

Mapping habitat distributions of rare plant taxa from optimized data



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Project Overview

Purpose

Improve knowledge of rare plant distributions for conservation planning

Methods

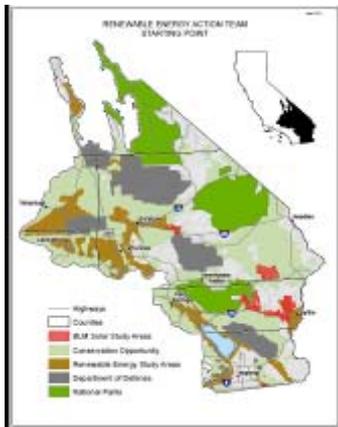
- 1) Map rare plants from herbaria (museum) collections
- 2) Predict additional occurrences of rare plants with modeling
- 3) On-the-ground field surveys to assess models

Rare plants in the CA deserts:

- **Over 300 rare taxa** (California Rare Plant Ranks 1, 2, 3 and 4)
- **22 Federally threatened or endangered**
- **Distributions poorly understood:**
 - historically under-surveyed
 - annual taxa only appear in some years



Advancing energy development:



How can we improve knowledge of rare plant distributions for conservation planning?

California Desert Renewable Energy Conservation Plan- initial starting point

1) Map rare plants from herbaria collections

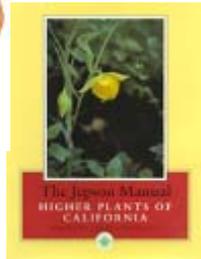
UC Berkeley & Jepson Herbaria



Jepson field notes



A Flora of California



Jepson Manual
New edition coming 2011



SMASCH



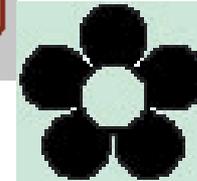
Desert Manual



Index to Calif. Plant Names



MEKA Keys



Horticultural Database



Ecological Flora of California



Jepson Online Interchange for California Floristics



Consortium of California Herbaria

Over 1.1 million searchable specimens: <http://ucjeps.berkeley.edu/consortium/>

The Consortium of California Herbaria is a gateway to information from California vascular plant specimens that are housed in herbaria throughout the state. 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

Search here using latitude and longitude

County

Alameda
Alpine
Amador
Butte
Calaveras
Colusa
Contra Costa

(1 or more; default is all counties)

Geographic Region

Anza Borrego
Big Sur
Channel Islands
Clear Lake
Death Valley
Donner Summit
Kings Canyon/Sequoia

Source (1 or more; default is all sources)

CAS (California Academy of Sciences)
DS (Dudley Herbarium in CAS)
CDA (California Department of Food and Agriculture)
CHSC (Biological Sciences Herbarium, CSU Chico)
HSC (Humboldt State University Herbarium)
IRVC (UC Irvine)
JEPS (Jepson Herbarium, UC Berkeley)

Collector (last name only; e.g.: Muir; Moref)

Collection Number (numerical part only)

Collection Date(s)

Month	Day	Year	Before	After
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="radio"/>	<input type="radio"/>

- CNPS Inventory (return only names in California Native Plant Society Inventory)
- Noxious weeds / invasives (return only records of CAL-IPC or CDFA covered weeds)
- Non-natives (Return only records of non-natives currently (2008) being georeferenced)
- Specimens with coordinates (return only records that can be mapped)
- Name list (return only one record for each taxon)

Submit Query

2000 records is default maximum: [Contact us for larger searches.](#)

Reset Form

About this page

Accession Number

JEPS2760

Get single record

(e.g., JEPS1234; SJSU1234, etc. Wildcards not recognized)

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**Consortium of California Herbaria
georeferencing progress -- 557,735
specimens georeferenced through
Jan, 2010**

Fewer specimens from deserts



Mapping rare plants: utilizing existing records



CCH ~ 12,000 rare desert plant specimens

Georeferenced:

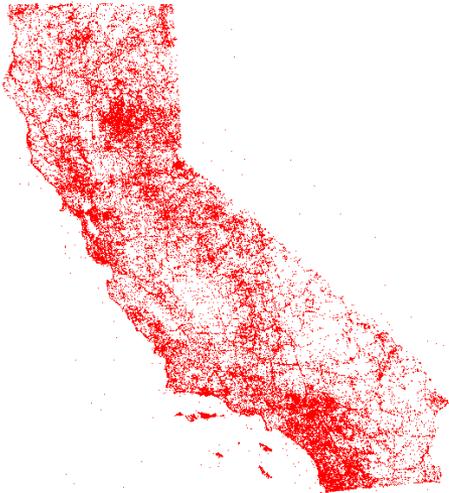
locality descriptions

archival notebooks

cross-referencing with other collections

Make data available via CCH website:

<http://ucjeps.berkeley.edu/consortium/>



**2) Predict additional occurrences of
rare plants with modeling**

Species Distribution Modeling

Methods that use:

species locations

&

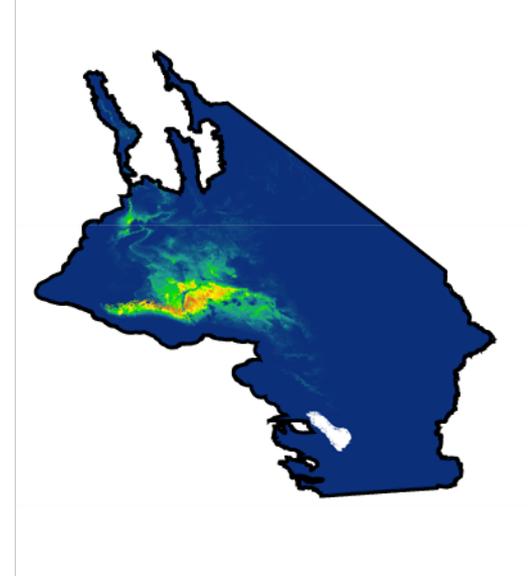
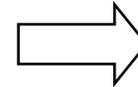
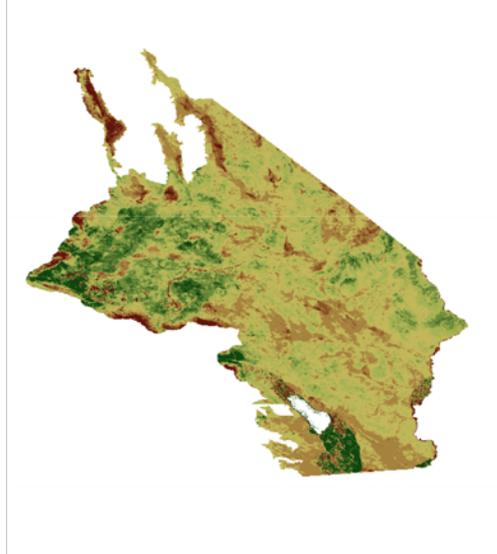
environmental data

to

estimate distribution



+



Uses in conservation:

- identify new localities & potential habitat
- focusing survey efforts
- model habitat shifts with climate change

Mapping rare plants: predicting habitat



Examples of locality data

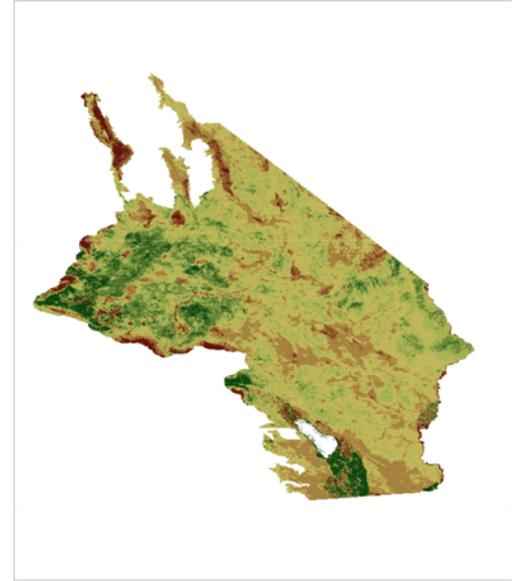
California Natural Diversity Database

Georeferenced records from CCH

Recently found unvouchered records:

New surveys (e.g. CNPS plant hunts)

Local experts



Examples of environmental data

Precipitation and temperature

Elevation, slope, aspect

Soil material

Remote sensed GIS layers:

Albedo (surface reflectivity)

NDVI (vegetation index)

Outline of modeling stages:

- **Review existing locality & environmental data**
- **Select target taxa (10-15)**
- **Build evaluation models of predicted habitat**
- **Field surveys to assess models (6-8)**
- **Refine models based on surveys & CCH data**

Target taxa selection

- **Federal & State T/E and California Rare Plant Ranks 1 & 2**
- **Number of occurrences for modeling (at least 10)**
- **Elevations suitable to solar installations**
- **Consultation with desert botanists & agencies**
- **A range of life forms and life histories**
- **Feasibility of conducting surveys**

Example taxa:

<i>Penstemon albomarginatus</i> (white-margined beardtongue)	CA Rank 1b
<i>Mimulus mohavensis</i> (Mojave monkeyflower)	CA Rank 1b
<i>Astragalus jaegerianus</i> (Lane Mountain milk-vetch)	Fed. End. CA Rank 1b
<i>Grusonia parishii</i> (Parish's club cholla)	CA Rank 2

Modeling approaches:

Multiple model methods, including :

Maxent & Generalized Additive Models (GAM)

implemented and statistically evaluated within
R statistical platform using developed distribution
modeling packages and custom scripts

Multiple combinations of environment & locality data

to identify robustly predicted areas
& method specific predictions

Assessing models:

Pre-survey statistical evaluation & practical review:

choose subset of evaluation models for field surveys

On-the ground field surveys:

- **Prioritized by robust predictions**
- **Focus on botanically under-surveyed areas**
- **Survey across range of predicted suitability to examine association between new occurrences and models**
- **Recommended practices for rare plant surveys:**
 - e.g. use known populations to time surveys**
 - awareness of non-focal rare taxa**

Project outcomes

- Georeferenced localities for 12,000 rare desert plant specimens
- Species Distribution Models and focused surveys for 6-8 rare plant taxa
- Assessment of utility of species distribution modeling in identifying new occurrences of rare desert plants

Acknowledgements

CEC/PIER Staff

Project Team

Kara Moore, *UC Davis*

Richard Moe, Bruce Baldwin, Brent Mishler, *UC & Jepson Herbaria*

Greg Suba *California Native Plant Society*