CALIFORNIA PHENOLOGY TCN – QUARTERLY REPORT – AUGUST 2021

*Assembled by Katie Pearson, 2 August 2021*

## PROGRESS IN DIGITIZATION EFFORTS

Figure 1 shows our progress in imaging, transcribing, georeferencing, and phenologically scoring the target specimens for the original 22 CAP institutions, explained more in detail in the following sections.

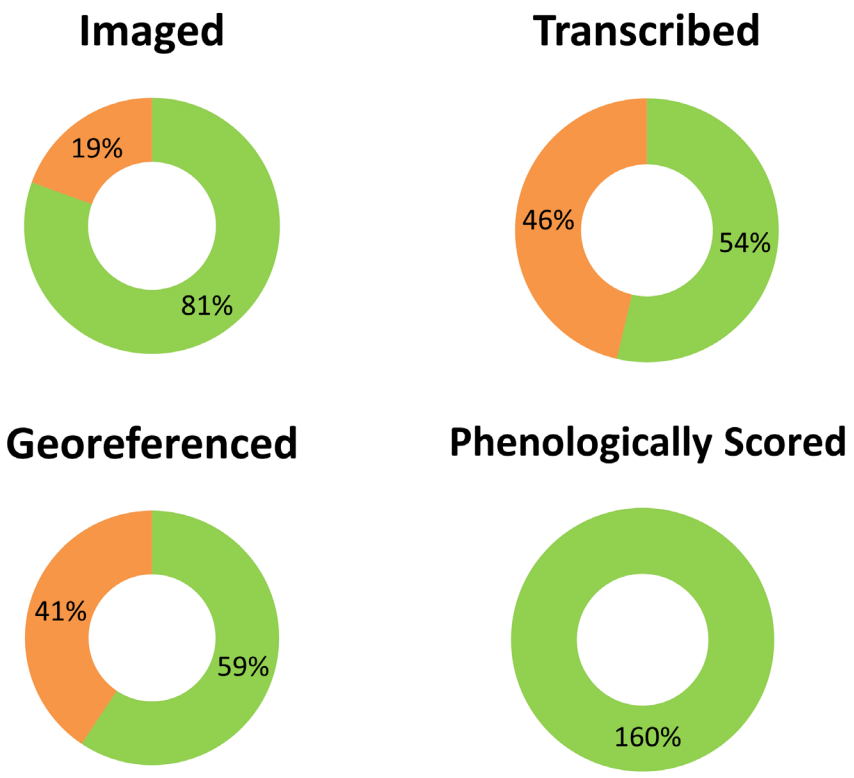


**Figure 1.** Progress in each of our four major digitization goals. Totals represent the original goals of the CAP grant: 902,400 specimens imaged and phenologically scored, and 300,000 transcribed and georeferenced. Additional specimens to be digitized by the PEN grant are tabulated in the PEN section below.

### TRANSCRIPTION

An estimated 161,000 specimen records have been transcribed across the CAP Network since the beginning of the project. This is approximately 54% of our goal.

Transcription has largely been accomplished by institutional volunteers and technicians in CCH2 and online volunteers in Notes from Nature.

## GEOREFERENCING

We have georeferenced over 178,000 specimen records, which is 59% of our goal. Georeferencing is conducted by trained staff and students at HSC, OBI, and SD, by naturalist volunteers are part of the "100 Club," and by undergraduate students in the cross-institution herbarium digitization course led by Cal Poly. The CAP 100 Club currently has 28 active members who have collectively georeferenced over 8,000 specimens since September 2020. We have also continued to use the code we developed to convert township, range, section data into decimal coordinates to apply georeferences to specimens from other states, as they are transcribed.

## IMAGING

Twelve of our 22 herbaria (55%) have accomplished their imaging goals (Figure 2). Of the remaining herbaria, seven have resumed imaging since the COVID-19 shutdowns. The other herbaria have used this time offsite to process images, georeference specimens, and transcribe specimens. Figure 2 shows the current state of CAP imaging as of July 2021.

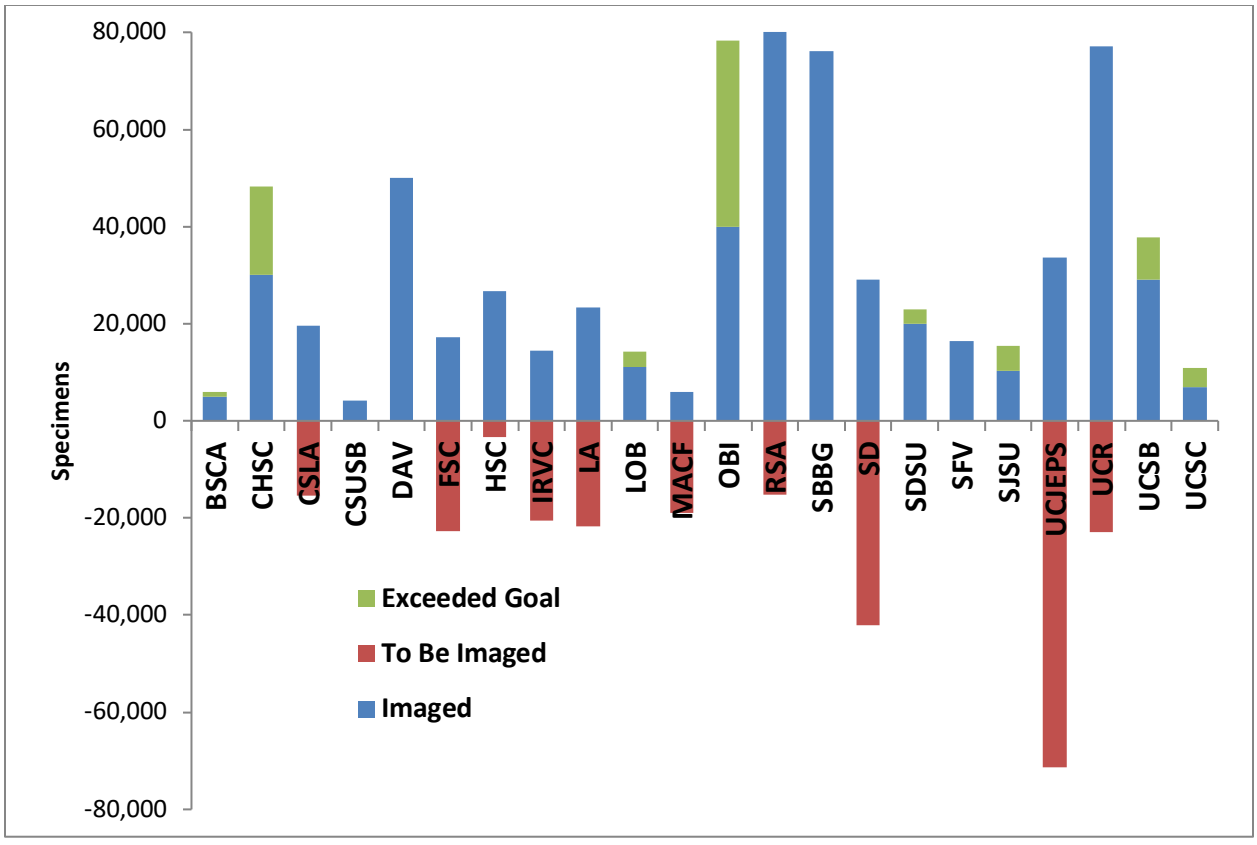


**Figure 2.** Herbarium specimen imaging progress. Blue portions represent the number of specimens that have been imaged, while green portions represent the number of specimens that have been imaged beyond the expected target specimens. Red bars below the zero line indicate the number of target specimens that have not yet been imaged.

## PEN PROGRESS

UNLV successfully completed their imaging goal and sent the equipment to SHTC. The CAP PM visited SHTC to train PI Gardner and a student technician in all steps of the digitization process. Imaging has begun at SHTC as of July 21st. Imaging has continued at SFSU and OSC, which have completed 7% and 41% of their goals, respectively. CDA is continuing to work on acquiring imaging equipment. Figure 3 shows the current imaging progress at PEN institutions.

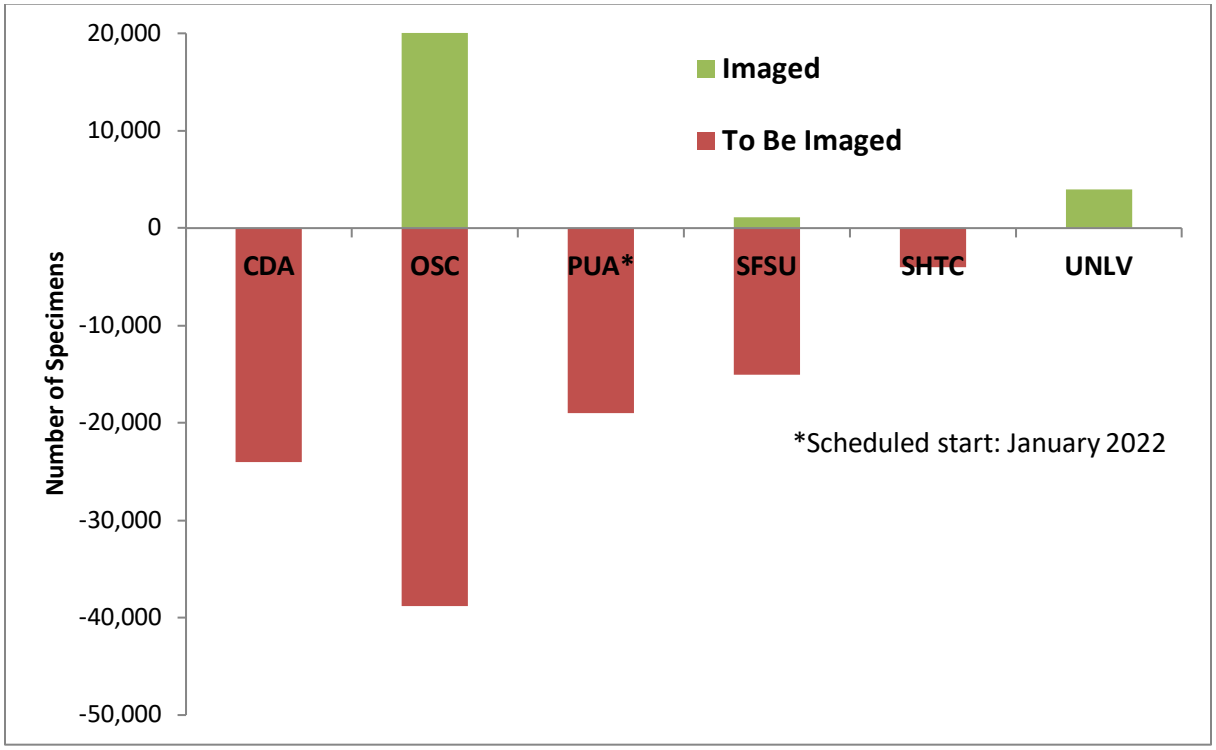


**Figure 3.** Herbarium specimen imaging progress for the seven PEN institutions. Green portions represent the number of specimens that have been imaged, while red bars below the zero line indicate the number of target specimens that have not yet been imaged. For SD, the total number of specimens to be imaged, including those added as part of the PEN grant, is indicated in Figure 2; therefore, SD is not included in this figure.

## SHARE AND IDENTIFY BEST PRACTICES AND STANDARDS (INCLUDING LESSONS LEARNED)

We held a meeting of the data standards advisory committee to plan for forming a TDWG Task Group to develop a Plant Phenology Extension for the Darwin Core. We have drafted a Task Group charter and will submit it to TDWG leadership in the coming months.

After a process of gathering community statements, holding a community webinar, and discussion of the Admin Committee, the Consortium of California Herbaria moved to continue the data protection policy for sensitive taxa (e.g., threatened species). We will continue to publish all data openly, but community members may petition to protect data for specific taxa that may require protection due to poaching or other threats. In this situation, the petition will be considered by the CCH Admin Committee and potentially an assigned ad hoc committee of evaluators. Individual herbaria are free to redact data

on a specimen-by-specimen basis, but they are encouraged to discuss with the community prior to redacting data for an entire taxon from their dataset.

## IDENTIFY GAPS IN DIGITIZATION AREAS AND TECHNOLOGY

We are developing a way to search for specimens based on taxon-level traits, such as CNPS rarity ranking.

Our community has expressed concern over the long-term sustainability and cost of storing image data. While some institutions have access to institutional cloud storage, others do not. Even those that do face an uncertain future that depends on the continued support by these cloud storage services, which has been liable to change with changes in the economy.

## SHARE AND IDENTIFY OPPORTUNITIES TO ENHANCE TRAINING EFFORTS

In July 2021, the PM visited CSU Stanislaus to set up the imaging equipment and train the PI and a student technician in imaging and image processing protocols.

We continue to support the work of our "100 Club" of naturalist georeferencers. We hold Zoom co-working sessions on the first Tuesday of every month in which we socialize, answer questions, and georeference together.

## SHARE AND IDENTIFY COLLABORATIONS WITH OTHER TCNS, INSTITUTIONS, AND ORGANIZATIONS

As previously described, we are building a TDWG Task Force that involves phenological researches from multiple non-California institutions including Agrifood Canada, Florida Museum of Natural History, Yale, and others.

CCH2 data are now searchable on Calflora, a popular website for searching California plant occurrences. As per our recently improved memorandum of understanding with Calflora, these data will be continuously updated on their site, and users of Calflora will be directed to CCH2 to learn more or post comments on the specimen records.

PM Pearson continues to advise the new GLOBAL Lichens and Bryophytes TCN on matters of reporting, georeferencing, and other needs.

## SHARE AND IDENTIFY OPPORTUNITIES AND STRATEGIES FOR SUSTAINABILITY:

We are prioritizing outreach within the California botanical community and beyond to publicize the resources that we have built. For example, we presented at the Digital Data in Biodiversity Research conference and the Botany 2021 conference and highlighted the use of our resources in each. We are also scheduled to present about the CCH2 at the Ecological Society of America 2021 meeting.

As previously described, we are also building a TDWG Task Force to develop a phenology extension for the Darwin Core. In this way, we hope to enable future collection and sharing of phenological data and ensure that the data we have created for this project will be available for research into the future.

## SHARE AND IDENTIFY EDUCATION AND OUTREACH (E&O) ACTIVITIES:

The PM shares updates on the project and phenology-related news via the network Twitter account (@CalPhenologyTCN).

Four blog posts were written and published to the CAP website: https://www.capturingcaliforniasflowers.org/blog-recap. Blog posts are publicized via Twitter and the "Herbarium Junkies" Facebook page.

Three Notes from Nature expeditions are ongoing, consisting of 5,943 specimens from Cal Poly, Cal State LA, and UC Los Angeles. Although volunteer activity has largely slowed in the summer, we expect to see an increase in traffic in late fall as we prepare for WeDigBio.

We concluded the spring 2021 quarter of the online digitization course in mid-June. This "advanced" session involved 16 students and 2 volunteers from seven institutions. The participants processed 543 specimens in 10 weeks and were able to georeference 485 specimens from Kern and Humboldt counties in California. We are currently recruiting for this course to run during the fall 2021 quarter.

PI Mazer also concluded the phenological research course at UCSB in the spring 2021 quarter. This course engaged 15 students and resulted in 15 posters that summarized the result of phenological analysis of herbarium specimens from CCH2. UCSB graduate student Tadeo Ramirez Parada worked with Mazer to improve the R code for analyses during the course, and throughout the summer, PM Pearson worked with Ramirez Parada to integrate the improved code into the published curriculum. An improved version of the curriculum, complete with coding demonstration and a simplified "students' code" was published on July 9 in QUBES (https://qubeshub.org/publications/1956/3).

We also developed a 3-hour workshop or lab version of the phenology research course in preparation for phenology workshops at UCSB. This version involved simplifying the analysis code, paring down and combining slides into a single presentation, and producing a "workshop packet" that leads participants through the process of conducting phenological analyses using herbarium specimens. We also prepared example datasets to streamline the technical part of the workshop. The workshop version is published on QUBES (https://qubeshub.org/publications/2476/1).

We gave oral presentations at the Digital Data in Biodiversity Research conference in June 2021 (https://youtu.be/xhETSXatHho) and at the Botany 2021 conference (https://youtu.be/guNGMmMupDc). In each of these talks, we highlighted the tools and resources developed by the CAP TCN and how they can be used by the community. In the Botany 2021 conference, we discussed research conducted by PIs Yost and Mazer, postdoc Love, graduate student Ramirez Parada, and PM Pearson to analyze the phenological sensitivity of the California poppy to climate change across the state. This research is currently in press in the journal *Madroño*. The PI at Fresno State

also presented a poster about digitization at her institution for annual conference of the Society for the Preservation of Natural History Collections (SPNHC).

## WEBSITE AND PORTAL USAGE

Our project website (capturingcaliforniasflowers.org) has received 1,296 visits and 1,922 page views from May 1 to August 2, 2021. The data portal (cch2.org) has supported 23,889 sessions, 113,025 pageviews, and 12,252 users over the same time period.