

EXIT REPORT

Monitoring the Saguaro Population in Saguaro National Park: Continuing a 70-year Tradition

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PARK: Saguaro National Park

ABSTRACT. We studied the demographics of the saguaro cactus (*Carnegiea gigantea*), Saguaro National Park's signature species, at the park during the 2010 Saguaro Census. The Census is based on 45 plots of 4 ha each that were originally established in both districts of the park in 1989-1990 by Dan Duriscoe and Sandra Graban, and re-surveyed in 2000 by Dale Turner and Carianne Funicelli. We also re-surveyed 11 historic plots established in 1941 and the 1970s to gain a longer perspective on this long-lived plant, and established 120 new, smaller plots at higher elevation to better understand the saguaro's distribution in the park.

Compared to 1990 and 2000, in 2010 we observed many more saguaros, particularly young saguaros (<1 m in height). In the Rincon Mountain District, the number of saguaros observed has increased 60.0% since 1990 and 40.7% since 2000. In the Tucson Mountain District, the number has increased 67.4% since 1990 and 10.3% since 2000. Using the same method as previous researchers, we estimated that there are approximately 1,896,030 saguaros in Saguaro National Park, up from 1,145,784 in 1990. We found saguaros to range in elevation to nearly 5,500 feet on south-facing slopes, but these higher elevation populations seems to be vulnerable to wildfires.

Our results indicate that recruitment of saguaros (the number of new individuals) was high during the 1970s through the early 1990s, but has declined during the past 10-15 years. Nevertheless, the population in both districts of Saguaro National Park now has a large number of young, growing saguaros. Given the current trends, we expect that the landscape view of the park, particularly in the Rincon Mountain District's "Cactus Forest" area, will once again begin to resemble the view seen by visitors when the park was first created in the 1930s.

The 2010 Saguaro Census was the first in which volunteer "Citizen Scientists" conducted nearly all of the field work under the direction of student employees and interns, and this aspect of the Census was a great success. It is hoped that the Census will continue as a long-term monitoring effort at Saguaro National Park, with plots surveyed every 10 years into the future.

RELEVANCE TO THE PARK. The saguaro cactus is the signature plant of Saguaro National Park. When Saguaro National Monument was established in 1933 (the monument became a park in 1994), it was to protect the large stand of saguaros at the base of the Rincon Mountains, considered the largest stand of this iconic Sonoran Desert cactus in the United States. The decline of this stand of saguaros, which began in the late 1930s and lasted for several decades, had a huge impact on the park's management and interpretation. The results of our study confirm that the saguaro population is rebounding, which is excellent news for the park. In addition, our study provides new insight into the dynamics of this plant throughout the park, particularly at high elevations, where it might be most expected to be impacted by climate change. We found that saguaros occur fairly high in elevation, but that they are limited there by wildland fire. Fires

appear to be increasing at these elevations in the park, and so understanding this relationship is important for our fire management program.

The "citizen science" and educational component of our study was very successful in terms of the number of students and adults who participated and the quality of the data they collected. We felt that this hands-on approach to education and service learning greatly benefitted the park and our ability to communicate the value of our local Sonoran Desert resources to our local community. We created a web site where participants could compare their results to previous years. We received a great deal of publicity for the project; and presented our results to more than a dozen audiences, including visitors, employees, volunteers, outside organizations, schools, academic conferences, and many others.

PROCESS. Our final work matches our original proposal quite closely, except that we expanded the scope of the project. We used WNPA funds to receive additional funding that allowed us to expand the part of the project dedicated to adding plots at higher elevations in the Rincon Mountain District; we added a total of 120 plots and were able to study the interactions between saguaros, fire history, elevation, and solar radiation.

The major challenge has been to finish the Census reports on time. Saguaro National Park was selected by the National Geographic Society to host the 2011 BioBlitz (one national park is selected each year). This has greatly increased our workload and caused us to fall behind schedule in producing the final reports.

BOOKKEEPING. The bulk of WNPA funds were spent on our student interns, including Kim Diamond, Kara O'Brien, and Adam Springer. We purchased some additional equipment that the park will retain (clinometers and tape measures). We used WNPA funds to leverage additional funds; ultimately the project was supported by the Friends of Saguaro National Park and Tucson Cactus and Succulent Society as well as some NPS funds. In addition, Adam Springer, a University of Arizona student, received additional funding through fellowships and the Cooperative Ecosystems Studies Unit that contributed to the Census effort.

PRODUCTS. We have published one paper on the Census, in the summer 2011 issue of Park Science. We are working on drafts of two other papers for peer-reviewed journals, one on the Census and the other on factors influencing saguaro distribution. Adam Springer gave a talk on the project at the George Wright Society meeting in New Orleans in 2010, Don Swann spoke at the Saguaro National Park Climate Change Symposium, and we have presented posters at two other conferences. Adam and Don Swann have given (or are scheduled to give) talks on the Census to non-scientific audiences, including the Tucson Cactus and Succulent Society, the Sierra Club, the Pima County Association of Governments, WNPA, the University of Arizona herbarium, and other venues. At the park, we have given an interpretive program in each district, and presented to Saguaro All Employees, a joint meeting of Resource Management and Sonoran Desert network staff, trail patrol volunteers, teacher-rangers, and Youth Intern Program interns.

We created a webpage on the Saguaro National Park website and posted the final report and summary, as well as the data and photos from individual plots. We have received wide coverage from many media outlets, including television coverage from several Tucson stations, the

Arizona Daily Star, the Desert Leaf. News stories about the Census have been syndicated in a number of newspapers across the U.S. and various web sites.

EVALUATIONS. We are greatly appreciative of the WNPA research grant program, which provides parks such as ours with research that is relevant to our most important resource needs. Saguaro has the advantage of being near the University of Arizona, which provides us with the opportunity to support student interns who bring creative energy, and often additional support, to WNPA-funded research projects. The flexibility of WNPA funds, which can go directly to University partners, but also to well-designed programs organized by park staff, is a major reason why this program is so successful for us. We recommend that WNPA continue this flexibility and also continue to keep the grants at about the same dollar amount, which enables many parks to benefit from this program.