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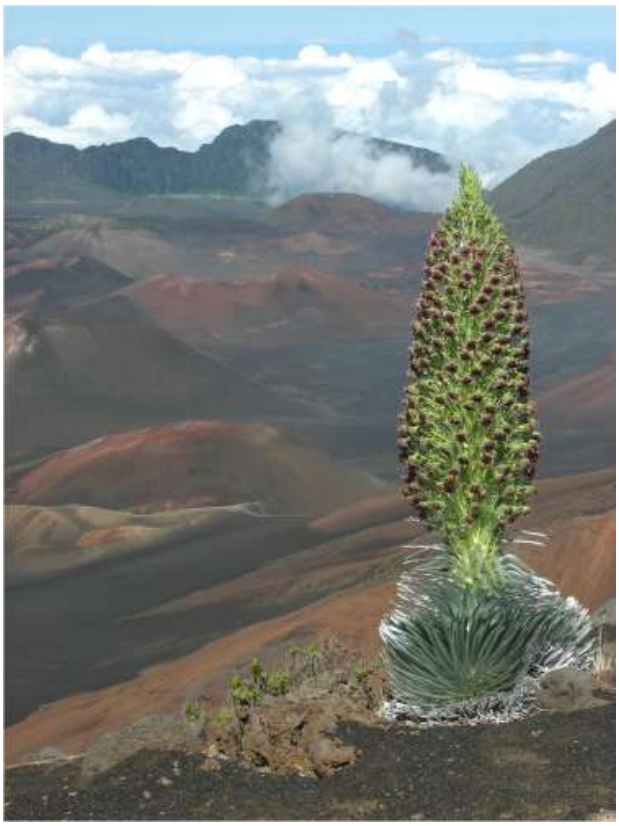
Amazing Hawaiian Plant Loved by Tourists but Endangered by Climate Change

By John R. Platt | January 17, 2013



Every year up to two million people visit Haleakalā National Park in Hawaii, the only habitat for the endangered Haleakalā silversword (*Argyroxyphium sandwicense macrocephalum*), a spectacular and unusual plant that is now threatened by climate change. According to research published January 7 in *Global Change Biology*, these silverswords have suffered a dramatic population decline in the past 20 years due to increased air temperature and reduced rainfall in their montane habitat. Unlike many species, which go extinct when no one is looking, the silversword might disappear while it is in plain sight.

Haleakalā silverswords have been a protected species since 1992, although their decline began long before then. The amazing plant—one of a handful of silversword species endemic to Hawaii—grows up to 1.8 meters tall and only flowers at the end of its life cycle, which can occur anywhere between 20 and 90 years after it first takes root in the rocky ground around Haleakalā volcano (aka East Maui volcano). When the plant finally does flower it produces up to 600 flower heads. Silverswords were initially endangered by the activity of people who unwittingly limited propagation by gathering the striking red blooms. Also, a variety of invasive species damaged the plants and their habitat. In the 1930s, when the national park was established as a protected site, silversword populations were as low as 4,000 plants. That number rebounded to about 65,000 by 1991 but today has fallen to somewhere in the 30,000 to 40,000 range.

Lloyd Loope, research biologist with the USGS Pacific Island Ecosystems Research Center and a co-author of the new research paper, explains some of the history of his association with the plants. “I came to Haleakalā National Park in 1980 as the first National Park Service ‘research scientist’ assigned there,” he says. “The park was then still being heavily damaged by feral goats and pigs, which were largely disposed of over the 1980s by fencing and removal—a tremendous task which was accomplished by park managers with amazing success.”

Loope’s research program at the time was tasked with investigating the potential effect of invasive species, such as the Argentine ant (*Linepithema humile*), on the rare silverswords. His team set up eleven five- by 20-meter silversword plots to help learn more about them. “Honestly, my thought was that it would be useful to document the continuing spectacular recovery of this species that had been depleted by feral ungulates and human vandalism and then responded very positively to 50 years of protection by the national park since the 1930s.” These plots were among the 31 growth areas around the national park studied for the new paper, which showed that

silversword populations had actually dropped by tens of thousands of plants in the past decade. “There is indeed some irony that now the Haleakalā silversword seems to be the only plant species in Hawaii with reasonably good documentation that global warming is seriously affecting it” because of the plots he established more than 20 years ago, Loope says.

Paul Krushelnycky, a biologist with the University of Hawaii at Mānoa and the lead author of the new paper, says the decline became evident in the middle of the last decade. “The numbers of plants in the plots had declined by two thirds to three quarters from their inception,” he says. At the time it didn’t appear that the decline was taking place across the entire silversword range, so Krushelnycky and his fellow researchers set out to see if there was a widespread pattern of mortality—not an easy task, he says. “This is exhausting, but rewarding, work, involving long hikes—10-plus miles in cases—and camping for some of the surveys, along with elevational gains and losses of 3,000-plus feet. The conditions can also be dramatic, ranging from high insolation to thick fog, and temperatures sometimes swinging between the mid-80s and freezing in the span of a day,” he says.

Over the period of their surveys the researchers found extensive silversword mortality, especially at lower elevations on Haleakalā volcano. The dead plants had not been previously observed. “I think this mortality was not more obvious to casual observation for several reasons,” Krushelnycky says. “First, mortality has been greatest in smaller plants, which are much less visible from a distance than larger plants. Second, from a distance the dead silverswords, which are a duller grey, do not look dramatically different from live silverswords, and can persist for many years, so high mortality may not be that apparent for a while. And finally, as is commonly the case, slow and steady declines are not obvious from year to year, and people tend to forget how things looked 10 or 20 years ago.”

With counts of dead plants in hand, the researchers then examined plant growth rates from the demographic plots along with extensive climate data. They then found the link between the population decline and increasing temperatures, solar radiation, decreases in total rainfall and the number of rainy days. Like many mountain species affected by global warming—such as the American pika—the Haleakalā silversword is doing better at higher elevations, but those areas also provide less habitat and sustain fewer individuals.

The decline of the Haleakalā silversword could have an impact on other species as well, Krushelnycky says. Several insects endemic to Hawaii depend exclusively on the plants, including a moth (*Rhynchephestia rhabdotis*) that feeds on its flowers, a planthopper (*Nesosydne argyroxiphium*) that feeds on its leaves and a long-horned beetle (*Plagithmysus terryi*) whose larvae feed on its roots. Quite a few others make use of the silverswords for food, habitat or even hunting grounds—several predatory wasp species hunt the other insects that can be found among the silverswords’ flowers. Tourism could also suffer: Flickr alone has several thousand photos of Haleakalā silverswords, an indication of their popularity.

As far as Krushelnycky knows, the plants are not cultivated outside of the national park, although it is possible that people have illegally collected seeds.

Despite the risks it faces, Krushelnycky notes the Haleakalā silversword is actually the most populous of a total of five silversword species, all of which are endemic to Hawaii. “There is a sister subspecies on Mauna Kea, Hawaii Island; a separate species on Mauna Loa, Hawaii Island; and a bog species in the mountains of west Maui,” he says. “Both the Mauna Kea and Mauna Loa species being highly endangered due to losses from feral ungulates.”

Krushelnycky and his fellow scientists now plan to continue their research by looking at climate change projections and how they might affect the future of the Haleakalā silversword.

Photo: Haleakalā silversword by Paul Krushelnycky, via U.S. Geological Survey

About the Author: Twice a week, John Platt shines a light on endangered species from all over the globe, exploring not just why they are dying out but also what's being done to rescue them from oblivion. Follow on Twitter @johnrplatt.

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