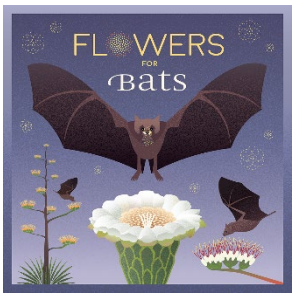
Phenology observations at Sands Ranch, Arizona, 2023

Executive Summary:

From June to October 2023, one volunteer from Borderlands Restoration visited Sands Ranch on an approximately weekly basis to make observations of flowering timing of *Agave palmeri*. This was the fifth consecutive year where these data were collected at Sands Ranch. This data collection is part of an ongoing effort by the USA National Phenology Network, Flowers for Bats, to provide information about changing flowering timing of nectar sources of the lesser long-nosed bat, *Leptonycteris yerbabuenae*. The observer collected 275 observations on 3 patches of plants and recorded both presence of flower buds and open flowers as well as the peak in flowering timing.

2023 Project Activities:



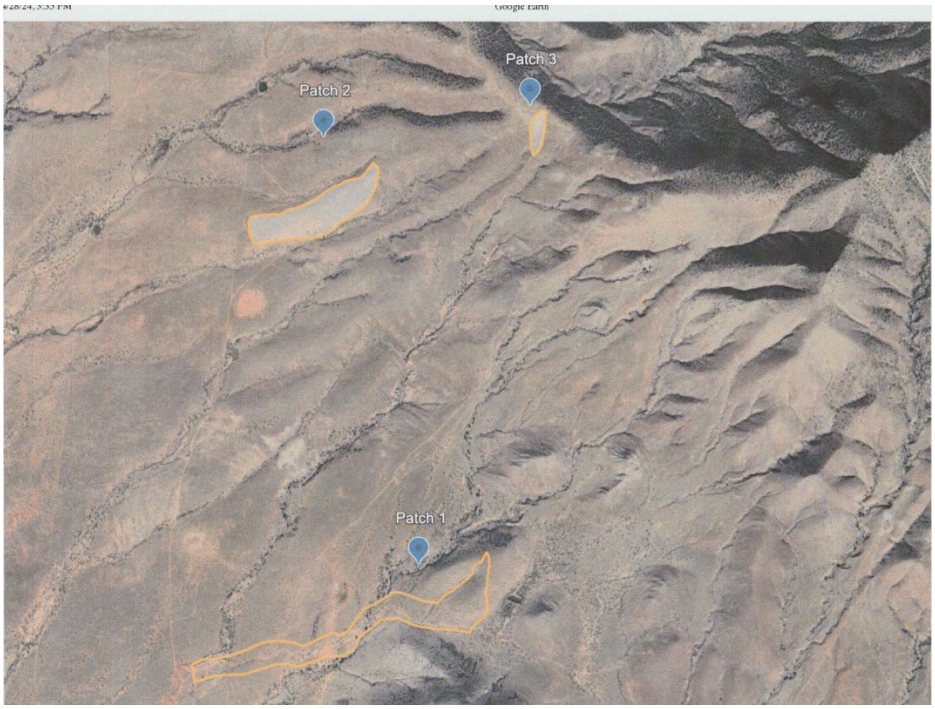
As part of the post-delisting process for the lesser long-nosed bat (*Leptonycteris yerbabuenae*) the U.S. Fish and Wildlife Service created a post-delisting monitoring plan that proposes two primary components to monitor the status of the lesser long-nosed bat: continued roost occupancy and threats monitoring, and an assessment of forage availability through phenology and distribution monitoring of lesser long-nosed bat forage resources.

The USA National Phenology Network (USA-NPN) is partnering with the USFWS to implement the forage monitoring portion of the lesser long-nosed bat post-delisting monitoring plan. The data collected will help the USFWS track changes in the phenology of important lesser long-nosed bat forage species and evaluate the potential effects of climate change on forage species. For more information about Flowers for Bats, as well as a detailed description of our methods, please view the *Lesser long-nosed bat (*Leptonycteris yerbabuenae*) forage phenology monitoring protocol* available at fws.usanpn.org/flowersforbats.

A number of organizations across southern Arizona are partnering with the USA-NPN in this effort to collect flowering phenology data, including the organization Borderlands Restoration. In 2023, for the fifth consecutive year, one Flowers for Bats volunteer observer with Borderlands Restoration, John Hughes, visited Sands Ranch to monitor flowering of *Agave palmeri*.

John collected 275 observations over the period of June 5th to October 2nd using a combination of binoculars and the naked eye. He monitored 3 separate patches of agaves, indicated on the map below.

Report compiled by Erin Posthumus, USA-NPN Partnerships & Projects Manager, April 29th, 2024



Here is John's account of his field season at Sands Ranch:

Two thousand twenty-three was an exceptional year for agave at the Sands Ranch Conservation Area. My goal in each of the preceding surveys was to measure up to 100 agaves in each of three patches. This practice was not always possible, but this year there were so many agaves it was easy to define small areas in patches one and two with multiple plants. The boundary of patch one remained essentially the same, as indicated in past years, and yields the least number of agaves. Patch two's boundary was confined to a single ridge in 2023, as indicated on the map. The boundary for patch three was restricted to a small area of the Clyne Ranch located adjacent to the National Forest. A limited search of literature seems to indicate soil moisture at a certain time drives the cycle. I don't have any winter precipitation records for the Conservation Area, but the Patagonia area received ample winter precipitation.

Agaves were counted, as in previous years, using binoculars to extend the search area beyond the ridges and the naked eye for plants in close proximity.

As in previous years, patch two experienced the most predation, presumably from cattle. A feeding station is present at the bottom of a ravine adjacent to patch two, which attracts the cattle to this area. No cattle were present on the Clyne patch, and there was no predation. Interestingly, predation is most prevalent in late May and early June, and agaves that send up stalks later don't suffer much, if any, predation.

The number of hummingbirds and orioles visiting the agave blooms showed a marked increase in 2023. As the season progressed, the number of different species observed was greater than past years.

The Conservation Area is a wonderful place to wander about and I greatly appreciate the opportunity to experience the wide-open spaces and solitude along with the wildlife and plant life.

Data Summary:

John estimated that the peak in number of agaves flowering was N = 54 for Patch 1 on June 12th, N = 100 for Patch 2 on July 3rd, and N = 100 for Patch 3 on June 26th.

Figure 1, below, displays the days on which an observation was recorded for the various phenophases, or life cycle stages of *A. plameri* at Sands Ranch. Colored lines indicate that the phenophase was observed, gray lines indicate that the phenophase was looked for, but the phenophase was not occurring. Across all patches, flower buds were already present at the first site visit on June 5th, and flowers opened on June 19th. Open flowers were still present on the last site visit on October 2nd.

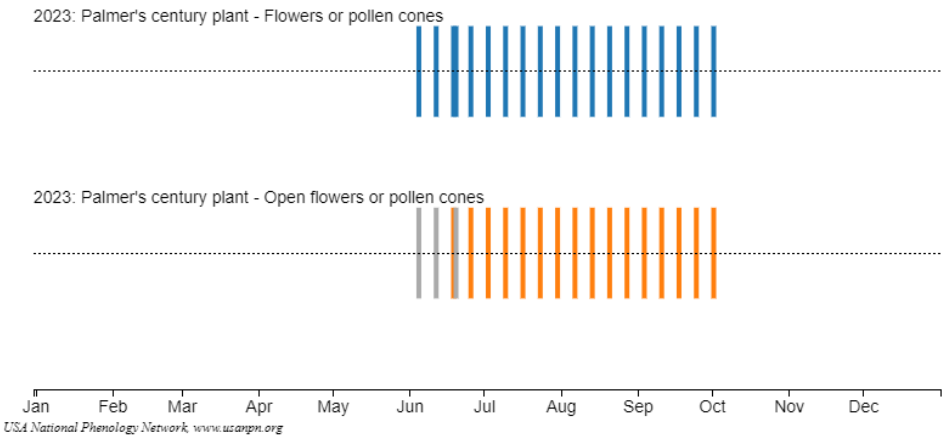
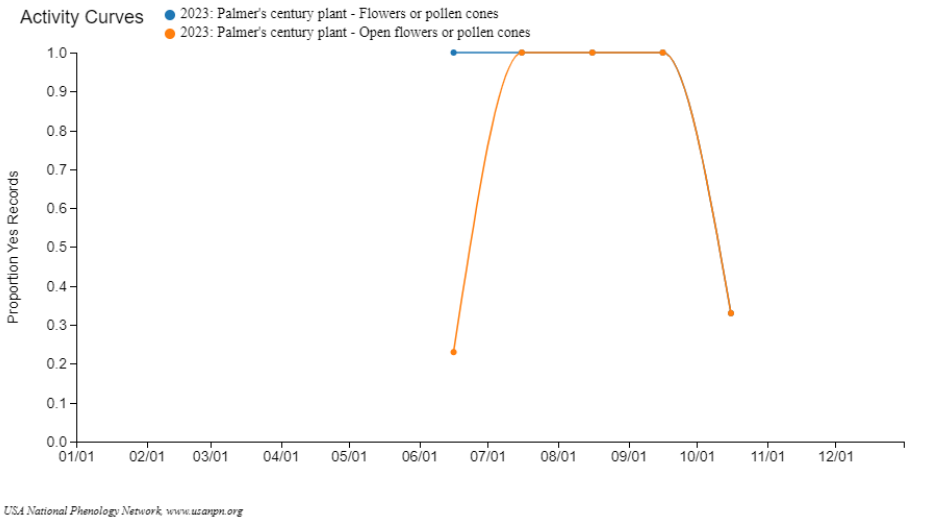
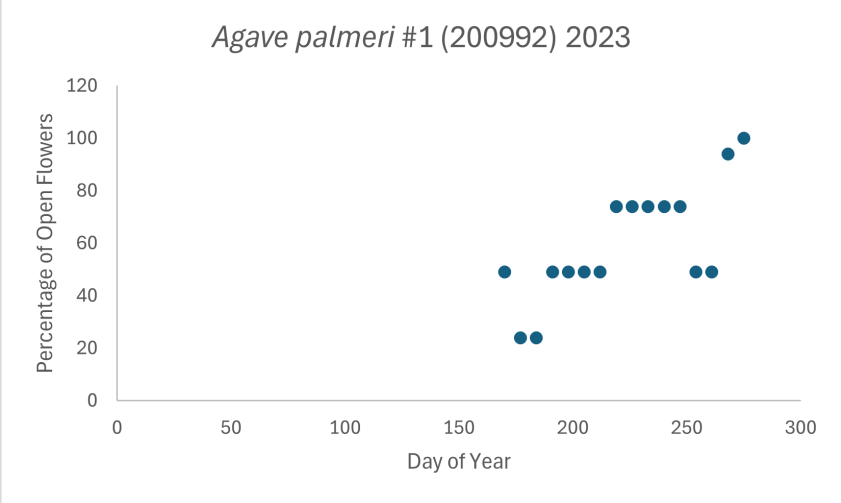
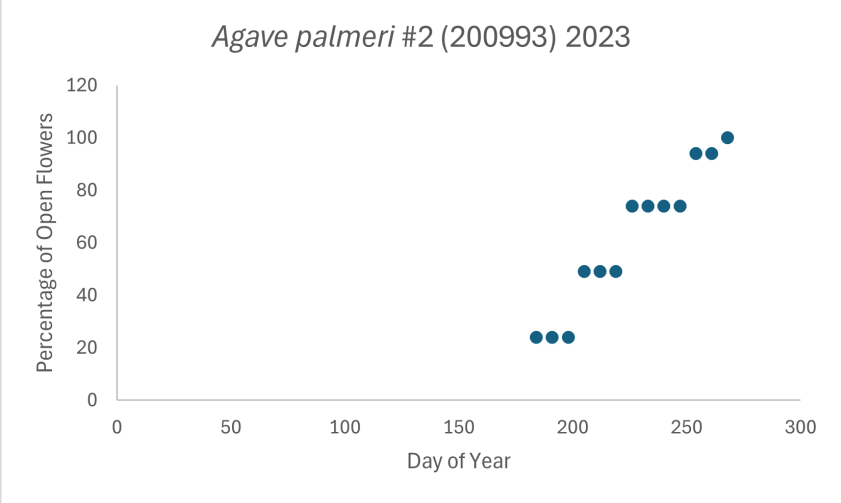


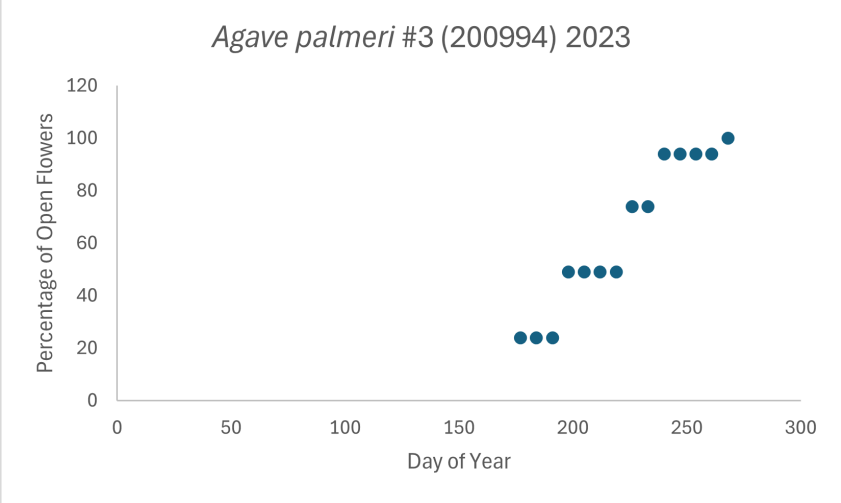
Figure 2, below, displays the magnitude of the phenological stage by showing the proportion of yes records reported for flowers or flower buds and open flowers across *Agave palmeri* patches at Sands Ranch.



In addition to phenophase status, the intensity of the phenophase was also recorded as a percent of flowers open. For patches with multiple flower stalks, the percentage was averaged for all plants across the patch. Figures 3, 4, and 5 below show Patch 1 peaked on October 1st and Patch 2 and 3 peaked on September 24th.







As we have four years of data collection, we can start to look at patterns in the data over these years. Figure 6 below shows that over the past four years, flower buds were present in the first week of June, while open flowers started in mid to late June. Flowering has lasted through mid to late October in all four years.

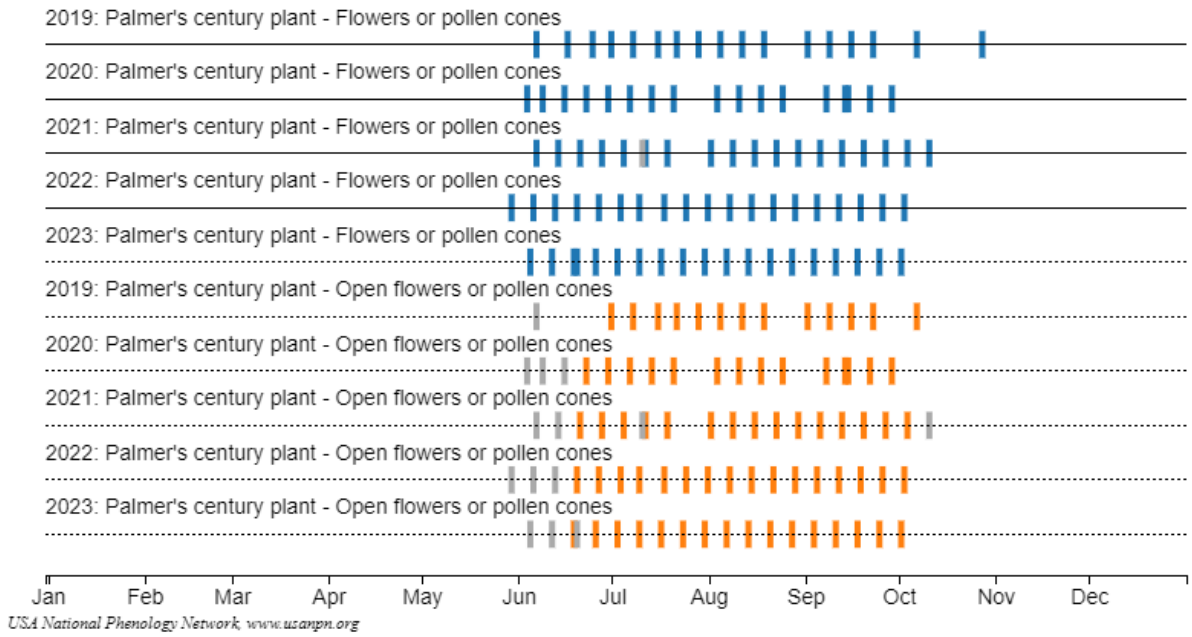


Figure 7 below shows the proportion of yes records for open flowers peaked at a similar time in mid-June in 2020, 2022, and 2023, but several weeks later in 2019 and 2021.

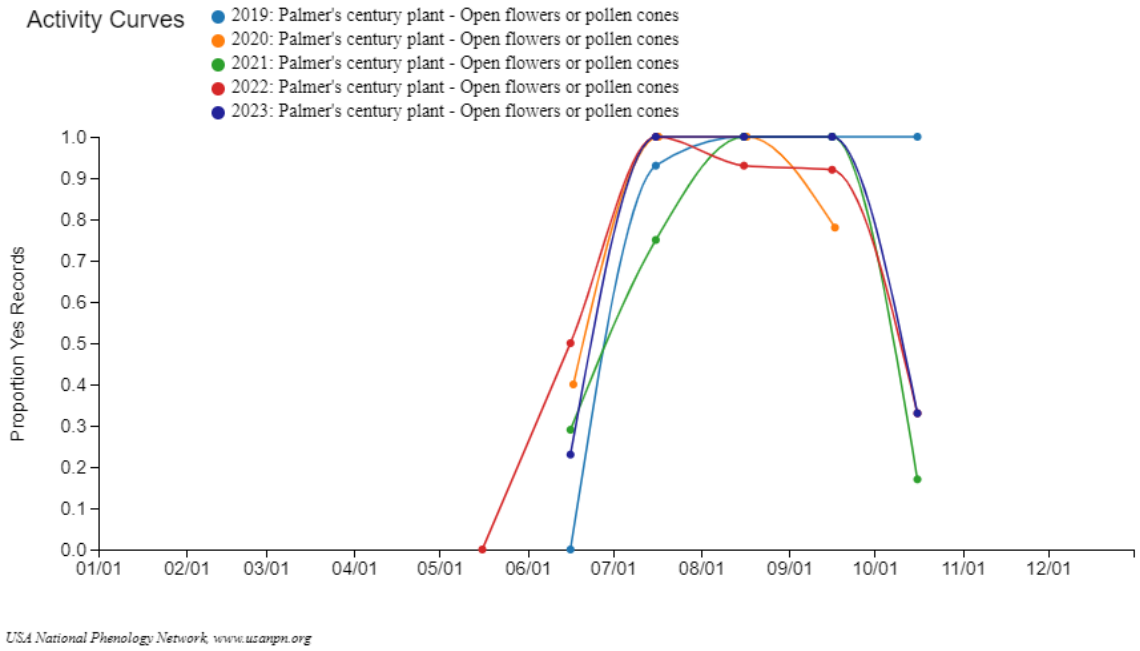


Photo by John Hughes showing a close-up of *Agave palmeri* flower buds.

Photo by John Hughes showing a close-up of *Agave palmeri* open flowers.

Photo by John Hughes showing an *Agave palmeri* with an unusual branching pattern.

Photo by John Hughes looking down at an agave.

Photo by John Hughes of an *Agave palmeri*.

Photos by John Hughes of multiple agaves at Sands Ranch.

Photos by John Hughes a western diamondback (top) and Cooper's Hawk seen at Sands Ranch.