

CAP: Using digital images to investigate phenological change in a biodiversity hotspot

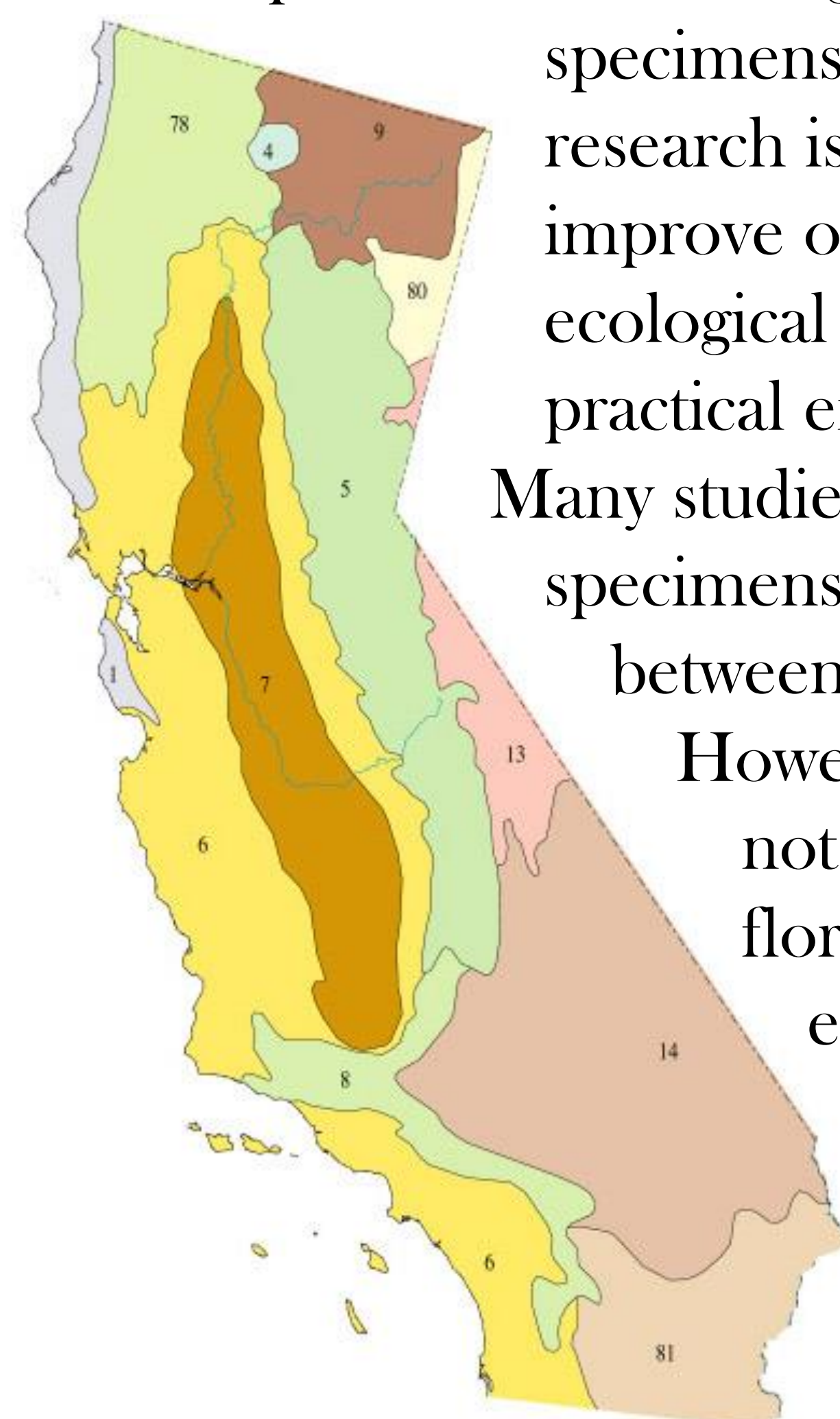


WHY PHENOLOGY?

Phenology (n): the timing of biological events such as flowering and fruiting

Many ecosystem functions depend on plant phenology. Phenology not only affects the individual fitness of plants but also the fitness of symbiotic organisms that depend on them, which in turn affects population level dynamics. Temporal mismatches between plants and pollinators, for example, can quickly drive populations extinct, cause rapid evolutionary shifts, and result in billions of dollars of agricultural losses. As climate change progresses, other organisms will change with unknown consequences. Maximizing the use of herbarium specimens for phenological

research is important not only to improve our understanding of ecological change, but also to address practical environmental problems. Many studies using herbarium specimens have discovered links between phenology and climate. However, these studies have not focused on the California flora, despite it being the most endemic and imperiled flora in the U.S. By digitizing California's collections, we will for the first time have long-term records of the phenological status of hundreds of thousands of specimens. With these data, researchers will be able to generate an unprecedented picture of relationships between phenology and climate in California.



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capturingcaliforniasflowers.org

@CalPhenologyTCN

Imaging

Using state-of-the art technology and building off of specimen imaging experience from the herbarium community, the CAP network aims to image over 900,000 herbarium specimens.

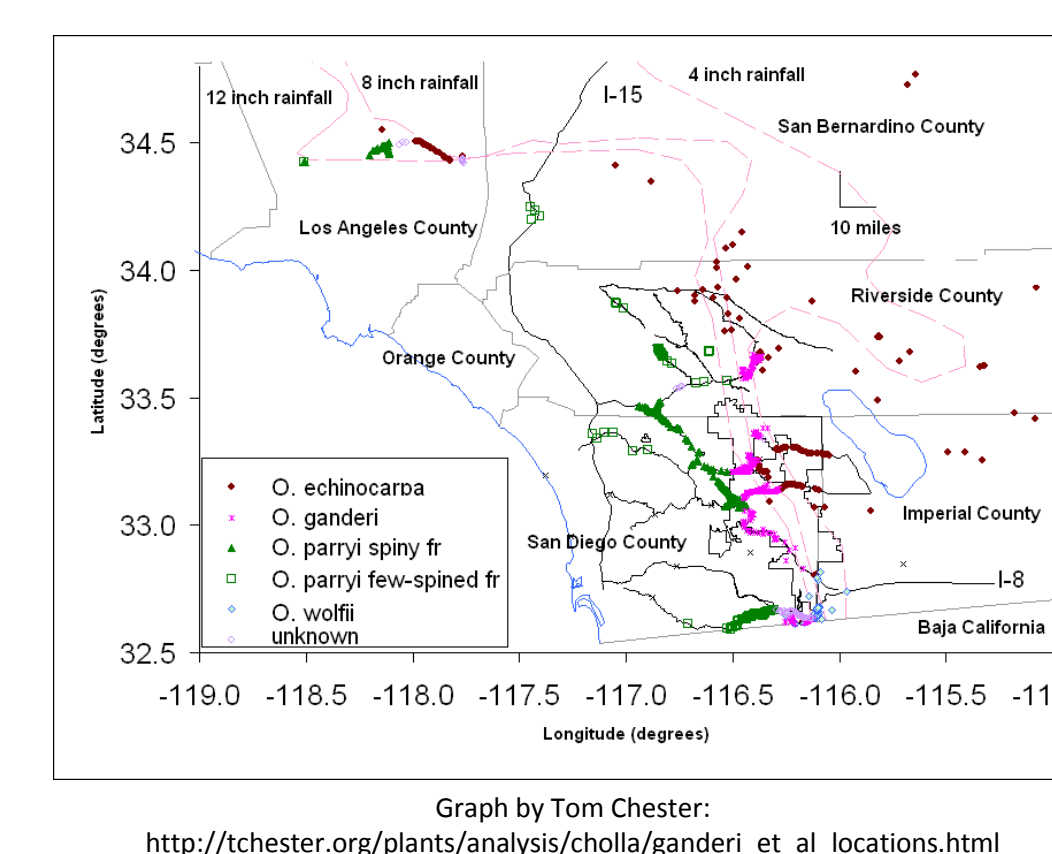


Phenological Scoring

The CAP network will record the phenological status (e.g., flowering, fruiting) of every specimen imaged during the project. To do this, new data standards, protocols, and training resources are being developed.

Databasing

The CAP network launched a new data portal, CCH2, that consolidates specimen records for over 22 California institutions and enables transcription of specimen data from all images created during the project.



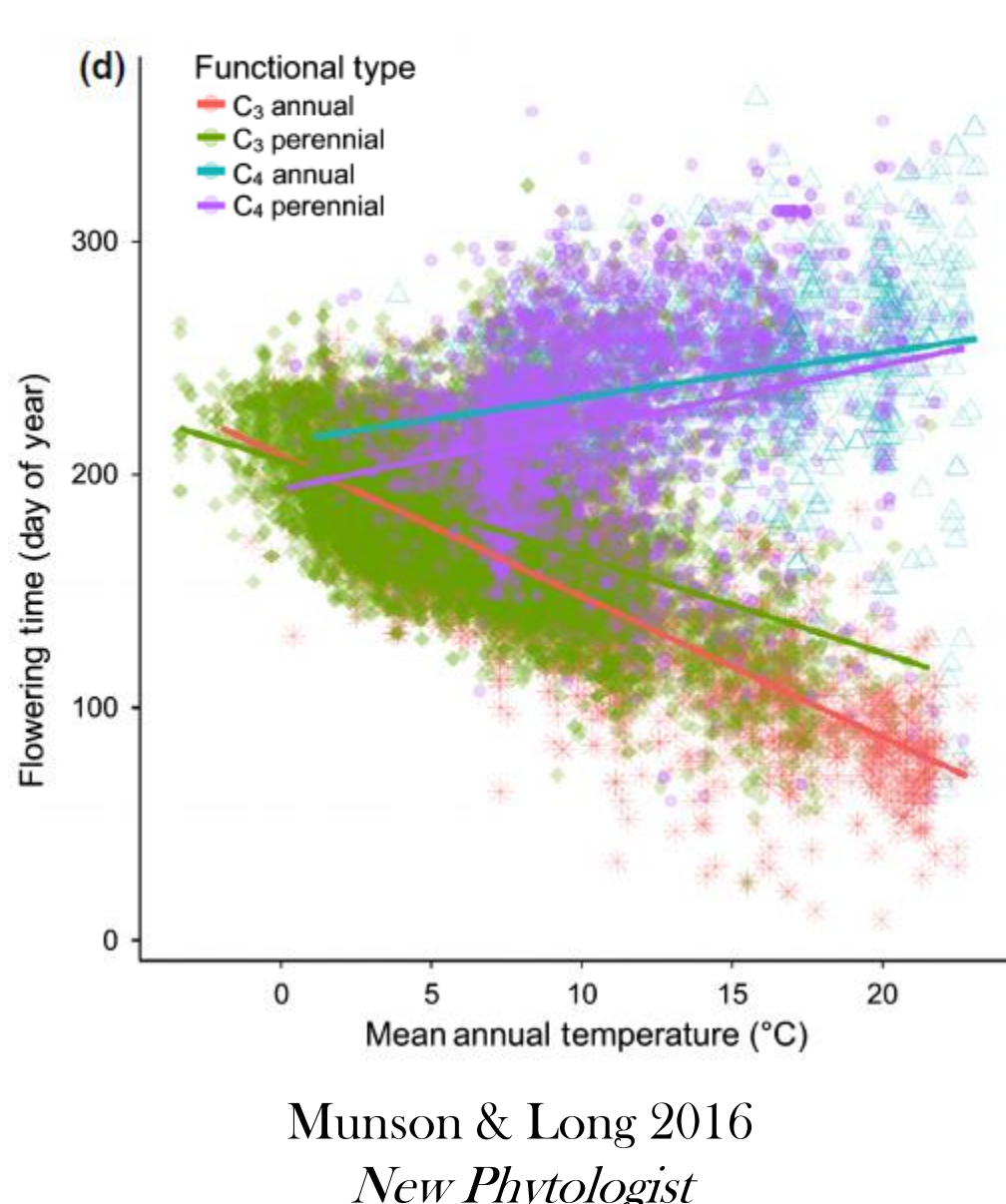
Georeferencing

Knowing where a specimen was collected is critical. With the help of new and existing tools, including the CCH2 data portal, the CAP network will "georeference" all specimens imaged in this project.

EMPOWERING RESEARCH

PHENOLOGY CHANGES WITH CLIMATE, BUT HOW?

With the data generated by this project, we will be able to answer questions such as: (1) Which species are in the most danger of phenological mismatches? (2) Which habitats and vegetation types are most phenologically sensitive to changes in winter precipitation and temperature?, (3) Where might mismatches occur between flowering plants/agricultural plants and their pollinators, pathogens, and pests?, and many more.



HOW DOES IT WORK?

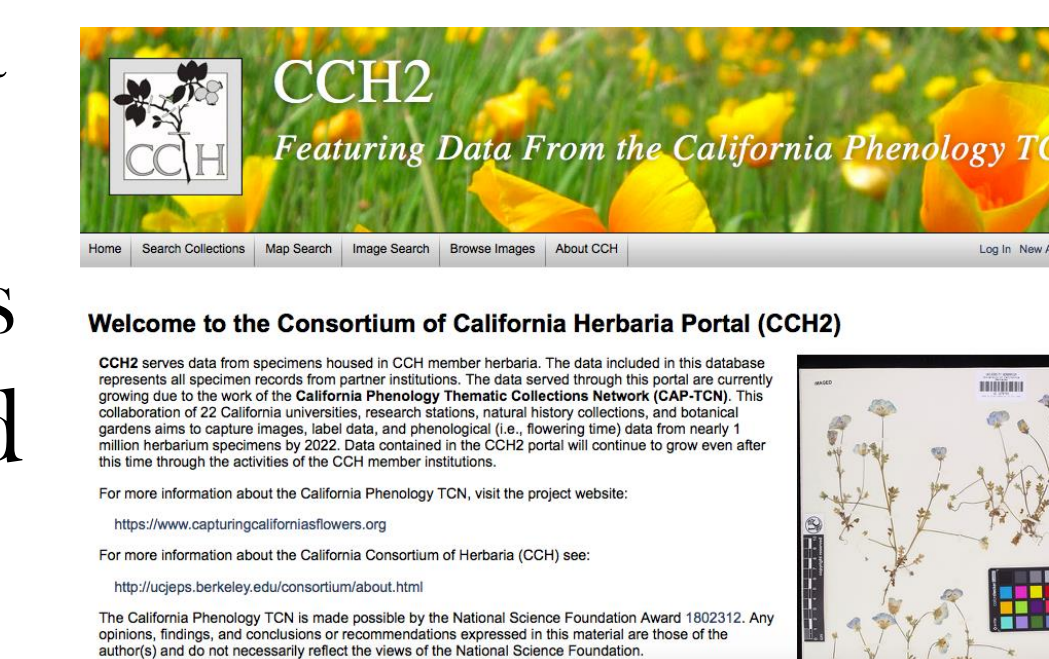
Collaboration and Training



CAP network leadership provides curatorial training in digitization techniques and database management through webinars and in-person visits. Protocols and other resources are documented on the website.

Tool Development

The CCH2 portal makes data management and quality control more efficient, enables development of new tools, and allows worldwide open access to specimen data.



Get Involved!

Can you help us empower research on California plants? If you are a volunteer or citizen scientist, contribute to our transcription expeditions on Notes from Nature. If you are a collection that would like to be digitized, contact us!



The CAP network is a collaboration of 22 California institutions and is managed by:



Dr. Jenn Yost, faculty member at Cal Poly and director of the Hoover Herbarium (OBD), is the lead PI of the project.
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Katie Pearson is the project manager and oversees protocol development, training, reporting, outreach, and anything else to help the project run smoothly.
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Jason Alexander is the data manager for the CAP network and California Consortium of Herbaria, and he is bioinformatics manager at UC Berkeley and UC/JEPS herbaria.



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