

Dr. Jenn Yost
Cal Poly Faculty - Biology
Herbarium Director
Capturing phenology from specimen
Standards Meeting in March



CAL POLY
SAN LUIS OBISPO



Cal Poly Collections Phenology & Specimens

The Cal Poly Hoover Herbarium

- 80,000 specimens accessioned
- Mostly collections from Robert Hoover and Dave Keil
- 40,000 databased
- Goal of 100,000 specimens by 2017



The Hoover Herbarium



The Robert F. Hoover Herbarium: OBI

- Dr. Robert F. Hoover was hired at Cal Poly in 1946 as founding member of the Biology Department
- 1937 Last PhD student under W. L. Jepson at UCB
 - Jepson's assistant until 1942 "one of the ablest collectors in California. He had a trained eye for material of importance."
- Founding member of CNPS
- Authored The Flora of SLO, 1970
- In 1969 Cal Poly formally dedicated his collection of plant as the Robert F Hoover Herbarium



The Robert F. Hoover Herbarium: OBI

- Dr. Dave Keil was hired at Cal Poly in 1976
- 37 years of teaching Field Botany
- Has collected ~32,000 specimens
- Served as director of the Hoover Herbarium since 1978
- Writing Revised & Updated Flora of SLO
- Established himself and Cal Poly as a center of botanical investigations
- Editor and major author of The Jepson Manual



The Hoover Herbarium Specialities

Collections

- SLO Co.
- Asteraceae
- Poaceae
- *Pectis*
- Vouchers
 - Hoover's flora
 - Keil's flora
 - California State Parks



Malcolm McLeod, D. R. Miller, Dirk Walters, Rhonda Riggins (*Lupinus*), Matt Ritter (*Eucalyptus*), Shirley Sparling (*algae*), George Butterworth, and Eric A. Wise (*aquatics*).

Early Collections in SLO Co.

- First record from SLO Co is David Douglas in 1833 - *Delphinium variegatum*
 - CAS- Photograph of a sheet from KEW
- 1860-1864 Geological Survey of California
 - William Henry Brewer
 - *Up and Down California* - Yale Press



Early Collections in SLO Co.

- Dr. Edward Palmer - 1876
 - Doctor and surgeon during the Civil War
 - Collected birds, insects, and plants
- Mrs. Lucia A. Summers - 1882
 - Husband and wife collecting team
- Mrs. Katherine Brandegees - 1880s
 - Discovered a new *Ceanothus* in San Simeon



Consortium of California Herbaria



Consortium of California Herbaria

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The Consortium of California Herbaria is a gateway to information from California vascular plant specimens that are housed in participant herbaria. Please cite data retrieved from this page: *Data provided by the participants of the Consortium of California Herbaria (ucjeps.berkeley.edu/consortium/)*.

Scientific Name

e.g.: [Platanaceae](#); [Dudl](#); [Dudleya bloch](#); [blochmaniae](#); [Dudleya blochmaniae insul](#); [Quercus X alvordiana](#)

Geographic Locality e.g.: [Round Meadow](#); [Forester](#)

Elevation (metric): Lower Upper

County

- All counties
- Alameda
- Alpine
- Amador
- Butte
- Calaveras
- Colusa
- Contra Costa
- Del Norte
- El Dorado
- Fresno
- Glenn

Geographic Region

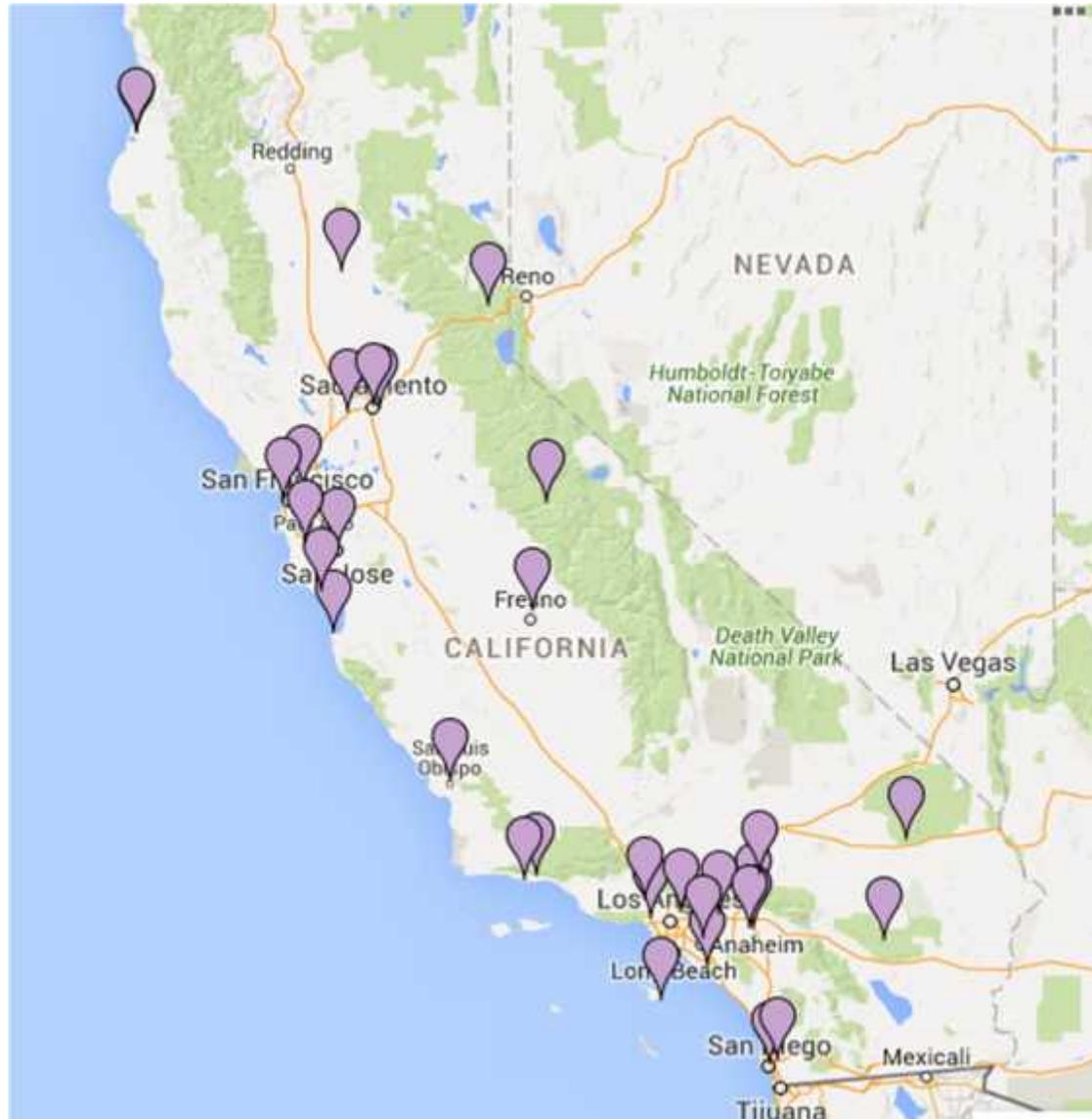
- All regions
- Anza Borrego
- Big Sur
- Channel Islands
- Clear Lake
- Death Valley
- Donner Summit
- Kings Canyon/Sequoia
- Lake Shasta
- Lake Tahoe
- Lassen
- Mendocino Coast

(1 or more; default is all counties) (Regions defined by bounding-box)

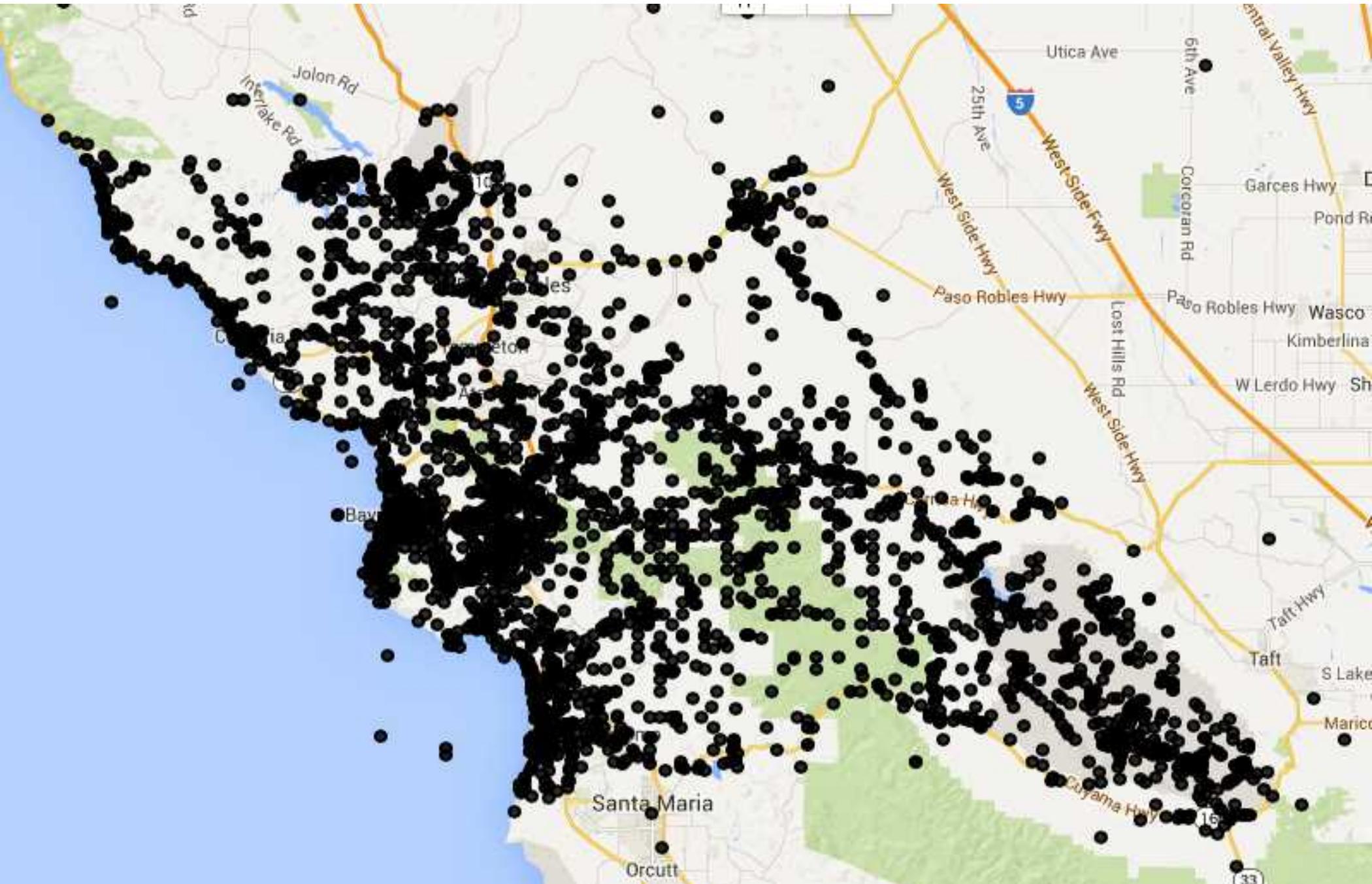
Source (1 or more; default is all sources)

- All sources
- CAS (California Academy of Sciences)
- DS (Dudley Herbarium in CAS)
- CDA (California Department of Food and Agriculture)
- CHSC (Chico State Herbarium, CSU Chico)
- CSUSB (Herbarium, CSU San Bernardino)
- HSC (Humboldt State University Herbarium)
- IRVC (UC Irvine)
- JEPS (Jepson Herbarium, UC Berkeley)
- UC (University Herbarium, UC Berkeley)
- OBI (California Polytechnic State University, SLO)
- PGM (Pacific Grove Museum of Natural History)
- POM (Pomona Herbarium in RSA)
- RSA (Rancho Santa Ana Botanic Garden Herbarium)
- SBBG (Santa Barbara Botanic Garden)
- SD (San Diego Natural History Museum)
- SDSU (San Diego State University)
- SJSU (Carl W. Sharsmith Herbarium)
- DAV (UC Davis)
- LA (UCLA Herbarium)
- UCR (UC Riverside)
- UCSB (UC Santa Barbara)
- UCSC (UC Santa Cruz)
- YM (Yosemite N.P Herbarium)
- JOTR (Joshua Tree National Park Herbarium)
- CLARK (Riverside Metropolitan Museum)
- VVC (Victor Valley College)

CCH Participants



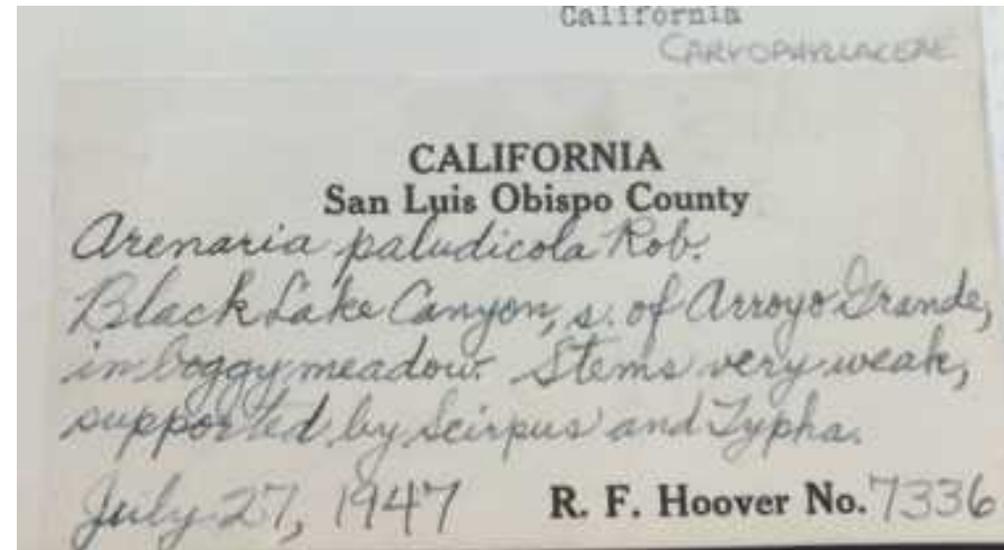
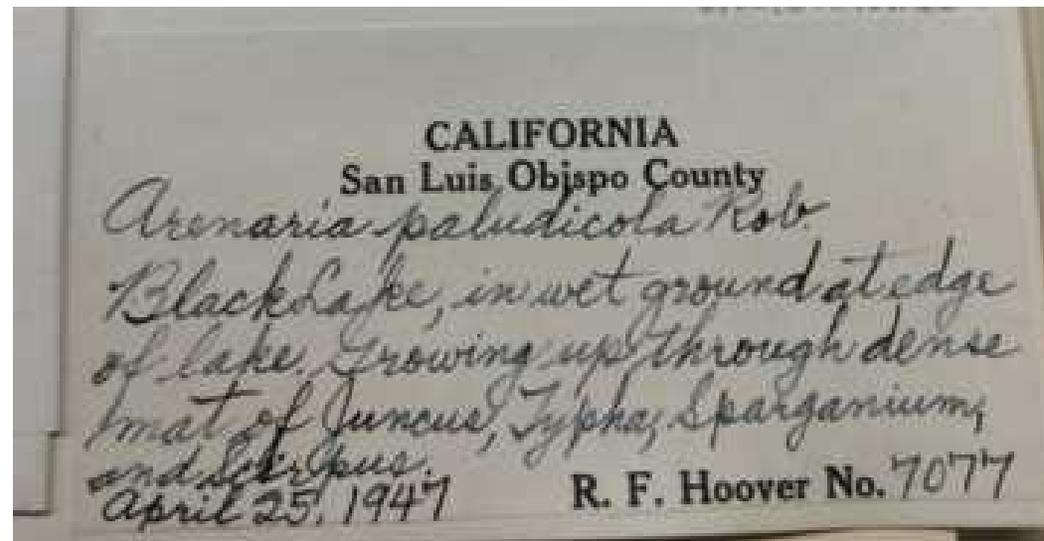
SLO Co. Collections



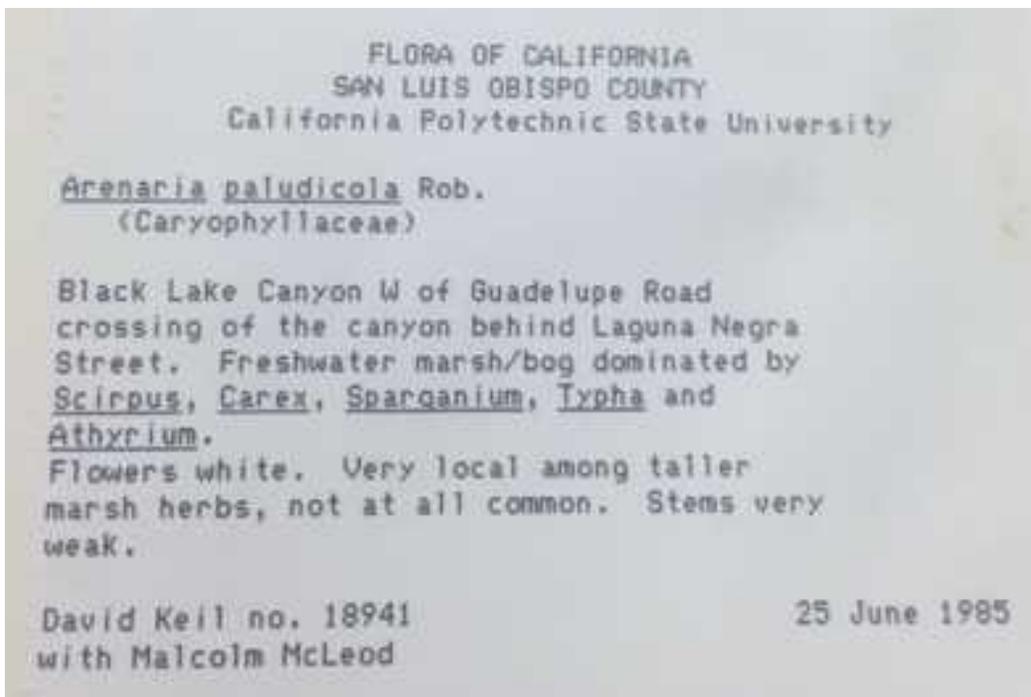
Under collected: Shell Creek Rd.



March Sandwort: *Arenaria paludicola*



2014 - Not found



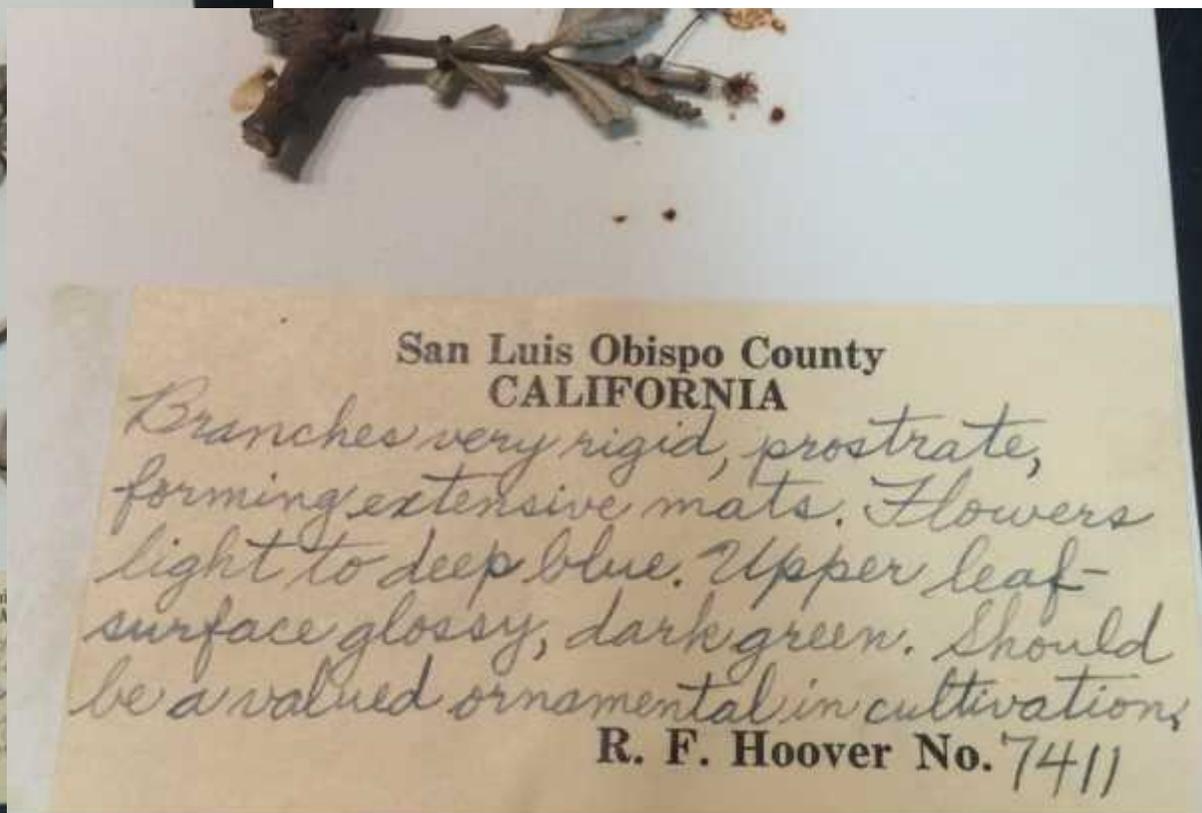
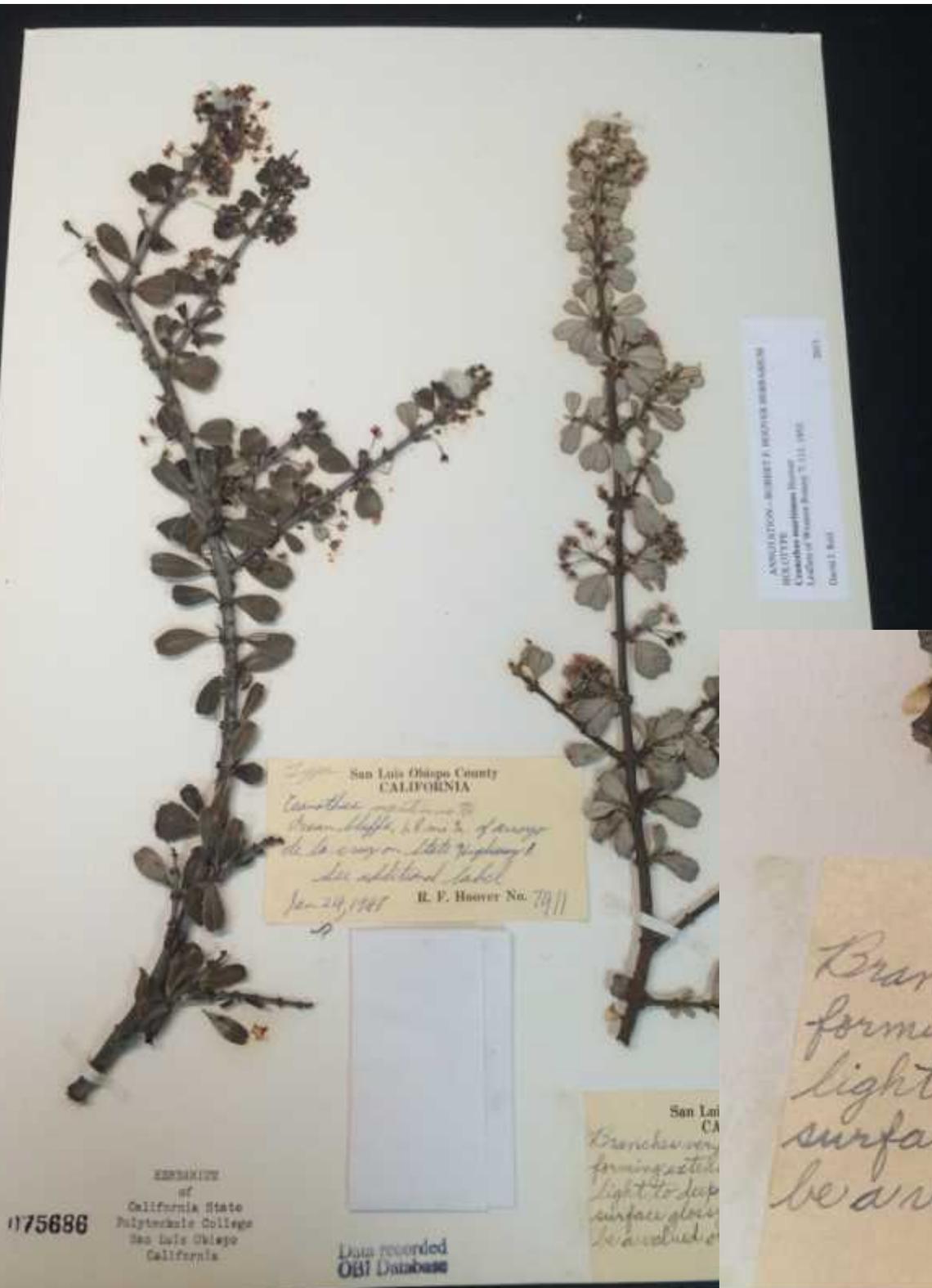
Eschscholzia rhombipetala: Diamond petaled poppy

- First collected in 1880's by Lemmon
- On CCH only 7 records from 1950s
- Presumed extinct
- Rediscovered by Dave Keil in 1992 in the Carrizo Plain



Ceanothus maritimus

71 Type specimens in the Hoover Herbarium



Current State of the Hoover Herbarium

- Database issues: Transition from Excel to Specify
- Synoptic collection for all SLO Co. taxa
- Public Hours each week
- ~ 20 students actively mounting, databasing, and georeferencing specimens every quarter



Cal Poly Collections: Birds

Birds:

- ~ 2500-3000 specimens
- ~75-85% with data
- ~ 2000 in an Excel sheet
- 0% georeferenced
- Backlog of 500-700 (?) in freezer.
- No type specimens
- 2 California Condors

We have a frozen tissue collection, ~1500-2000 There's an old Excel spreadsheet with about 250 records. Most of the records are on index cards.



Cal Poly Collections: Herps

- 676 specimens with data in the research collection (almost entirely formalin and ethanol preserved specimens, no tissue)
- About 100 specimens with no data in the preserved teaching collection
- About 20 live herps in the vivarium (this number changes constantly).



Cal Poly Collections: Mammals

Mammals:

- ~2500-3500 specimens
- ~75% with data
- 50% in an Excel sheet
- 0% georeferenced
- Blacklog of 250 or so in freezer
- No type specimens
- Very important specimens of (almost certainly) extinct Morro Bay Kangaroo Rat.



Cal Poly Collections: Insects

- ~300,000 specimens in teaching and reference collections (pinned and in alcohol)
- ~90% have collection data associated with them
- A few are very old (1920's or earlier)
- Some of the better curated specimens were collected by historic collectors such as Ed Cott



Other Collections

- Fish
- Inverts
- Plant Conservatory of living plants
- Cones
- Lichens
- Pioneer Museum in Paso Robles
- Natural History Museum in Morro Bay
- Random fossils
- Moss collection is starting



Cal Poly's Main Challenges

- Student/staff time
- Workflows/ oport manual
- Cabinets – storage
- Supplies

Biodiversity Research Center
Cal Poly Natural History Museum

Phenology Standards for Herbarium Specimens

Currently ~50 million herbarium specimens in US

>5,000,000 digital herbarium records from 58 institutions throughout the U.S.

311,969 had reference to flowering & GPS coordinates

Plants of Arizona
ARIZONA STATE UNIVERSITY

6%

Mirabilis coccinea (Torr.) Benth. & Hook. f.
Family: Nyctaginaceae

Arizona, Maricopa Co.; Tonto National Forest,
Sycamore Creek at Hwy. 87 southwest of Mt. Ord,
N 33° 52.56' , W 111° 27.27' 3600 ft. (1098 m)
Habitat: Riparian.

Associated spp: *Platanus wrightii*, *Baccharis sarothroides*,
Chilopsis linearis, *Juniperus coahuilensis*.

Notes: Perennial herb; flowers red

Collected by: L.R. Landrum 9933 1 June 2001
with: E. Makings, D. Damrel & S. Doan



Specimen Details

[Report a Problem](#)

Species: Acacia angustissima var. hirta
Collection Date: June 2, 1989
Bar Code ID: 000027046
UUID: ee815114-857c-4b75-8c51-63274085c594
Collectors: Loran C. Anderson
Collector's Identifier: 12045
Flowers Present?: True
Country: United States
State or Province: Florida
County or Parish: Dixie
Plant Morphology Observations: Filaments prominently white, perianth light green
Local Abundance Observations: Frequent



[View Image](#) [View JPEG](#)
[Download JPEG \(1.59 MB\)](#)



PLANTS OF THE HOPLAND FIELD STATION

University of California
Mendocino County

Rosa californica Cham. & Schldl.

Location: S-1, app .25mi SE of James Cabin.

Site: Edge of pond.

Elevation: 1,600 ft,

Date: 6-9-97

Plant Number: #2031

Collected by:

Kerry L. Heise



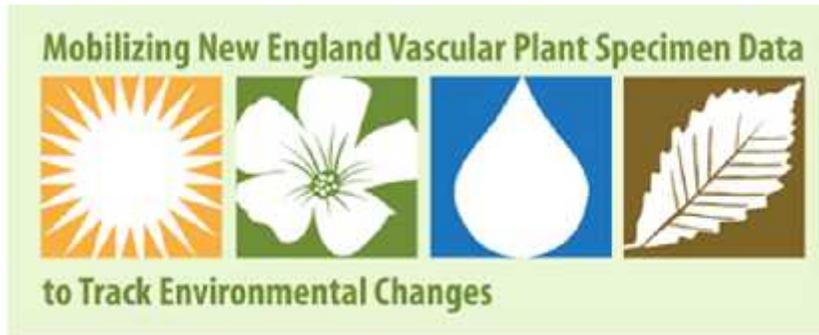
Phenology Standards for Herbarium Specimens

New England Vascular Plant TCN - Patrick Sweeny

Chuck Davis - CURIO

Individual Herbaria

Independent Research Efforts



- Each collects a unique subset of phenology data and quantifies them differently according to their research or institutional priorities.
- Rarely made accessible to the public
- Difficult to aggregate in a meaningful way

No Darwin Core standards & No community wide standards

TCN: NEVP	AppleCore	USA-NPN	Darwin Core	Curio – PI-Davis
Vegetative—no flowers	Vegetative growth			
Flowering—mostly buds (<1/2 open)	Budding	Flower buds— ≥1 closed flower buds visible	reproductiveCondition – controlled vocabulary	
Flowering—mostly open (>1/2 open)	Flowering	Open flowers— ≥1 flowers open; stigma or anthers must be visible		Number of flowers
Flowering—mostly old (<1/2 open)	Flowering senescing	Wilting flowers—one or more flowers with wilted or abscised petals		
Fruiting—mostly young fruits	Fruiting	Expanding ovaries— one or more spent flowers in which the ovary or pistils are visibly expanding or at full size		
Fruiting—mostly mature fruits (full)	Fruiting senescing	Ripe fruits/dehiscing fruits—One or more dehiscent fruits or fruits that are ready to be dispersed		Number of fruits
Fruiting—fruits past maturity (past full)				

Phenology Research from Specimens

- Establish the average seasonal timeframe of a phenophase
- Explore long-term changes in plant phenology
 - pre-flowering, first flowering, peak flowering, last flowering, after flowering).
 - date and location



Literature Search

Phenology Survey

March 12 - 13th, 2016

1st Meeting of Herbarium Phenology Standards Group

UC Berkeley

The goals of the current workshop are to:

1. Review the ways in which phenological characters are currently being captured from specimens at herbaria.
2. Review the phenological metrics most often used by the research community, and those most desired by the research community.
3. Review the metrics used by current field phenology monitoring projects.
4. Discuss the utility of different phenological metrics. What do we learn from each? Are some redundant? Which are the most valuable?
5. Review the requirements for creating new data standards, and the current state of phenological characters in biodiversity data standards.
6. Set a list of phenological scoring priorities for institutions that may just be getting started.
7. Draft methods for scoring the most relevant characters for major plant groups.
8. Develop the next steps for creating data standards.