Greening STEM Case Study: Involving Students in a Real-World Land Management Project on Local Public Lands

The Project

The *Lost Carnivores Wildlife Monitoring and Citizen Science Project* is designed to engage professional and amateur scientists in hands-on investigation and on-the-ground data collection in Saguaro National Park and other natural areas in the Tucson Mountains in Pima County, Arizona. Originally launched in 2005, the Lost Carnivores Project was established to monitor five small carnivore species in the Tucson Mountains area: the Common Hog-nosed Skunk (*Conepatus mesoleucus*), the Western Spotted Skunk (*Spilogale gracilis*), the Striped Skunk (*Mephitis mephitis*), the Kit Fox (*Vulpes macrotis*), and the Common Raccoon (*Procyon lotor*).

At the time, biologists from the park started noticing startling declines in the populations of these five species as the surrounding land became more developed. In response, scientists began using infrared-triggered wildlife cameras to track and study these small carnivores over a period of several years.

Starting in 2011, Saguaro National Park began involving citizen scientists in the data-collection aspects of the project, including students from the surrounding rural communities. Soon after, they partnered with Friends of Saguaro National Park and the National Environmental Education Foundation (NEEF) to develop an innovative environmental education program that would engage youth from local communities by providing opportunities for genuine exploration, critical thinking, and quality time in Saguaro National Park.

The goals of the Lost Carnivores Project are to engage students in real, place-based STEM/scientific research that is seamless from the classroom to the field; to expose youth to park management and data-collection principles through the use of wildlife cameras both in the park and at school; and to kindle an interest in careers in STEM as well as a sense of appreciation and ownership of their local public lands.

Key Partners

National Environmental Education Foundation

NEEF has provided grant support for the Lost Carnivores program since 2015 as part of a US Department of Education after-school STEM program. Starting in 2020, Robert Sendrey, NEEF's Program Director for Environmental Education, has used his expertise in the Greening STEM model to host trainings and workshops for NPS staff participating in the NPS-21st CCLC grant program.

Saguaro National Park

Saguaro hosts the Lost Carnivores program on national park land. Sita Stanfield, Environmental Education Next Generation Ranger, oversees the project and works with students on the project through the Environmental Education and Resource Management Division.

Roadrunner Elementary School and Altar Valley Middle School (Tucson, AZ)

Educators and students from these two schools participated in both in-class instruction and on-site fieldwork in Saguaro National Park as part of the Lost Carnivores program.

Friends of Saguaro National Park

As the not-for-profit fundraising partner for Saguaro National Park, FSNP helped provide financial support as well as environmental education resources including classroom ranger visits and on-site instruction at Saguaro National Park.

Project Highlights

- Ranger visits to the classroom prepared the students for the field trip, taught them how to use the gear and equipment, and assisted them in researching the habitat requirements for wildlife.
- Students formed hypotheses about the best location within the park to place each wildlife camera, and at what height and angle to position the cameras in order to photograph each target species. They were also responsible for tracking the location of wildlife cameras using handheld GPS units in the field and online geographic information system (GIS) tools in the classroom.
- Students went into the field to check wildlife cameras that had been set out by the previous round of students. They then had the opportunity to set their own cameras which would be checked by another group of students a few weeks later.
- Students gathered data, researched and analyzed the data, and drew conclusions regarding the species they captured on camera.
- On the post-project ranger visit, students shared data and photos with park biologists and considered options for the park to explore if indeed the species populations were declining.
- Ultimately, students helped the park in finding evidence of five species of small carnivores not documented in the past 10 years at Saguaro National Park.
- During the post visit, wildlife cameras were left with students on campus so they could conduct similar research at their school and continue exploring their understanding of data collection and research and its value to land management.

Use of Greening STEM Principles

Through the Lost Carnivores Wildlife Monitoring and Citizen Science Project, students got involved in real citizen science, increasing their knowledge of biodiversity, population dynamics, and the scientific method. They utilized knowledge-based problem solving, critical thinking, and team building skills on a project using cutting-edge scientific equipment, providing them with an up-close look at how technology is changing the world of scientific inquiry.

Most importantly, the students took ownership of their work and got to make a real impact on land management decisions on their local public land, re-entering their communities with a renewed interest in science and a sense of respect and responsibility for their environment.