Re-Survey of a 1941 Saguaro Population Study

Introduction

Saguaro National Park has a rich history of ecological research and intensive study of the giant saguaro (*Carnegiea gigantea*) cactus. Shortly before the monument opened to the public, in the late 1930s, park staff observed a major die-off of saguaros in the Rincon Mountain District (RMD) "Cactus Forest" area. Researchers from the US Department of Agriculture Bureau of Plant Industry were asked to study the problem. Lake S. Gill and Paul C. Lightle observed mortality in large numbers, with many older cacti emitting a black fluid that they hypothesized was associated with a contagious bacterial infection. Gill and Lightle organized a large-scale study on a 640 square acre area of the cactus forest within the monument – section 17 of range 16 East, Township 14 South, now referred to as "Section 17" – where they conducted a census of all saguaro cacti within the plot, and collected height and size-class data. Initial demographic results indicated an aging population with few young saguaros, which raised questions about the viability of the species given the possibility of a bacterial disease. Most researchers now believe that the die-off and subsequent emission of black fluid was the result of extreme freeze events in 1937 and 1939.

The objective of this 2012 study was to resample Section 17 in its entirety for the first time in 70 years. Age structure data are important to ecologists and resource managers because they provide an estimate of overall population health as well as a means to monitor the pattern of vegetation change over time.

Citizen Science

The 70th anniversary of the original survey of Section 17 coincided with the 2011 BioBlitz. Staff at the park felt that the BioBlitz was a great opportunity to highlight the research history of Saguaro National Park, involve hundreds of high school students and volunteers, and educate Tucsonans about the park's namesake plant that is also an iconic symbol of the American Southwest. More than 170 volunteers, many of them high school students, participated in the Section 17 survey on the first day of the BioBlitz. Approximately 130 volunteers supported this project after the BioBlitz, during November 2011-March 2012. In all, volunteers contributed more than 3,000 hours to the project.

High school students from Arizona College Preparatory Academy sampling saguaros in Section 17 during the BioBlitz on October 21, 2011.

Methods

We followed the field sampling protocols established by Saguaro National Park for monitoring saguaros and we recorded the coordinates and nurse tree species for all saguaros. Measuring each saguaro allowed us to use height-age equations from Steenbergh and Lowe (1976) to determine germination dates and age, thus providing a clearer picture of the recruitment and regeneration of the saguaro cactus in Section 17. The 64 plots in Section 17 were resurveyed between October 2011 and July 2012.

Following the collection of data in the field, we created a database for each plot and compared the current distribution of saguaro cacti to the first census in 1941.

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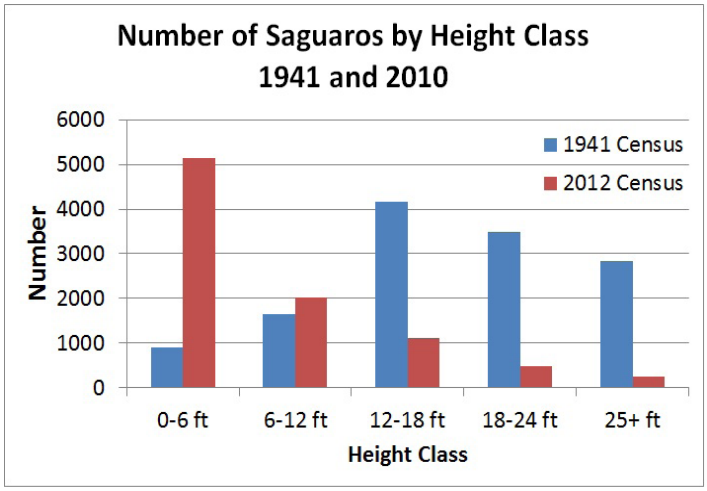
Results

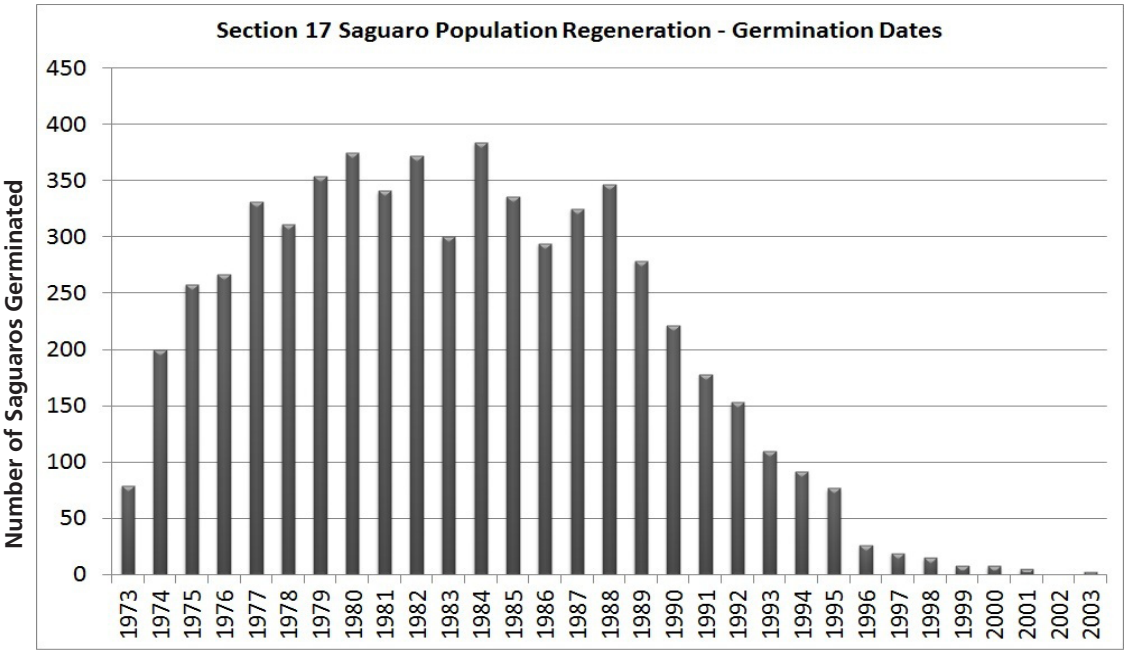
We counted 9,023 saguaro cacti in the 2012 census. Total numbers of saguaro cacti were 31.4% lower than the 1941 count of 13,148. Each plot averaged 144.1 saguaros in 2012, 61.4 fewer than the 205.4 average in 1941. The demographic composition of the population has also changed since 1941. In 2012, saguaros less than 1.8 meters tall represented 57.1% of the total saguaro population, which indicates that the majority of the current saguaro population is less than 36 years old.



Discussion

The demographic results of this study confirm the findings of many studies completed within the past 20 years that documented the decline of the original Cactus Forest and the tremendous increase in young saguaros during the decades of the 1960s-1990s. The results of our Section 17 re-survey indicate that the saguaro population, as a whole, has yet to fully recover from the decline observed in the early 1940s. However, it is important to recognize that 70 years represents only approximately two generations for saguaro reproduction. In that regard, the saguaro population appears to be recovering at a rapid rate.

The current ecological trajectory and demographic pattern suggest that the saguaros in Section 17 may become more evenly distributed in age during the next 40 years in the absence of any disturbances. During that time, we predict that the youngest saguaro cacti in the RMD will reach reproductive age and begin to produce the third generation of saguaro cacti since the establishment of Saguaro National Park. By 2050, the saguaro population has the potential to surpass the 1941 count and visitors to Saguaro National Park may witness the Cactus Forest full of "grandfather" saguaros as seen in 1941.



Estimated Annual saguaro germination from 1973 to 2003

Conclusion

Recovery of a long-lived species population requires patience and monitoring over long periods of time. This census study shows that the saguaro population is significantly healthier than it was decades ago, but recovery is not yet complete. Management of the saguaro population and the disturbances that affect it must continue to mitigate the negatives and maximize the benefits to ensure that future generations of visitors to Saguaro National Park enjoy the cactus forest landscape.

More Information

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