Research Learning Centers
Annual Report 2019

National Park Service
U.S. Department of the Interior

Natural Resource Stewardship and Science
Washington, D.C.

Cabrillo Hosts Cutting-Edge Genetics Research


NPS PHOTO

Collecting leaf samples for genetic analysis at Cabrillo NM.

Maria leaned back from an agave leaf and took a break from collecting samples to wipe the sweat from her forehead. She gazed at the glittering Cabrillo National Monument coastline and a view that encompasses Mexico and the Coronado Islands. Maria and three other high school students were helping understand genetic diversity of Shaw's agave in collaboration with the Boz Life Sciences Research and Teaching Institute and the **Southern California RLC**.

The endangered agave grows only in coastal southern California and northern Mexico. It has declined because of human activities and natural erosion. Managing this species—including a population in the park that was established in the 1970s with transplants from unknown sources—depends on knowing how genetically variable are the plants and soil microbes that provide nutrients, and how populations are related to each other.

Boz Institute researchers, with Maria and other students, collected samples from plants and soil in the park. They sequenced the DNA of the plants and compared them to sequences from the San Diego Navy Base (U.S.), the border crossing (U.S.), Rosarito (Mexico), and Arroyo Hondo (Mexico). Their analysis showed agaves in the park are genetically diverse and more similar to agaves in Mexico than to other, recently-extirpated, U.S. populations. This result means that park managers do not need to translocate plants or pollen from Mexico. They can instead focus on supporting pollinators or other local factors that may help the park population grow. The study will be submitted to the peer-reviewed journal Molecular Ecology this spring.

Collaboration among the park, Boz Institute, and the Southern California RLC enabled this research. And it let Maria and her peers gain experience that fosters their identities as scientists. Their efforts to understand local biodiversity help conserve it for everyone.

Coordinator's statement

The Research Learning Centers (RLCs) launched at the close of the last millennium. In the intervening two decades they have undergone a sort of adaptive radiation as each evolves to its local environment of needs, opportunities, parks, programs, resources, and people. In 2019, as in all past years, they continued to excel at promoting and facilitating research, learning, and public engagement with science in national parks. This year's newsletter tells some of their recent accomplishments.

But in some ways the value of RLCs today is best demonstrated by the emergence of new ones, even 20 years after the network began. We welcome the brand-new Jemez Mountains RLC, established in January 2020 by Bandelier National Monument, Valles Caldera National Preserve, and the U.S. Geological Survey. We're delighted to see a new RLC fill an otherwise unoccupied niche!

Tim Watkins
RLC Coordinator
February 28, 2020

Inside...

Enticing Beaver Back to Rocky Mountain National Park

How can you encourage beaver to inhabit an area? Provide them with the habitat they need! Last September, the **Continental Divide RLC** worked with NPS staff and academic research partners to build four simulated beaver structures (SBS) along two streams in Rocky Mountain National Park. The SBSs are expected to slow the flow of water, create pools behind the structures, and allow for higher rates of sediment deposition within the pools. Ultimately, they are a tool for adding complexity to the streams, helping to restore wetlands and increase biodiversity within riparian areas. Also, they will create the wetland conditions that beavers love!

NPS PHOTO

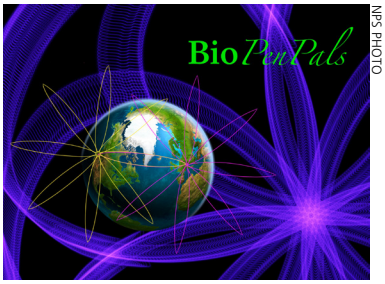
NPS staff and partners prepare a site for SBS installation.

The SBS project ties directly into the park's 2008 Elk and Vegetation Management Plan's guidance to restore habitat affected by elk over-browsing. The 5-year review of the plan found variability in willow response inside fences designed to keep elk out. With elk browsing pressure greatly reduced, the lack of positive response in some areas was concerning. Hydrological conditions, particularly low water tables, were suggested as the most likely reason. Beavers, or at least their dams, were recognized as a missing feature that could improve the wetlands. Beavers, however, were not returning to Rocky as quickly as hoped. The SBSs are expected to enhance wetland habitat, help natural restoration of willow, and eventually encourage beavers to again make these areas home.

NPS PHOTO

SBSs will act as beaver dams, adding complexity to the stream.

Sister Parks Initiate Distance Learning Project



NPS PHOTO

Crater Lake Science & Learning Center (CLSLC) staff worked with staff from Triglav National Park, Slovenia, to pilot a new distance learning, citizen science program called Bio*PenPals*. The project connects teachers and students internationally through iNaturalist observations and journal entries. Students compare habitats and adaptations between species from their local park and their sister park while learning about the culture and language of their student counterparts. The CLSLC hopes the project grows to be replicated by schools across the globe. To facilitate the project, CLSLC Education Coordinator John Duwe traveled to Triglav National Park for technical exchanges in the summers of 2017 and 2019. Duwe met with teachers, students, and resource specialists to collaborate on projects and exchange ideas. For more information, go to: https://www.nps.gov/rlc/craterlake/biopenpals.htm

PHOTO: LUKA DAKSKOBLER

US and Slovenian students discuss their feelings about threats posed by invasive species in Triglav NP, Slovenia.

Engaging Underserved Youth in Park Science and Research

Navigating on hands and knees through a thick mat of tundra moss, a high school student picks up snowshoe hare scat pellets and counts them one by one - "...twenty-seven, twenty-eight, twenty-nine..." - before tossing them over her shoulder. Her partner ticks off each one on waterproof paper. With both laughter and scientific meticulousness, they search until they're satisfied that the quadrat is clear of droppings. Then they move down the line to the next plot. Next summer, another team of citizen scientists will repeat the procedure, with the aggregated data painting a picture of herbivore population trends in Denali through time.

Scat-counting is one of many field research activities that students in Denali Summer Science Academy (DSSA) get to participate in each year. DSSA is a four-day science camp led by NPS and Alaska Geographic staff through Denali's **Murie Science and Learning Center**. The goal is to put students alongside scientists to increase scientific knowledge of the park and encourage new park stewards. The program is offered at no cost for youth who lack the resources - social or economic - to visit a national park on their own. They come from Alaska Native tribes, foster care programs, and university student services organizations.

NPS PHOTO

Alaskan youth gain hands-on field experience through the DSSA.

NPS PHOTO

Students work along side park staff to clear a quadrat of snow-shoe hare scat pellets.

Said one student about the program, "It gave me insight into the national park system and some possible routes to gaining a career with them. ... I met scientists, I did scientific work, I met amazing people, I made amazing friends, and I explored a part of Alaska that lots of Alaskans have yet to see. I feel so lucky... to have seen the things I have seen."

Teachers Learn Science in the Parks

If you're a science teacher, few summer activities invigorate your work more than getting into the field to do research with scientists and fellow teachers. The **Ocean Alaska Science Learning Center** knows this, which is why they conducted a Floating Teacher Workshop in 2019. Eight Alaskan school teachers spent a couple of days at a hands-on teacher workshop in Seward, followed by 5 days traveling to field sites in Kenai Fjords National Park on a live-aboard boat. They were paired with researchers and got to learn what questions and hypotheses are important, how to lay out plots and collect data in coastal ecosystems, and why scientific information is relevant to park management. They were inspired by glorious mountains and glaciers, abundant wildlife, and the joys of investigating how nature works. After traveling through ocean swells and walking gingerly among mussel beds, one teacher said "You indeed connected content with experiences -- something I hope to do within my classroom." Workshop partners included the Southwest Alaska I&M Network, Prince William Sound Regional Citizens' Advisory Council, and Alaska Geographic.

NPS PHOTO

Learning science in the intertidal zone of Kenai Fjords NP

Research Learning Centers

Science and Learning Across the Nation

Crater Lake Science & Learning Center

Worked with 7 parks to complete the 3rd annual *Climate Connections* traveling teacher workshop.

Pacific Coast Science & Learning Center

93 research projects, The UC Field Station had over 400 users, and the PCSLC Field Station housed over 2000 person nights.

Southern California Research Learning Center

Multi-agency monitoring of one of the most productive peregrine falcon nests in southern California.

Murie Science & Learning Center

Alaskan youth learn bear safety during Denali Discovery Camp.

Ocean Alaska Science & Learning Center

Clean-up efforts reveal black bears play with marine debris.

Desert Research Learning Center

Studying the effects of climate change on adobe structures.

Crown of the Continent Research Learning Center

Citizen scientists collect mountain goat scat for genetic analysis.

Continental Divide Research Learning Center

Students teach park managers about the Lily Lake Phenology Walk, a citizen science project.

Jemez Mountains Research Learning Center

The National Park Service creates a brand new Research Learning Center!

Great Lakes Research & Education Center

Intern assisted a survey of genetically-distinct muskellunge at VOYA.

Schoodic Education & Research Center

Research fellows are trained in communicating science to visitors.

Atlantic Research & Learning Center

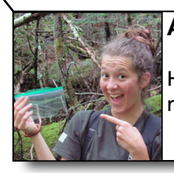
The 9th annual "Science in the Seashore"symposium presented diverse research on Cape Cod.

Urban Ecology Research Learning Alliance

14 University of Maryland interns wrote reports, created science stories, and engaged the public in science.

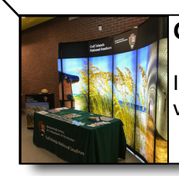
Old-Growth Bottomland Forest Research & Education Center

Hosted a NPS research management training for NPS staff from 15 offices.



Appalachian Highlands Science Learning Center

High school interns enjoyed salamander genomics research in Great Smoky Mountains NP.



Gulf Islands Research & Education Center

Interns hosted a career fair booth at multiple venues.

Developing Guidance for Innovations in Social Science Research

Social science research is critical for helping the NPS achieve its mission, but it can bring special permitting considerations. This is especially true with wondrous technology that helps us understand visitors but also raises legal and ethical questions.

Last year, the **Old-Growth Bottomland Forest Research and Education Center** (OGBFREC) received a permit application to make audiovisual recordings of visitors interacting with an augmented reality sandbox that supports geosciences learning. The proposed study raised concerns such as public notification, recording of children, media releases, commercial filming permits, social media content, 4th amendment issues for law enforcement surveillance, and data security. Lacking guidance for permitting this type of work, OGBFREC Director Dr. David Shelley reached out to WASO staff in the Special Park Uses, Social Sciences, and Research Permitting offices. Together they drafted guidance that can help other parks navigate the opportunities and challenges of this type of research.

In the end, the research was permitted. The guidance will be finalized and communicated through the NPS Research Permit and Reporting System. Dr. Shelley and his collaborators hope that the guidance will inform and inspire innovative research on park visitor activities.

National Park Service
U.S. Department of the Interior

Research Learning Centers

www.nps.gov/rlc/index.htm

Appalachian Highlands Science Learning Center
www.nps.gov/grsm/learn/nature/pk-homepage.htm

Atlantic Research and Learning Center
www.nps.gov/caco/learn/nature/arlc.htm

Crown of the Continent Research Learning Center
www.nps.gov/rlc/crown/index.htm

Continental Divide Research Learning Center
www.nps.gov/rlc/continentaldivide/index.htm

Crater Lake Science and Learning Center
www.nps.gov/rlc/craterlake/index.htm

Desert Research Learning Center
www.nps.gov/im/sodn/drlc.htm

Gulf Islands Research and Education Center
www.nps.gov/rlc/gulfislands/index.htm

Great Lakes Research and Education Center
www.nps.gov/rlc/greatlakes/index.htm

Murie Science and Learning Center
www.nps.gov/rlc/murie/index.htm

North Coast and Cascades Research Learning Center
www.nps.gov/rlc/northcoastcascades/index.htm

Ocean Alaska Science and Learning Center
www.nps.gov/rlc/oceanalaska/index.htm

Old Growth Bottomland Forest Research and Education Center
www.nps.gov/rlc/ogbfrec/index.htm

Pacific Coast Science and Learning Center
www.nps.gov/rlc/pacificcoast/index.htm

Southern California Research Learning Center
https://www.nps.gov/rlc/southerncal/index.htm

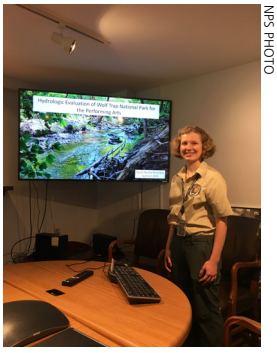
Schoodic Education and Research Center
www.nps.gov/rlc/schoodic/index.htm

Urban Ecology Research Learning Alliance
www.nps.gov/rlc/urbanecology/index.htm

This newsletter was developed by Tim Watkins, Carissa Turner, and John Duwe with input from NPS staff affiliated with all of the RLCs.

Modeling Stormwater Infiltration and Runoff

How do Research Learning Centers bring science expertise to park management? Each year the **Urban Ecology Research Learning Alliance** uses the Geoscientist in the Parks program to support a guest scientist who helps parks in National Capital Area, Region 1 find solutions to pressing management needs. In 2019 Sarah Paschal Gerenday, a university instructor and PhD student in hydrology, analyzed stormwater and its effect on resources at Wolf Trap National Park for the Performing Arts.



NPS PHOTO

GIP Sara Gerenday presents her findings to park staff.

Gerenday's project informs decision-making by outlining sub-basins in and around the park based on topography and surface characteristics. Using programs and databases such as United States Army Corps of Engineers' Hydrologic Engineering Center – Hydrologic Modeling System (HEC-HMS), Gerenday described and mapped sub-basin area and runoff for each area. Then she scaled stormwater discharge to sub-basin size. Her maps make obvious the relative contributions from each of the catchment areas in and around the park. Using her report park leaders can prioritize decisions based on most effective, easiest to accomplish, or most expensive approach relying on quantified stormwater runoff.