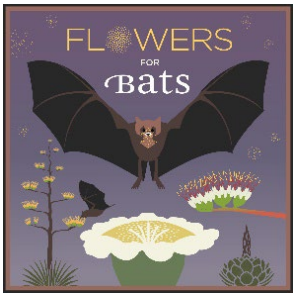
Phenology observations at Sands Ranch, Arizona, 2022

Executive Summary:

From May to October 2022, 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 fourth 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 285 observations on 3 patches of plants and recorded both presence of flower buds and open flowers as well as the peak in flowering timing.

2021 Project Activities:



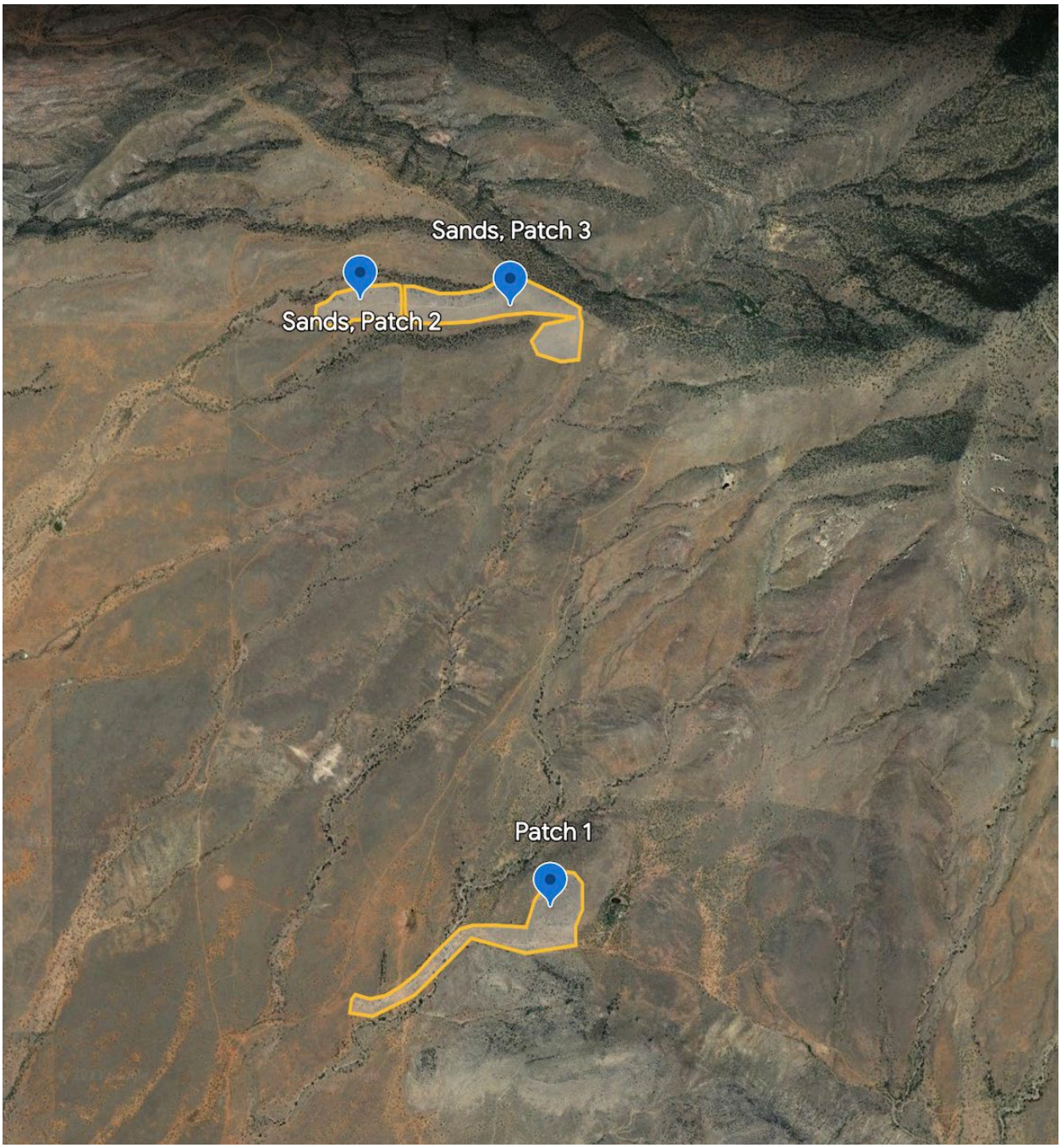
As part of the post-delisting process for the lesser long-nosed bat (*Leptonycteris yerbabuenae*) the U.S. Fish and Wildlife Service created a post-delisting monitoring plan that proposes two primary components to monitor the status of the lesser long-nosed bat: continued roost occupancy and threats 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 2022, for the fourth consecutive year, one Flowers for Bats volunteer observer with Borderlands Restoration, John Hughes, visited Sands Ranch to monitor flowering of *Agave palmeri*.

John collected 285 observations over the period of May 30th to October 3rd 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 Outreach Coordinator and USFWS Liaison, May 9th, 2023



Without a partner for the 2022 survey of the Sands Ranch Conservation Area coupled with high agave predation, John adjusted the survey technique and adjusted the patch area covered. On Patch 1, he started the survey when he first encountered an agave plant. Typically, along the road in, there are few agaves, and John surveyed these from the vehicle. John parked at the base of the high ground before the locked gate and walked up a north-south fence line, circling the highest area and returning to the vehicle. Many of the agaves were surveyed, using binoculars, on the opposite side of the fence line as most of the agaves on the hill had been predated.

In the past, Patch 2 included all the area within the area starting after the prairie dog town through a closed gate to the next closed gate. John's partner would survey one side of the road while he did the other. They would stop at the highest point and circle the knoll on foot, using binoculars on plants that were too distant to observe up close. This area was heavily predated to the point that it wasn't worth the effort to get out and walk the area. This year, John altered the area for Patch 2 to the area between the two gates. He parked at the first gate and walked off-road in a large circle from gate to gate ending up back at the vehicle. This is a small area of what was Patch 2 on past surveys.

Patch 3 was essentially the same as past years. He started at the gate where he left off from Patch 2 and walked off-road circling the area. In all cases binoculars were used to observe agaves that were too far to reach in a timely manner. The section of Patch 3 that was part of the Clyne Ranch had so many agaves that he limited the sample size to one-hundred plants.

While anecdotal in nature, John observed high predation where cows were present. There were plenty of agaves, but the shoots had been chewed down. On areas that appeared to have been heavily grazed last season and no cows were present, flowering agaves were present in great abundance.

John estimated that the peak in number of agaves flowering was N = 34 for Patch 1 on August 1st, N = 55 for Patch 2 on July 25th, and N = 97 for Patch 3 on July 25th.

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 not occurring. Across all patches, flower buds were present as of May 30th, and flowers opened on June 20th. The last date of open flowers was recorded on October 3rd.

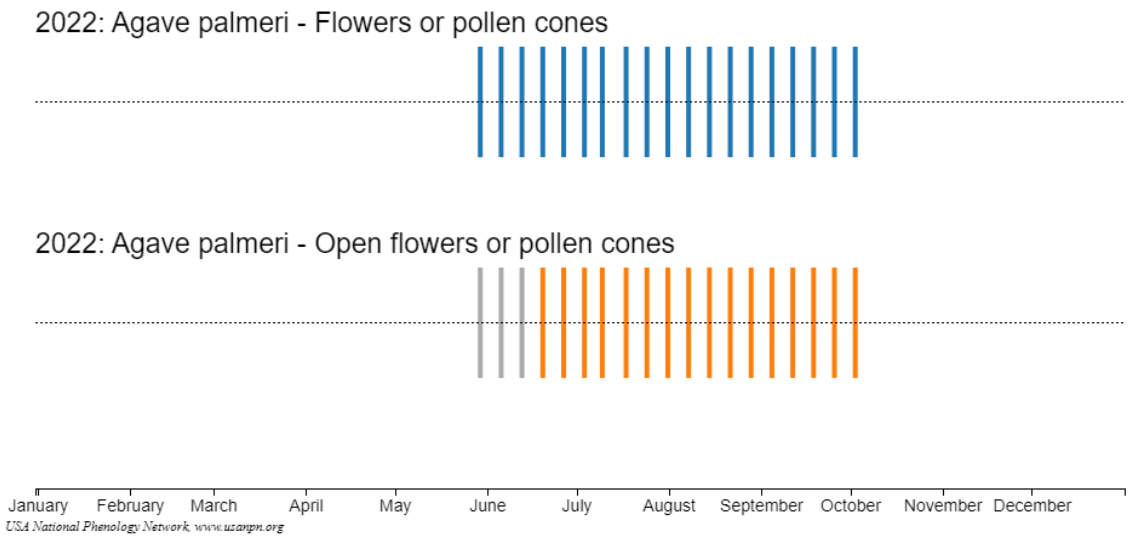
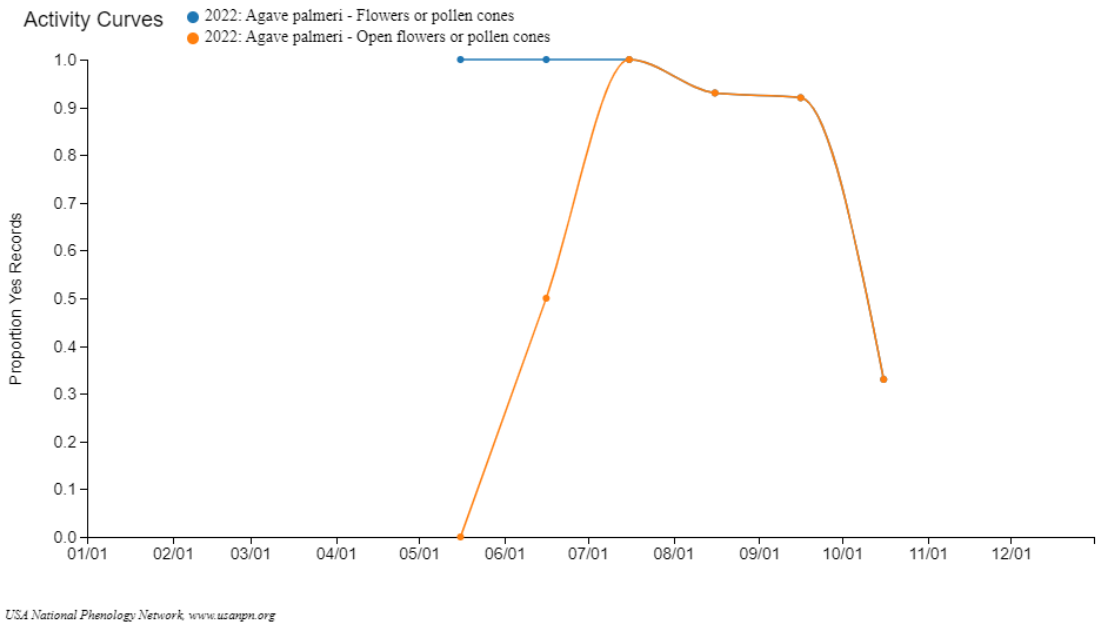
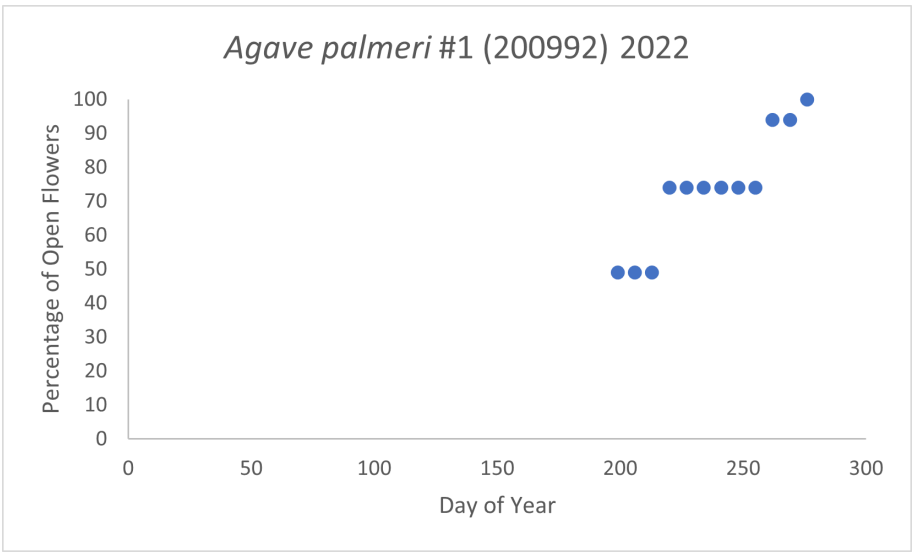
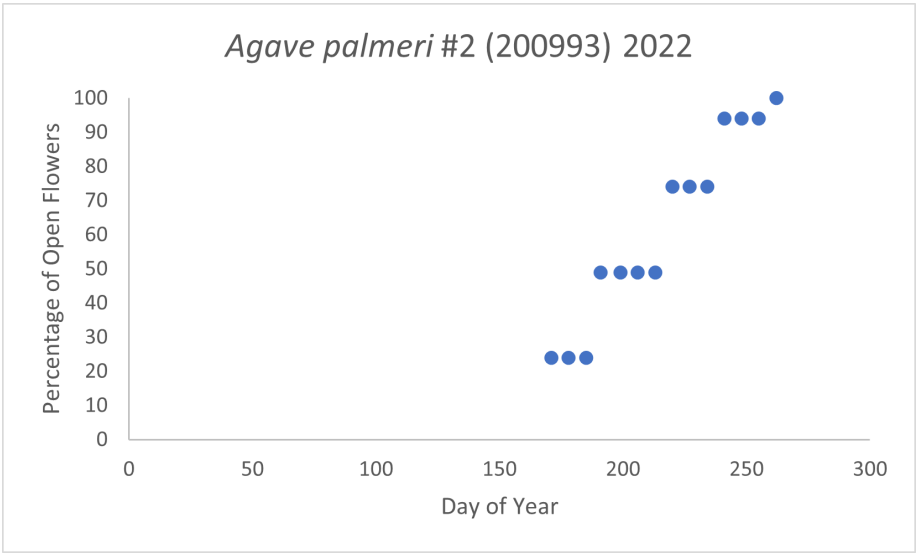


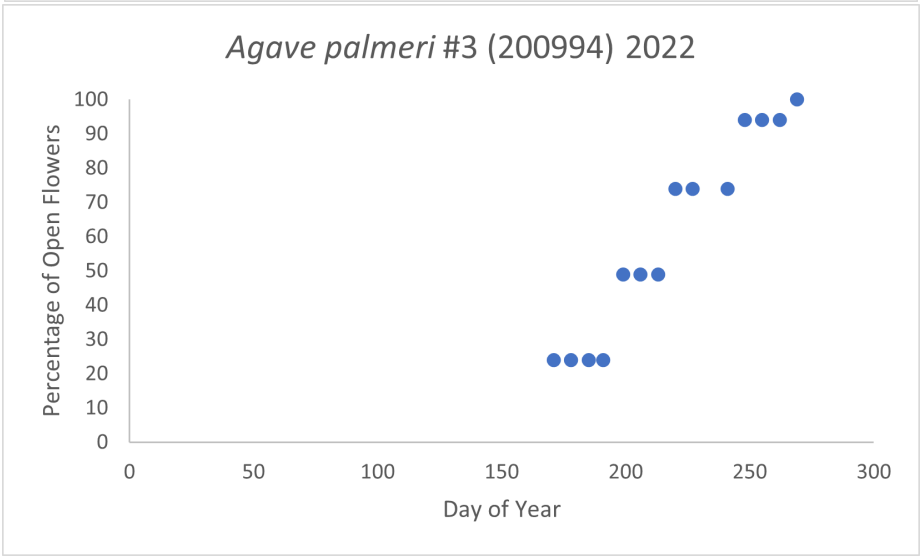
Figure 2, below, displays the magnitude of the phenological stage by showing the proportion of yes records reported for flowers or flower buds and open flowers across *Agave palmeri* patches at Sands Ranch.



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 3rd and Patch 2 peaked on September 19th, and Patch 3 peaked on September 26th.


Agave palmeri #1 (200992) 2022
Percentage of Open Flowers
0
10
20
30
40
50
60
70
80
90
100
0
50
100
150
200
250
300
Day of Year


Agave palmeri #2 (200993) 2022
Percentage of Open Flowers
0
10
20
30
40
50
60
70
80
90
100
0
50
100
150
200
250
300
Day of Year


Agave palmeri #3 (200994) 2022
Percentage of Open Flowers
0
10
20
30
40
50
60
70
80
90
100
0
50
100
150
200
250
300
Day of Year

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, flowering has started around the first week of June, while open flowers have started in mid to late June. Flowering has finished by mid to late October in all four years.

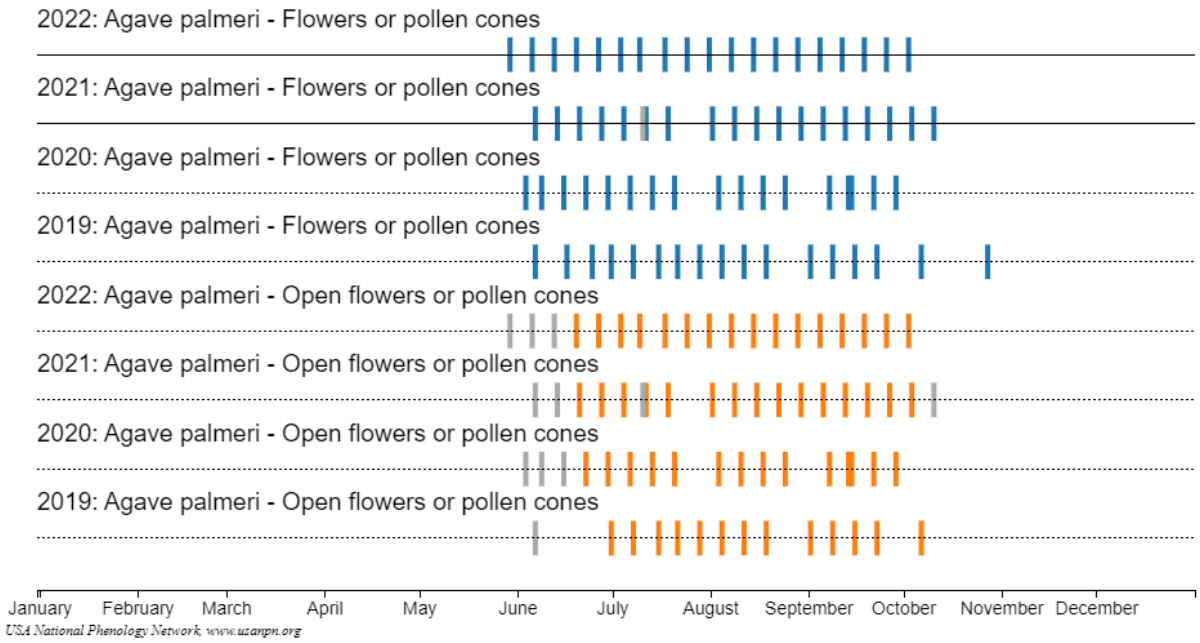


Figure 7 below shows the proportion of yes records for open flowers peaked at a similar time in mid-June in 2020 and 2022, but several weeks later in 2021 and 2019.

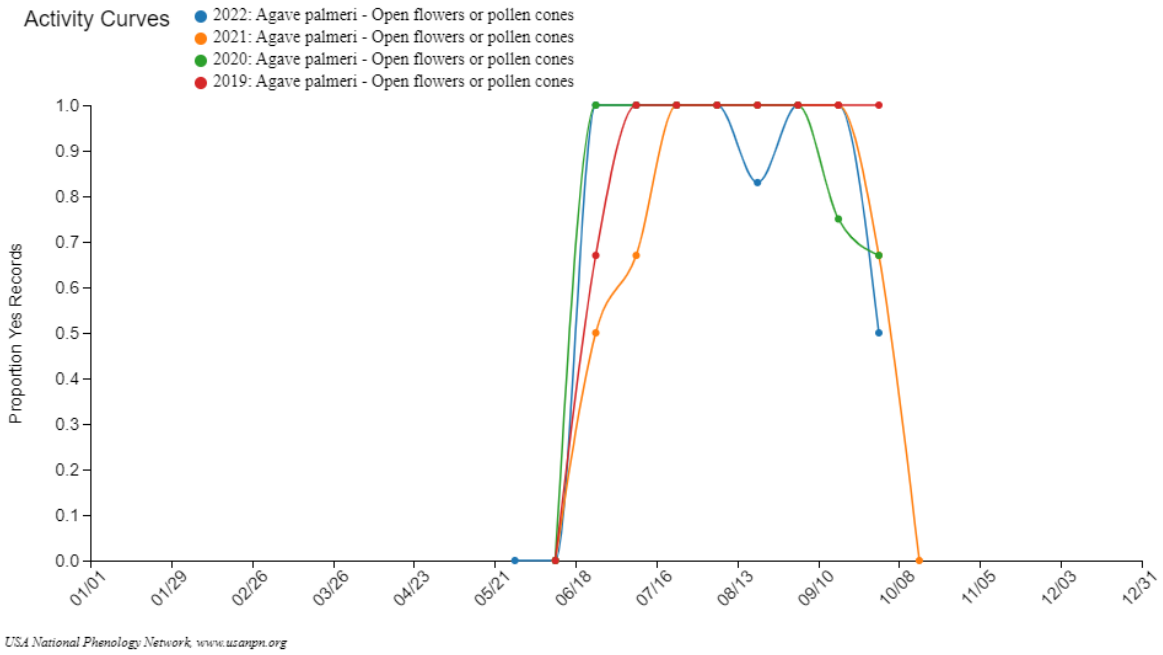


Photo by John Hughes showing a close-up of *Agave palmeri* flower buds.

Photo by John Hughes showing an *Agave palmeri* with a curved stalk.

Photo by John Hughes showing open flowers on *Agave palmeri*.

Photo by John Hughes of an *Agave palmeri*.

Photos by John Hughes show birds that he observed perching *on Agave palmeri* in 2022.