

POSITION ANNOUNCEMENT:

FUTURE PARK LEADERS of EMERGING CHANGE

The National Park Service (NPS) is pleased to support the *Future Park Leaders of Emerging Change* (FPL) program as a pathway for exemplary students in higher education (advanced undergraduate students and graduate students) to apply their skills and ideas to park-based challenges and solutions. The Initiative offers 12-week paid internships which allow students to gain valuable work experience, explore career options, and develop leadership skills through mentorship and guidance while helping to advance NPS efforts on emerging management issues. Successful students may be eligible for non-competitive hire into federal positions for which they qualify following completion of all academic requirements.

Determining Long-term Changes in Snow Cover and Stream Flow

Saguaro National Park/Resource Management Division
Tucson, Arizona

INTERNSHIP PROJECT BACKGROUND

Saguaro National Park's Rincon Mountain District is a "sky island" in southern Arizona, one of a number of isolated mountain ranges that rise from the desert into mixed-conifer forests at high elevations. Due to its large elevational range, location near sub-tropical ecosystems of central Mexico, and surprising number of small springs and spring-fed stream pools, Saguaro is one of the most biological diverse parks in the United States. The park's unique riparian and aquatic ecosystems rely on melting snowpack for maintaining water supplies during the critical hot, dry months before the summer rains begin in July.

Saguaro and its scientific partners monitor precipitation and stream flow, but not snow, and there are no long-term snow monitoring stations in southern Arizona. However, observations at the park suggest that snowpack has diminished in recent decades as temperatures have grown dramatically warmer at the park since the 1970s (Gonzalez et al. 2018; <https://doi.org/10.1088/1748-9326/aade09>). Because winter snow is so critical to maintaining springs and streamflow during dry periods, a high priority for resource managers at the park is a more quantitative understanding of how the snowpack may be changing and the implications for the long-term health of riparian resources.

In 2016, the park teamed with NASA Develop program to use Landsat and other satellite data to assess snow cover distribution changes in the Rincons and its impact on streamflow over time. Although there was not sufficient time to develop a full analysis of trends in snow cover and water resources, the project created a Google Earth Engine (GEE) script to explore synoptic snow cover trends for both past and future, and analyzed historic snow cover maps from a representative subset of the data.

INTERNSHIP PROJECT DESCRIPTION

The Future Park Leader will use the NASA GEE script and other emerging technologies to provide a full reconstruction of the relationship between snow cover, stream flow, and climate over the past four decades, and possibly further back in time. The intern will first complete the NASA analysis, and then explore other tools that indirectly quantify snow, such as using tree ring data to estimate Snow Water Equivalent (SWE) from the Rincons. He or she will summarize the results in three main products: 1) a peer-reviewed paper; 2) a report written for lay audiences and park managers; and 3) a 3-minute video for the park's visitor center produced by the park's film interns. Throughout the internship, the intern will be mentored to be an active public scientist at the park. He/she will "talk snow" with the park's staff throughout the hot Sonoran Desert summer; give talks to park volunteers and the public; be available for social media and traditional media; and have the opportunity to mentor younger interns.

QUALIFICATIONS

The most qualified applicants will have, or be pursuing, an advanced degree in earth sciences with skills and experience in climate change science. This internship will be very quantitative and qualified applicants should have strong analytical skills and the ability to understand, integrate, and synthesize large data sets related to climate. The student should be proficient in R, and have some knowledge of ArcGIS, MATLAB, and similar analytical software. Because of the communication elements of the internship, the best applicants will have skills and experience in communicating science through writing, speaking, and social media.

LEADERSHIP DEVELOPMENT

- Collaborative science. The intern will work with park biologist, Don Swann, who coordinates the science program and is co-author on a number of peer-reviewed papers related to desert ecology and aquatic resources. The intern will interact with partners at the U of A, USGS, the regional and Southern Arizona Park hydrologists. Retired regional hydrologist, Colleen Filippone, who directed the NASA projects, will be a co-advisor.
- Natural resource and NPS management. The intern will work with park managers, restoration ecologists, university staff, volunteers, and education staff.
- Safety and Wilderness training. Saguaro National Park is 78% designated wilderness, so emphasis will be on the importance of science in wilderness management.
- Science communication. The park's science program is fully integrated with the Interpretive Division. In addition to developing science writing skills, the intern will help interpretive staff in communicating scientific findings at the park.

DATES OF POSITION

This position will ideally start in mid-May and be for 12 weeks ending in August, but we are very flexible.

COMPENSATION

This initiative supports one student at \$16/hour for 12 weeks, or 480 hours.

HOUSING

Saguaro National Park sits on the edge of large city (Tucson) that has a major university (the University of Arizona), and housing and all other services are located within a short distance of the park. There is no public transportation to the park, so a car is strongly recommended. The park does have limited housing available, but generally we recommend that the intern finds housing off-site, and we would provide a \$500/month housing stipend.

WORK ENVIRONMENT

The park is adjacent to Tucson, a city of nearly one million people. Southern Arizona is very hot in the summer, with daily averages near 100 degrees F. Field work is not required as part of the internship, but we will provide a range of field experiences if the intern is interested. Field work is physically demanding in that there are spiny plants, dangerous animals such as rattlesnakes, in addition to the intense heat. Safety is our highest priority and we take it very seriously: the intern will have extensive safety training and conditioning to the heat before starting any field work.

CONTACT INFORMATION

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