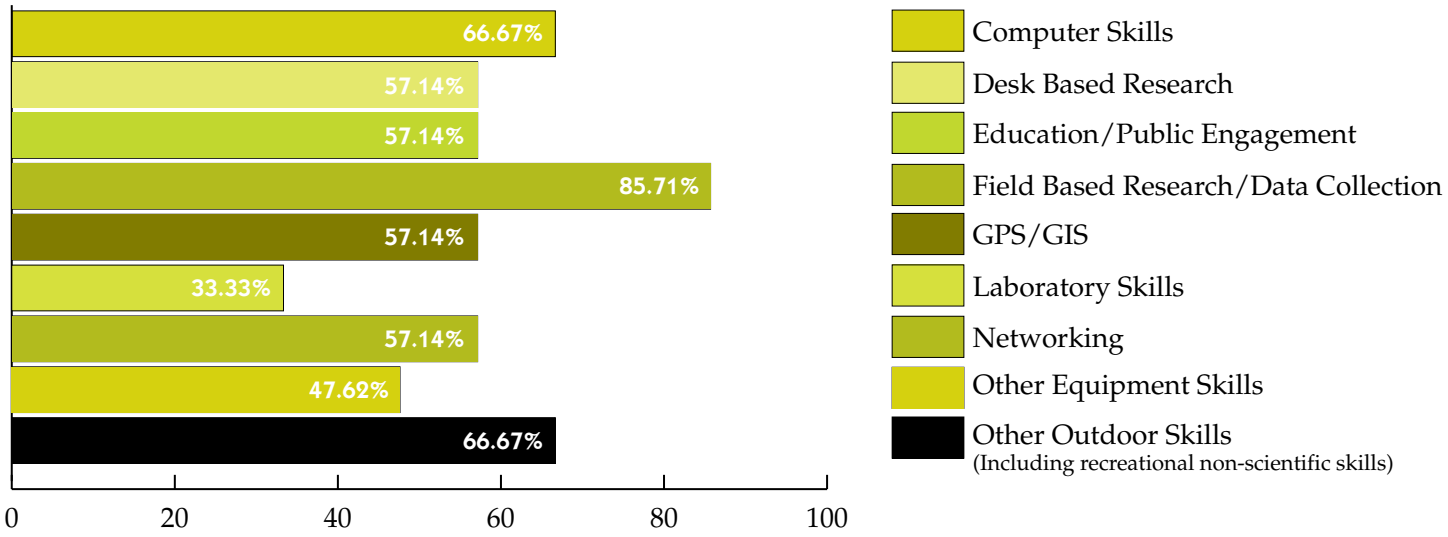
Participant Responses: Participating in this program has helped you…



Participant Responses:
What life skills did you develop or expand on during your project?



Participant Responses:
What job skills did you develop or expand on during your project?



project agreed with these statements by the time that they had completed the program. Where participants are unfamiliar or unsympathetic with stewardship ethics, the program is successful at communicating these concepts.

> "At first, it was intimidating to know how important our summer's work was going to be ... but as the summer progressed, the idea became incredibly exciting. With the help of my partner, I was really doing some good work for a national monument that would affect their future work. This summer was not just about being an intern and getting some experience, we were being counted on. It feels good to know that we made a difference."
>
> *– Roxanne Pourshoushtari, El Malpais National Monument*

In addition to all of these positive outcomes, the majority of the participants also felt that they were completing worthwhile work during their project, and contributing valuable research or resources to the parks. This feeling of making a valuable contribution enhances the overall positive experience of the program. 80% of Mosaics in Science participants felt that their overall experience as part of the program was outstanding, and no participants felt that it was unacceptable or poor. All of the participants in 2014 would recommend participating in the program to others.

Mosaics participant surveying a transect of vegetation at a cave entrance.

Mosaics participants learning about the Martin Luther King Jr. Memorial.

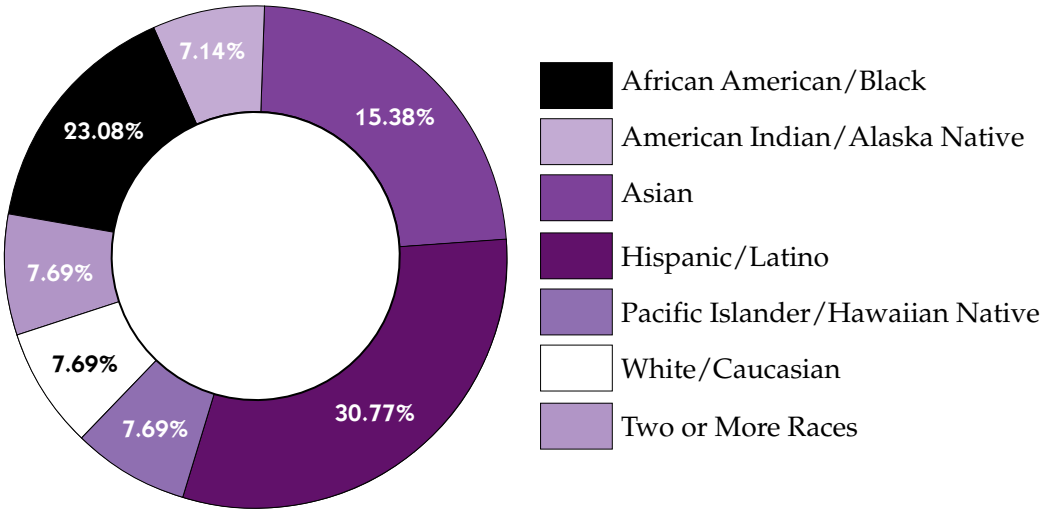
Diversity in Mosaics in Science

Science, Technology, Engineering, and Math (STEM) fields have an integral role to play in how we understand the world around us, in our nation's future, and in how we relate to and care for our public lands. Encouraging a diverse STEM workforce ensures that as STEM employees seek solutions to some of the modern world's most pressing challenges the entire population's ideas are represented in those solutions. However, STEM fields still suffer from a lack of diversity. As such, the Mosaics in Science program strives to encourage diverse youth to explore and pursue careers in STEM fields.

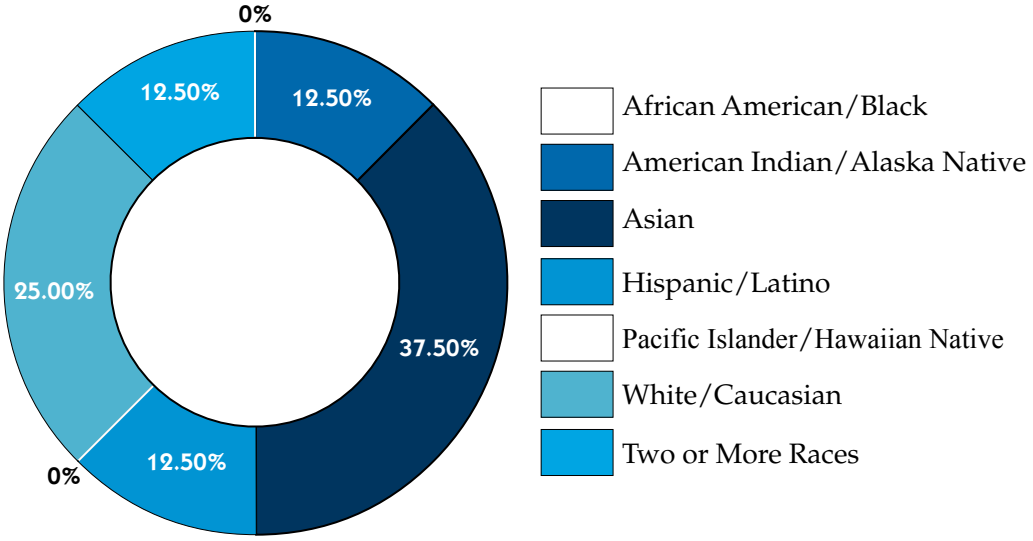
The Mosaics in Science program's focus on diversity also draws on the NPS, DOI, and federal government's objectives to increase diversity in the workforce—an objective that is shared by GSA. The NPS acts as a steward for public lands that are more than the sum of their parts. The iconic places that the NPS cares for, from Mount Rainier to the National Mall and Monuments, often serve as symbols of the character of the nation. It is therefore essential that the NPS workforce, including its STEM employees, shows the same diversity and represents American society's values and beliefs as a whole.

A diverse workforce includes members of different ethnicities, races, ages, genders, abilities, sexual orientation, and backgrounds. As mentioned in the *Government-Wide Diversity and Inclusion Strategic Plan:* "Diversity encompasses all that

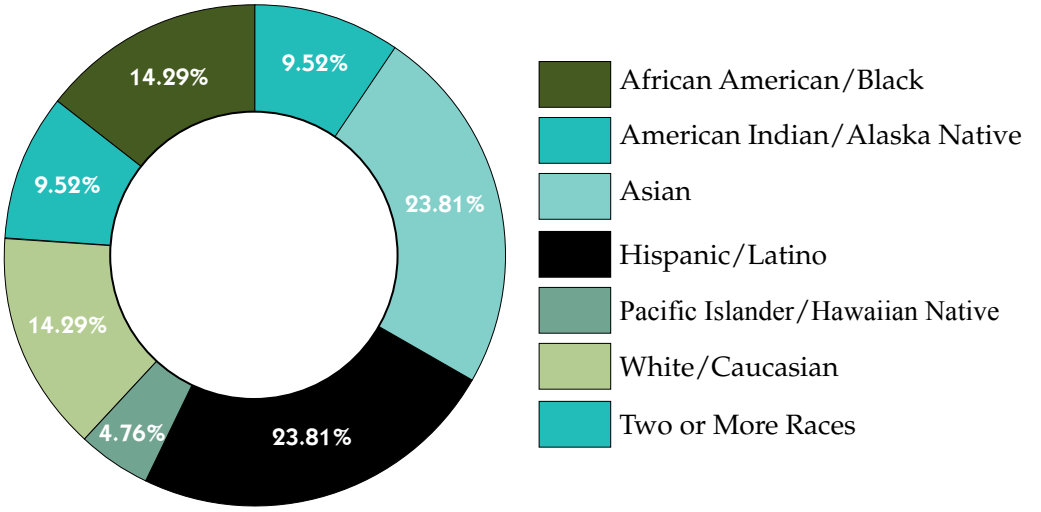
Mosaics in Science 2014 Female Participants by Ethnicity



Mosaics in Science 2014 Male Participants by Ethnicity



Mosaics in Science 2014 Participants by Ethnicity

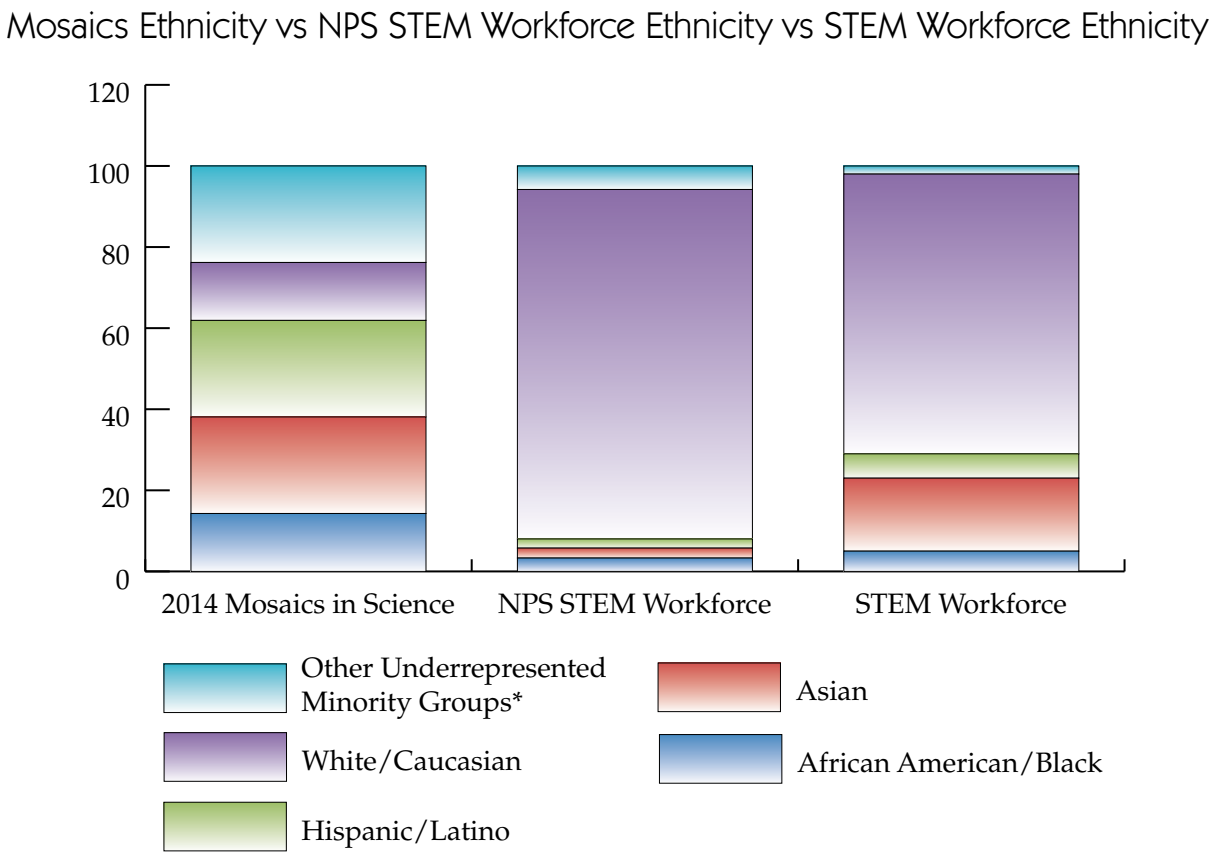


makes us unique, including the diversity of thought and perspective that accompanies our identity" (U.S. Office of Personnel Management, 2011). Attributes that contribute to a diverse workforce, as outlined in this strategic plan, are "national origin, language, race, color, disability, ethnicity, gender, age, religion, sexual orientation, gender identity, socioeconomic status, veteran status, and family structures"(U.S. Office of Personnel Management, 2011). The goal of the Mosaics in Science Program is to represent the wide spectrum of the nation's diversity. The 21 participants in the 2014 Mosaics in Science program include young men and women between the ages of 18 and 35. Every participant brought with them a unique perspective as a result of their backgrounds and life experiences.

61% of the program participants were women, compared to 28% in the STEM workforce as a whole (National Science Foundation, 2010). These women also represented a variety of groups usually underrepresented in the sciences.

14% of the participants identified as Caucasian, which is the majority within the STEM workforce. In 2010, white men and women made up 69% of the STEM workforce, with only 31% of the workforce made up of all of the various ethnic minority groups present in the United States (National Science Foundation, 2010). The Mosaics in Science program has been very successful in encouraging an ethnically diverse group to become familiar with the National Park Service and to gain experience in a STEM field.

The Mosaics in Science program in 2014 also included veterans, participants from low-income families, first generation Americans, first generation in their family to seek higher education, recent immigrants, person with a disability, and LGBT (lesbian, gay, bi-sexual, and transgender) people.



*Other underrepresented minority groups includes: American Indian/Alaska Native, Pacific Islander/Hawaiian Native, and two or more races.

Mosaics in Science participant (left) recording damage to underwater cultural resources.

Outcomes for the National Park Service

The Mosaics in Science program provides valuable resources and the completion of science projects for the NPS. These projects would not happen without the dedicated time of the program participants. In 2014 Mosaics in Science participants volunteered 9,264 hours of their time toward research, conservation and management, inventory and monitoring, and education and interpretation projects. Based on the 2013 Value of Volunteer time ($22.55/hour) (Independent Sector, 2014) the 2014 Mosaics in Science participants contributed $208,903 to the National Park Service through their dedicated work.

In addition to the monetary value of their contributions, the interns also provided valuable and lasting resources, and their projects led to positive outcomes at the parks. Examples of the resources and outcomes resulting from the Mosaics in Science projects in 2014 include:

- Paleontology information that will guide resource management;
- New resources for a cave management program;
- Documents to educate non-geology park staff on geological resources;
- Educational workshops and tours;
- Updated water quality information;
- Archaeology condition assessments;
- Improved science and climate change resources and communication with the public;
- GIS viewshed impact monitoring tools; and
- Expanded plant nursery and propagation protocols.

All of the NPS staff that took part in the program evaluation felt that their park would benefit from further involvement in the Mosaics in Science program.

Mosaics in Science Participants and the Public

Through their work, the Mosaics in Science participants also have an impact on the general public, their appreciation for STEM fields, and their use and appreciation of America's public lands. Many of the participants' projects included public outreach, interpretation, and education. Many more of the participants interacted with park visitors in the course of their work. Based on numbers provided in the 2014 final evaluations, Mosaics in Science participants interacted with 5,172 people visiting national parks. The work that the Mosaics in Science participants complete also affects the long-term research, conservation, and management of their host national park, and indirectly affects all of the members of the public that visit that location.

Mosaics in Science participant (left) with students collecting data on the size and species of invasive fish.

Preparing for the Next Step

The 2014 Mosaics in Science Career Workshop & Supporting Early Careers

The 2014 Mosaics in Science Career Workshop took place from August 4–7, in Washington, D.C. Attendance at the workshop is mandatory for all participants. The cost of travel to and from the workshop and hotel and meals were covered by the program. The objectives of the Mosaics in Science Workshop were to:

- Provide the participants with an opportunity to meet and network with each other and with professionals from the NPS and DOI;
- Provide participants with the experience of presenting their work to other professionals; and
- Provide participants with the tools to successfully apply for jobs in the STEM workforce and within the federal government in particular.

Workshop activities began with a group dinner on the evening of Monday, August 4th, with career-related activities taking place on Tuesday, August 5th, and Wednesday, August 6th.

The career-related activities begin with a sharing circle, where participants had the opportunity to introduce themselves and briefly introduce their project. The participants were given a worksheet to guide their participation in the sharing circle, and were asked to complete the following sentences:

1) I expected to learn/accomplish/improve;
2) Though I did not expect to I learned/accomplished/improved;
3) Since my internship I have been thinking about; and
4) The things that I have gained will help me in my future by/because.

A career exploration panel allowed current professionals within the NPS to share their experiences with the participants and give insight into what steps to take to work toward their career goals. After the panel discussion, participants were split up into groups led by one of the panelists in which a more in-depth discussion occurred, and participants could ask questions regarding their specific career objectives.

A major component of the career-related activities were oral and poster presentations given by the participants, focused on the project that they worked on throughout the summer. The purpose of these presentations was to encourage the participants to reflect on the purpose and outcomes of their work and provide them with an opportunity to practice delivering scientific, conference-style presentations to a small audience of peers.

During the career-focused section of the workshop, participants also had an introduction to Youth Programs in the National Park Service and an introduction to the Institute for Broadening Participation. On Wednesday morning, participants heard about how to acquire a federal job and use the USAjobs website. Throughout all of these activities, the participants were given the opportunity to network with visiting NPS and STEM professionals.

Participants attending a talk about applying for federal jobs.

The most significant meeting that the participants had was an opportunity to meet with Sally Jewell, Secretary of the Interior. During this meeting, Secretary Jewell gave a brief introduction to her focus on youth, getting young people outside, and caring for the country's natural resources. She then asked the participants to share with her what they thought could be improved within the NPS after their summer working in the parks. The Mosaics in Science participants shared some valuable insights into how different departments within the parks could work better together. At the end of the meeting, Secretary Jewell was presented with a Mosaics in Science bag, t-shirt, and patch, as well as some information about the program. The meeting with Secretary Jewell was the highlight of the career workshop for most of the 2014 Mosaics in Science participants.

2014 Mosaics participants with Secretary Jewell.

"Gathering every morning at the Department of the Interior and getting the opportunity to hear Secretary Sally Jewell speak has really personalized the idea of government for me, made me think more consciously about my civic duties, and how I can contribute more to my community and to the ideals of the National Park Service."

—Nyambura Njagi, Manassas National Battlefield Park

Because many of the participants had never visited Washington, D.C., opportunities to visit NPS sites on the National Mall were also included in the workshop. These activities gave the participants a chance to relax and see the city. These activities also related to the NPS mission, DOI purpose, and STEM careers. This year, participants received a guided tour of the National Mall and monuments led by NPS rangers and a behind the scenes tour of a few areas of the Smithsonian Museum of Natural History.

An evaluation of the workshop was completed by the participants in the interest of ensuring that the workshop is imparting the skills and knowledge that are important for the participants, and for improving the workshop content. Based on participant responses, the 2014 Mosaics in Science Workshop was an overall success. The length of the workshop was the attribute with which the participants were most displeased. Many felt that it was rushed and that more time could have been focused on the participant's presentations. To address this feedback, the workshop will be extended to 4 full days. Despite feeling that some activities were rushed, 80% of the participants felt that the workshop's contribution to their job search skills and increased confidence to seek and obtain a STEM career exceeded their expectations or was outstanding. 90% of participants felt that the Career Workshop exceeded their expectations or was outstanding, and none of the participants felt it was unacceptable or poor.

Supporting Early Careers

> "I feel as if this opportunity itself kick-started my career. I have no doubts about what the future holds."
>
> —*Sydney Mathis, Valley Forge National Historical Park*

Undergraduate studies, graduate studies, and the first five years of the career of a STEM employee are crucial to their continued engagement in the STEM workforce (Gonzales and Keane, 2011). It is therefore imperative that any program seeking to encourage a diverse STEM workforce also provides assistance to the program participants to help them successfully navigate their first experiences while building their career. In providing such valuable hands-on experience, the Mosaics in Science program aims to give its participants a working advantage when seeking jobs within the STEM workforce and jobs within the NPS. The career-focused activities that give the participants experience networking, presenting their work, and skills geared toward applying for jobs also aim to support participants' early careers. In addition to gaining on-the-job work skills, each participant was paired with NPS and Natural Resource Stewardship and Science Directorate (NRSS) mentors to help them gain experience networking and growing their technical and work skills.

Mosaics in Science participant leading a butterfly monitoring project, North Cascades National Park.

Mosaics in Science participant networking at the 2014 GSA Annual Meeting.

Mosaics in Science Success Stories

Ivan Carabajal

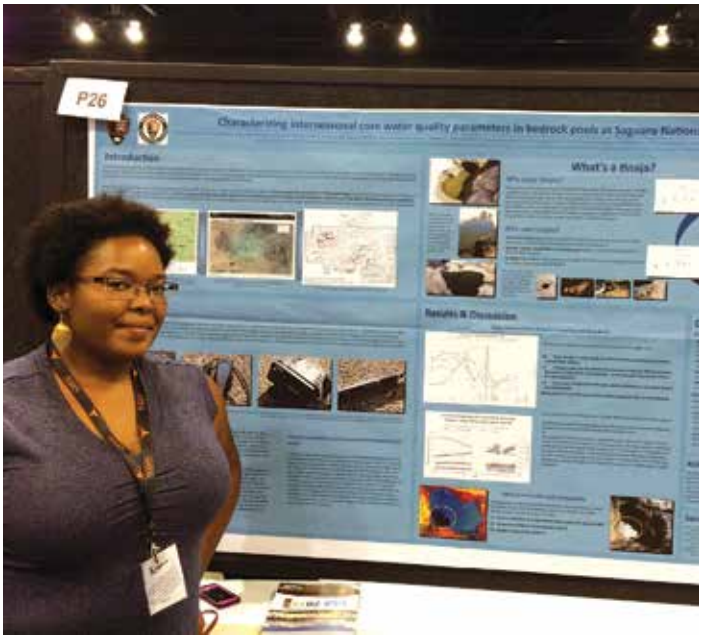
Ivan Carabajal was selected as a Mosaics in Science participant at Chesapeake and Ohio Canal National Historical Park during the summer of 2013 as a Hydrogeology/Wetland Scientist and Paleontologist. As a hydrogeologist, Ivan worked with the park to collect data for a wetland restoration project. Ivan also built on the paleontological work of a former Geoscientists-in-the-Parks/GeoCorps participant, spending significant time completing outcrop evaluations of the fossil resources in the park, collecting fossils where outcrops were at risk, and

Ivan Carabajal: Mosaics in Science Participant, Chesapeake and Ohio Canal National Historical Park, Summer 2013. GeoCorps Guest Scientist, Chesapeake and Ohio Canal National Historical Park, Fall/Winter 2013.

conducting an assessment of the geology and paleontology outreach at visitor centers along the canal. When his Mosaics in Science position ended, Ivan was selected for a GIP/GeoCorps Guest Scientist position at Chesapeake and Ohio Canal National Historical Park focusing on increasing visitor awareness of geological and paleontological resources. As part of his Guest Scientist position, Ivan was involved in training a new group of volunteers for a Paleontology Site Steward program at the park, dubbed the "Paleo Protectors." This new volunteer program has the potential to serve as a model for other parks wanting to monitor their paleontological resources. Ivan also decided to share his experiences as a Mosaics in Science and GeoCorps America participant by contributing to GSA's "Speaking of Geoscience" guest blog (http://geosociety.wordpress.com/2014/04/23/chesapeake-and-ohio-canal-national-historical-park-an-unexpected-place-for-some-unexpected-science/).

Kristan Culbert

Kristan Culbert was selected as a Mosaics in Science participant in 2013 at Catoctin Mountain Park. She returned to the Mosaics in Science program again in 2014 as a Desert Hydrology Research Assistant at Saguaro National Park and the Sonoran Desert Network. Kristan's work for her second Mosaics in Science project focuses on monitoring tinajas, semi-perennial bedrock pools, in the Sonoran Desert. Tinajas are important water sources and vital habitats within the desert. They are threatened by urban sprawl, groundwater depletion, climate change, and wildfires. Kristan's work is monitoring changes in the water quality in the tinajas to inform on how climate change is affecting groundwater in Saguaro National Park. Her work looked so promising early on in her Mosaics in Science project that a GeoCorps/GIP Guest Scientist position was created to extend the project. Kristan was offered the position and started this fall. Her important work monitoring tinajas and groundwater quality will continue for the next year. Kristan presented her work at the 2014 GSA Annual Meeting in Vancouver, Canada.



Kristan Culbert: Mosaics in Science Participant, Catoctin Mountain Park, Summer 2013. Mosaics in Science Participant, Saguaro National Park, Summer 2014. GeoCorps Guest Scientist, Saguaro National Park, Fall/Winter 2014.

The Future of Mosaics in Science

The future of Mosaics in Science lies in its participants and partners. The main goal of the Mosaics program is to introduce diverse youth to STEM careers in the NPS. In the coming years, the program hopes to increase the number of participants, program value, and projects within the National Park Service. To achieve these goals, the program will need additional partners and sustainable funding.

Mosaics in Science participant receiving training from a project partner at the USGS.

Short-Term Goals

Mosaics in Science plans for next year (federal fiscal year 2015):

- Creating a Natural Resources Stewardship and Science Directorate (NRSS) youth team that will work together to expand and enhance all NRSS youth programs including Mosaics in Science;
- Expanding the Mosaics in Science Program to include all natural resource disciplines;
- Increasing the age limit to participate in the program to 35 years old (as per guidance from the Youth Programs Division);
- Increasing the number of participants to 26;
- Restructuring the Mosaics Career Workshop to accommodate a larger group;
- Expanding the length of the career workshop to four full days;
- Addressing standards for learning goals and objectives, mentoring plans, and mentorship guidelines with each park participating in the program;
- Working with the Youth Programs Division to develop a mentoring handbook;
- Formalizing the NRSS and park mentoring component by requiring parks to sign a mentoring agreement;
- Developing online webinars and written materials to help interns apply for and obtain a federal job; and
- Seeking the Direct Hire Authority under the Public Land Corps Act for the program.

Long-Term Goals

The long-term goal of the program is to develop the participants' technical and leadership skills with the intent of hiring the best and brightest participants into careers with the NPS. By focusing the program on training and hiring diverse youth in the STEM fields, the demographics of the NPS workforce will change over time to better reflect the diversity of the U.S. population.

Mosaics in Science Organizational & Financial Overview

Structure and Staffing

The Mosaics in Science program was developed by the National Park Service Geologic Resources Division in conjunction with The Geological Society of America. The program is administered jointly between the NPS Geologic Resources Division and GSA. The roles and responsibilities of the NPS Geologic Resources Division and GSA are as follows:

Lisa Norby, NPS Mosaics in Science Program Manager, is responsible for:

- Preparing and issuing the call for project proposals;
- Working with park staff to identify science needs and develop a position description;
- Coordinating a NRSS panel to select internships and notifying parks of the selections;
- Managing program financial assistance agreements, cooperative agreement and annual task agreement (obligation of program funding);
- Budget tracking and payment of invoices to GSA;
- Maintaining and updating the program database and websites;
- Responding to Washington Support Office requests for program information;
- Responding to parks' questions and resolving issues related to participants' performance of duties and injuries; and
- Organizing and facilitating the Career Workshop in collaboration with GSA.

Matt Dawson, Education and Outreach Program Officer, and Allison Kerns, Education and Outreach Assistant, are responsible for:

- Maintaining and updating the Mosaics in Science website and program materials;
- Reviewing position descriptions for completeness and troubleshooting position descriptions with supervisors/technical coordinators;
- Recruiting qualified applicants;
- Distributing completed applications to park supervisors;
- Completing participant agreements and other required paperwork;
- Paying stipends, housing, and arranging travel for participants;
- Troubleshooting with Mosaics in Science participants;
- Developing, managing, and distributing online program evaluations;
- Coordinating the logistics for the Career Workshop; and
- Preparing the annual report in coordination with the NPS Geologic Resources Division.

Financial Overview

To date, the Mosaics in Science Program has been funded primarily by the NPS Youth Programs Division ($150,000 in both 2013 and 2014). In 2014, the National Park Foundation also provided $60,000 for an additional six internships. It is anticipated that the Youth Programs Division will continue to fund the program in the future.

The value of the Mosaics in Science participants' volunteer time (see page 12 of this report) is considered GSA's in-kind contribution to the program.

How to Get Involved

Aspiring Participants

The Mosaics program, through GSA, has an established a successful recruiting plan to attract diverse applicants. GSA conducts nationwide recruitment to find qualified and motivated participants to carry out the duties as outlined in the project descriptions. The position descriptions are posted on the Mosaics in Science website: http://www.geosociety.org/mosaics/.

To be eligible to apply for the Mosaics program, candidates must be

A member/affiliate of one of the following organizations:

- The Geological Society of America (GSA): http://www.geosociety.org/;
- The National Park Service (NPS) Geological Resources Division (GRD), GRD Mosaics in Science : http://nature.nps.gov/geology/mosaics/index.cfm;
- The National Park Service (NPS) Youth Programs Office: http://www.nps.gov/gettinginvolved/youthprograms/index.htm;
- The National Hispanic Environmental Council (NHEC): http://nheec1.org/;
- The College Success Foundation (CSF): http://www.collegesuccessfoundation.org/; and/or
- Minorities in Agriculture, Natural Resources and Related Sciences (MANRRS): http://manrrs.org.

A member/affiliate of another diversity-oriented organizations or program, such as:

- SACNAS (Society for Advancement of Chicanos and Native Americans in Science);
- AISES (American Indian Science and Engineering Society);
- NABG (National Association of Black Geoscientists);
- IBP (Institute for Broadening Participation);
- MS PHD's (Minorities Striving and Pursuing Higher Degrees of Success in Earth System Science);
- AIHEC (American Indian Higher Education Consortium);
- HACU (Hispanic Association of Colleges and Universities); and/or
- HBCU (Historically Black Colleges and Universities).

Referred by a minority organization, agency staff, or college professor.

Eligible candidates should contact GSA for application login information at mosaics@geosociety.org.

Mosaics in Science program updates are posted on the GSA Mosaics in Science website (http://www.geosociety.org/mosaics), the NPS Mosaics in Science website (http://nature.nps.gov/geology/mosaics/index.cfm), the GeoCorps Facebook page (www.facebook.com/geocorps), the GeoCorps Twitter feed (www.twitter.com/geocorps), the main GSA Facebook page (www.facebook.com/GSA.1888), and the main GSA Twitter feed (www.twitter.com/geosociety).

National Parks Interested in Participating

In late summer of each year a call for proposals is shared with all NPS staff seeking to be considered for the Mosaics program for the following year. Prospective parks upload their position descriptions to the GSA website. A panel of NRSS staff then reviews position descriptions. The highest ranked project proposals are selected based on established criteria, and a position is created for the following summer.

Since the establishment of the Mosaics program in 2013, thirty park units have participated in the Program. Some parks (Florissant Fossil Beds NM, National Capital Parks–East, and Prince William Forest Park) have hosted Mosaics in Science positions in both years. However, a park can only be granted

funding for one Mosaics in Science position per year. It is possible for positions to be associated with more than one park.

If a park is interested in hosting a Mosaics in Science position and would like more detailed information about the application and selection process, it should contact:

Lisa Norby,
Chief, Energy and Minerals Branch
Geoscientists-in-the-Parks and Mosaics in Science
Program Manager
Geologic Resources Division
National Park Service
lisa_norby@nps.gov

Matthew Dawson
Education and Outreach Program Officer
The Geological Society of America
mdawson@geosociety.org

Aspiring Partners and Donors

The Mosaics in Science program welcomes the partnership and support of any diversity, STEM, natural science, or other organization interested in nominating candidates or sponsoring a Mosaics in Science position.

Organizations or individuals interested in nominating a candidate, or in contributing funds to sponsor a Mosaics in Science position, should contact:

Matthew Dawson
Education and Outreach Program Officer
The Geological Society of America
mdawson@geosociety.org

Mosaics in Science participant taking a break from butterfly monitoring.

Acknowledgements

The Mosaics in Science program received support from a variety of dedicated and enthusiastic people and groups. Without their generous donations of commitment, time, and funding, the contributions to the STEM field that the Mosaics in Science program makes would not be possible.

Thank you to all of our participants, mentors, partners, and donors for your generous and greatly appreciated support!

Participants

Jeneva Wright, Archaeological Impacts of Climate Change, Biscayne National Park

Jeneva Wright graduated with a Bachelor of Arts degree in history from the University of Montana. She is currently a student at East Carolina University where she is studying for her Master of Arts in maritime archeology. As the child of two National Park Service scientists, Jeneva grew up having an interest in exploration and adventures. She is an avid SCUBA diver and is fascinated by the oceans, particularly maritime history and submerged cultural resources. Her previous research has focused on the development of public outreach programming for underwater archaeological sites. Past projects have included the documentation of Great Lakes shipwrecks, excavation of the presumed flagship of Blackbeard, and work on Civil War blockade-runners off North Carolina's coast. Jeneva's responsibilities at Biscayne National Park included the documentation, surveying, and monitoring of imperiled archaeological sites. Her project will provide additional information in order to manage the impacts of climate change to these non-renewable cultural resources.

Binal Rana, Field Research Technician, Congaree National Park

Binal Rana is a native of India and a recent graduate of Rutgers University, where he studied Civil and Environmental Engineering. His previous work experience includes being the building manager for the recreation department at Rutgers University. Last year, Binal was the project manager for the Rutgers Concrete Canoe Team under the Rutgers Chapter of the American Society of Civil Engineers and successfully created a floating concrete canoe. Binal's interests include hydrology and hydraulics, being outdoors, and watching football, basketball, and cricket. As a Field Research Technician at Congaree National Park, Binal worked on an educational workshop focusing on effective ways to communicate science to students, assisted in the inventorying of the number of champion trees that are still standing in the wilderness, and collected samples for a hydrology monitoring project at Weston Lake.

Rachel Lopez, Speleologist, Coronado National Memorial

Rachel Lopez is a recent graduate of the University of Arkansas in Little Rock. She earned a Bachelor of Science degree in Geology and a Bachelor of Arts degree in Spanish. As an undergraduate, Rachel enjoyed being a teaching assistant and conducting research. Her current research involves streamlining the synthesis process of forsterite, a member of the olivine mineral group, and creating different types of the mineral. In the fall, Rachel will be working toward her Ph.D. in geology at Notre Dame. Rachel's interests include hiking and camping—preferably in the Rocky Mountains. At Coronado National Memorial, Rachel was responsible for reviewing, amending, and implementing the new cave management plan. She was also involved in the removal of graffiti and trash from caves and the collection of baseline data for the three of the main caves at the park.

Yeyzy Vargas, Water Quality Research Assistant, Cuyahoga Valley National Park

Yeyzy Vargas graduated in May 2014 from the University of Illinois at Chicago (UIC), with a Bachelor of Science degree in biology and a minor in earth and environmental sciences. She has worked with the Summer Research Opportunities Program at UIC; The Restore Project: Environment, Culture, and Conservation; and the Department of Pharmacology College of Medicine at UIC. Yeyzy has presented her research, which focuses on regional bee and pollinator biodiversity, at a Committee on Institutional Cooperation event for higher learning at Ohio State University, and she has co-lectured on regional bee/pollinator biodiversity at the Chicago Cultural Center and Wild Things: A Chicago Wilderness Conference for People and Nature. At Cuyahoga Valley National Park, Yeyzy was

responsible for validating a model that will provide near-real-time information regarding the water quality of the river. This model predicts the concentrations of E. coli and can provide visitors with the information needed to assess the recreational water quality risks of the river.

Chelsea Lewis, Digital Research Communicator, Denali National Park

Chelsea Lewis graduated in May 2013 from Hamilton College with a Bachelor of Arts degree in Geoarchaeology. She has had an interest in geology since she visited Yellowstone National Park when she was six. Chelsea was drawn to geology and archaeology as an undergraduate and worked on several interdisciplinary projects using geochemistry to source lithic artifacts and track the movement patterns of paleolithic people. In her free time, Chelsea enjoys running, horseback riding, and rugby. She is a park enthusiast and hopes to one day work for the National Park Service or a partner organization. Chelsea was responsible for aiding Denali National Park in achieving their education-related goals. She conducted school field trips, worked on the Denali Discovery Camp, and developed an interpretive program for children.

Roxanne Pourshoushtari, Bat and Cave Biology Research Assistant, El Malpais National Monument

Roxanne Pourshoushtari is an undergraduate in the wildlife program at Purdue University. Her undergraduate studies focus on bat research. She held a position as a technician with a consulting firm conducting mist-netting and acoustic surveys. While working at a rehabilitation center for flying foxes in Australia she gained experience with megabats. In her free time, Roxanne enjoys hiking, rock climbing, and various water activities. At El Malpais National Monument Roxanne was responsible for conducting population estimates on the Brazilian free-tailed colony that roosts in Bat Cave. She also monitored the population of bats in back country areas of the El Malpais National Monument, and informed the public about bat and cave biology.

Gabriella Rossetto, Paleontology/Museum Assistant, Florissant Fossil Beds National Monument

Gabriella Rossetto is a junior majoring in geology with a minor in anthropology at Colorado College in Colorado Springs and is currently working on her senior thesis. Her research involves the study of volcanic tuff and ash of the Florissant Formation to understand the elevation during Late Eocene time. Gabriella is passionate about education and museum studies. She hopes to continue research in paleontology and go on to earn a Ph.D. In her free time, Gabriella enjoys backpacking, traveling, rollerblading, skateboarding, and teaching Spanish to elementary school children. Gabriella's project at Florissant Fossil Beds National Monument was the inventory and monitoring of paleontological resources at the Monument. She was responsible for photographing, evaluating, and documenting different paleontological sites in order to better protect these resources.

Madeleine Pluss, Natural Resources Intern, Fort Union National Monument/Pecos National Historical Park

Madeleine Pluss is attending the University of Colorado and is pursuing a bachelor's degree in geography and environmental science with a minor in geology. She hopes her studies of natural hazards and resource management will take her to New Zealand and Iceland. Her goals are to be able to use her background to offer assistance for management in the use of mitigation strategies for areas prone to geologic hazards and to support the well-being of at risk populations. As a Colorado native, Madeline can most likely be found outside exploring the mountains, rock climbing, hiking, mountaineering, skiing, slack lining, or trail running. Madeline also enjoys teaching yoga, traveling, painting natural landscapes, and supporting local music. Madeleine investigated salient exotic plant species at Fort Union and Pecos, evaluated the most imposing populations, and surveyed the density, phenology, and growth of native plants. The goal of her study was to highlight volatile areas and emphasize target areas for mitigation and treatment.

Anton Yelk, Interdisciplinary Science and Education Technician, Grand Teton National Park

Anton Yelk is attending the University of Wisconsin–River Falls and is pursuing a degree in geology with a minor in hydrogeology. He was the treasurer for the university's Geology Club from 2012–2014. After graduation, Anton hopes to pursue a career in geology and ultimately return to school to earn master's and doctorate degrees. Eventually, he hopes to conduct research and teach at a university. Anton has participated in the work-study program offered by the University of Wisconsin college system and has been a teaching assistant for a number of semesters. Anton's responsibilities at the Grand Teton National Park included assisting the Education and Outreach Program with planning and developing field science based programs for high school students. He also assisted in drafting preliminary protocols for inventory and monitoring of invasive species and documenting locations of species and water conditions.

Kaytan Kelkar, Paleontology Inventory Assistant, Great Basin National Park

Kaytan Kelkar is a recent graduate in geology from the University of California at Riverside, and wants to pursue a master's degree. His scientific interests lie in stratigraphy, volcanology, and glaciology. He is a member of The Geological Society of America and has a long-term goal to be employed as a geologist with a well-established company. His hobbies are hiking, swimming, and playing soccer. Kaytan wants to remain involved in research and was fortunate to conduct research in a biogeochemistry lab during his undergraduate studies. As a

Paleontology Inventory Assistant at Great Basin National Park, Kaytan was responsible for updating the park's on-going paleontological inventory by prospecting known fossil localities and scouting potentially fossiliferous areas.

Salvador Amador, Phenology Monitoring & Climate Change Intern, Guadalupe Mountains National Park

Salvador Amador is a geology student at Austin Community College and will be graduating in June 2015. His career goals include working for the National Park Service in different parks so that he can gain new cultural experiences, learn about new places, and meet new people. In his spare time, Salvador enjoys the outdoors and hiking. Salvador's responsibilities at Guadalupe Mountains National Park included the development of a phenology-monitoring citizen-science program for the park. He used Nature's Notebook, which is part of the National Phenology Network, to provide an application that allows visitors to make phenological observations of the different fauna they encounter.

Stephen Roethle, Natural Resources Assistant, Hopewell Culture National Historical Park

Stephen Roethle recently graduated from Western New Mexico University where he majored in biology and minored in geology. Prior to attending the university, Stephen was enlisted in the U.S. Coast Guard. Stephen is a self-proclaimed science junkie and enjoys mountain biking, exploring the backcountry, and enjoying the diverse biological and geological wonders in New Mexico. His work at Hopewell Culture National Historical Park this summer included studying the Emerald ash borer beetle, an invasive beetle that has made its way in to Ohio, and seeing the effects created by the recent polar vortex. Stephen worked as a Biological Technician in the natural resources department of the Park. His primary focus was invasive species management.

Sarina Patel, Science Communications Assistant, Lava Beds National Monument

Sarina Patel is currently a student at Middlebury College where she is studying geology and environmental studies. Her interest in geology began when she read a book about volcanoes and became hooked on the subject. Though her interests have since expanded to a wide variety of geologic processes, volcanoes and other things that go 'boom' remain her biggest soft spot. Sarina plans to go into natural hazard and disaster management, and use geoscience (in combination with fields like engineering, sociology, and law) to make a life-saving difference. In addition to playing with rocks, she enjoys writing novels, sketching and painting, and doing pretty much anything outdoors. Sarina helped implement an Inventory and Monitoring (I&M) protocol at Lava Beds National Monument, to be used for the next fifty years, designed to track the changes wrought on caves ecosystems as a result of climate change and human visitation. She also produced materials to help park staff learn more about the geology of the park and better educate the public.

Nyambura Njagi, GIS/Viewshed Technician, Manassas National Battlefield Park

Nyambura Njagi is a recent graduate of the Geospatial Surveying Engineering Program at Texas A&M University, Corpus Christi (TAMUCC), where she earned a master of science degree in geographic information systems (GIS). Her health-science related thesis, titled "Driving factors of obesity in South Texas," explored spatial access to physical activity opportunities in Corpus Christi, Texas. In the fall, Nyambura will pursue further studies in GIS in the Ph.D. program at the University of Texas at Dallas. Her career goal is to become a professor of GIS technology. Nyambura was an active member of the GIS Student Organization at TAMUCC and regularly participated in GIS volunteer events such as GIS Day and TAMUCC Island Days to help spread the word about GIS and the GIS programs at TAMUCC. Nyambura was responsible for creating a viewshed model at Manassas National Battlefield Park to predict where proposed developments in the area would be visible using high-resolution LiDAR data and GIS.

Justin Tran, Science Engagement Specialist, North Cascades National Park

Justin Tran is a first generation Asian-American who just finished his first year at the University of California, Santa Barbara (UCSB). He is studying earth science with an emphasis on geophysics. Justin is a newly initiated member of the Cal Gamma chapter of Sigma Phi Epsilon, an events coordinator at UCSB Campus Conference Services, and a member of the Excursion Club. He is studying the Deepwater Horizon Oil Spill under the direction of Dr. Dave Valentine, professor of oceanography. In the summer of 2015, he plans to travel with Dr. Valentine to the Gulf of Mexico for continued research on the Gulf oil spill. In his free time, Justin enjoys playing the guitar, photography, and fishing. Justin documented the interdependence between butterflies and wildflowers at North Cascades National Park in order to provide conclusive evidence to describe how climate change is affecting the park. He was also responsible for encouraging visitors to get involved in surveys and served as a liaison between the park's research and interpretive divisions.

Alianora Walker, Cave and Karst Interpreter, Ozark National Scenic Riverways

Alianora Walker graduated from Smith College in May 2011, where she earned a bachelor of arts degree in geosciences. Growing up in the high Sierras and close to the San Andreas Fault inspired her interest in plate tectonics and the challenges of living safely in dynamic landscapes. Last summer, she worked as an interpreter in Sequoia and Kings National Park's Crystal Cave, where she used her theatre skills to share caves

and karst with park visitors. She is currently the vice-chair of the Redwood Grotto, which is California's youngest National Speleological Society caving club. At Ozark National Scenic Riverways, Alianora worked on education and outreach projects, continuing to use her theatre skills to teach park visitors about caves and karst and regional geology.

Shelby Matsuoka, Paleontologist, Petrified Forest National Park

Shelby Matsuoka graduated from San Diego State University in May 2014 with a bachelor's degree in geology with an emphasis on paleontology. Her interest in vertebrate paleontology started when she first watched *Jurassic Park* as a little girl. She is a member GSA and the Phi Kappa Phi Honor Society. Shelby first learned about GeoCorps and the Mosaics in Science programs through GSA's On To the Future program. She was encouraged by her professors to apply to participate in Mosaics in Science. Shelby was in charge of collecting a specimen called Desmatosuchus at Petrified Forest National Park, which was previously recorded but had not been collected, and was responsible for preparing the specimen for inclusion in the park's collections.

Darius Naraine, GIS Technician, Prince William Forest Park

Darius Naraine is a junior at East Carolina University where he is working toward a bachelor of science degree in applied geography with a minor in geology. Upon graduation, Darius hopes to work in the field of GIS. He was drawn to the Mosaics in Science program because the project involved GIS and GPS, his two favorite courses he took in college. Darius enjoys spending time at the lake or beach where he can swim and kayak. Darius was assigned to collect GPS coordinate points of all concrete trail post signs (TPS) at Prince William Forest Park and to create individual site maps of all the TPS. He also worked on a variety of other projects, collecting data and making maps of the TREC Campground, RV Site Pad, Jurisdictional Inventory, and Chopawamsic Backcountry Parking Lot.

Kristan Culbert, Desert Hydrology Research Assistant, Saguaro National Park

Kristan Culbert graduated from the University of Southern California with an undergraduate degree in earth sciences and a minor in peace and conflict studies. She is on leave from her positions as Project Coordinator at Inland Empire Waterkeeper, a non-profit organization committed to protecting the Santa Ana River Watershed, and as a Saturday Academy Chemistry Teaching Assistant for USC's Neighborhood Academic Initiative. After completing her project, she hopes to continue working at a nonprofit or for the National Park Service. Kristan's hobbies include hiking, baking, reading, sailing, and exploring Los Angeles' vibrant food and music scene. Kristan was responsible for monitoring the water quality of the tinajas at Saguaro National Park. Her data will provide a better understanding of how climate change is affecting surface and groundwater in the park.

Graham Crawbuck, Prairie Restoration Assistant, San Juan Island National Historical Park

Graham Crawbuck is a sophomore at the George Washington University studying public health and Spanish. He assisted in the creation of the new San Juan Islands National Monument, which designated 1,000 acres of land administered by the Bureau of Land Management as National Conservation Lands. Graham has previously worked as a research assistant at the University of Washington Friday Harbor Marine Laboratories, conducting research on the local seagrass species. This internship, coupled with his family's background in botanical research, prompted him to continue studying the flora of the Pacific Northwest. As a Prairie Restoration Assistant at San Juan Island National Historical Park Graham was responsible for the expansion of a native plant nursery. He established a schedule for nursery propagation for the next two years. He also created a native plant propagation guide, which provides information on the planting of certain native prairie species.

Sydney Mathis, Natural Resource Conservation Assistant, Valley Forge National Historical Park

Sydney Mathis is currently a student at Humboldt State University where she is studying Environmental Management and Protection. Upon graduation, Sydney wishes to become a park ranger for California state parks. Her focus is to promote and spread environmental awareness and conservation to those who are less likely to be informed. Working in Valley Forge National Historical Park was her first experience working in the field other than class field trips in the Humboldt area. During her Mosaics in Science project Sydney Mathis created a GPS map of invasive plant species within the park which will be used to assess park resources.

Mentors

National Park Service staff who are acting as mentors for participants are providing invaluable guidance and work experience to our participants. Thank you for your time and dedication!

Park Mentors:

Elsa Alvear

Gorden Bell

Denny Capps

Colette Carmouche

Martin Christiansen

Janet Coles

Tammi Corchero

Bryan Gorsira

David Hays

Frank Henning

Kate Jensen

Megan Kohli

Charles Lawson

Jason Mateljak

Sierra McLane

Kathy Mellander

Herb Meyer

Nancy Nordensten

Conni O'Connor

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William Monahan

Jason Kenworthy

Richard Neubauer

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Nicholas Fisichelli

Pete Penoyer

Pat Mangan

Karen Trevino

Samuel Fox

Megan McKenna

Vince Santucci

Alan Ellsworth

Jennifer Back

Jennifer Sieracki

Karl Brown

Partners and Sponsors

The partners and sponsors of the Mosaics in Science program provide invaluable support and funding. Their support allows this program to give our participants work experience, training, and skills, and the parks with much needed research and resources.

George McDonald discussing the history of the Secretary of the Interior's office.

National Park Service Youth Programs Division

In addition to providing the majority of the funding for the Mosaics in Science program, the National Park Service Youth Programs Division staff are also an invaluable resource, providing guidance on ways to continue to improve the program and support during the Mosaics in Science Career Workshop. Thank you to the WASO Youth Programs Division. Without you this program would not be what it is! Particular thanks to

George McDonald, Division Chief, NPS Youth Programs Division

Alex Tremble, Program Analyst, NPS Youth Programs Division

Courtney Goulding, Youth Programs Assistant, NPS Youth Programs Division

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Projects sponsored by the National Park Foundation:

- Speleologist, Rachel Lopez, Coronado National Memorial (Arizona)
- Phenology Monitoring & Climate Change, Salvador Amador Guadalupe Mountains National Park (Texas)
- Natural Resources Assistant, Stephen Roethle, Hopewell Culture National Historical Park (Ohio)
- Paleontologist, Shelby Matsuoka, Petrified Forest National Park (Arizona)
- Prairie Restoration Assistant, Graham Crawbuck, San Juan Island National Historical Park (Washington)
- Natural Resources Intern, Madeleine Pluss, Fort Union National Monument and Pecos National Historical Park (New Mexico)

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If you have questions regarding Mosaics in Science, go to www.nature.nps.gov/geology/mosaics/ or www.geosociety.org/mosaics

e-mail mosaics@geosociety.org or call +1-303-357-1000

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