



Climate Change Vulnerability Index

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Introduction

- Climate change impacts on biodiversity need to be addressed in resource management decisions and included in revisions of key planning documents.
- The **climate change vulnerability index (CCVI)** was developed to assess potential impacts of climate change to individual species based on their life history characteristics and distributions.
- The output will guide monitoring, management, and conservation plans for sensitive plant and animal species.

Objectives

- Evaluate climate change assessment methodology.
- Assess 156 rare plant species using the climate change index.
- Create future plant species distribution models and maps to aid in the assessment of vulnerability.
- Make management recommendations.



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Methods

- Assess 156 rare plant species in California based on CCVI factors:
 - Predicted exposure to climate change
 - Use Climate Wizard data and Maxent to create climate models
 - Climate change sensitivity
 - Indirect exposure to climate change
 - Land conversion
 - Development
 - Species specific factors
 - Dispersal ability
 - Habitat restrictions
 - Documented response to climate change
 - A2 emissions scenario
 - Predicted for the year 2080



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Preliminary Results

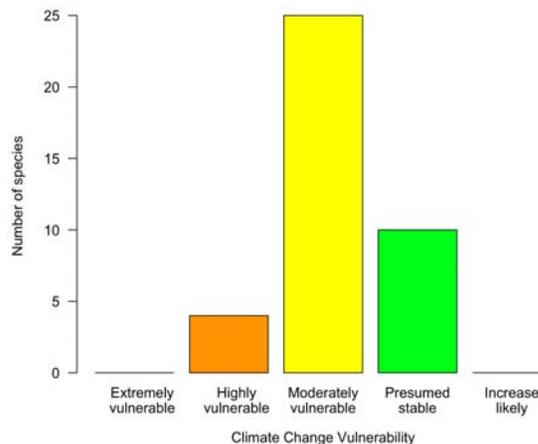
- We have assessed 50 species to date (Figure 1).
- Most species fall into the moderately vulnerable to climate change category, followed by presumed stable, and highly vulnerable.
- Overall, climate models indicate a decrease in climate suitability for most of the species we have assessed to date.



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Species Vulnerability

Figure 1: Climate change vulnerability index (CCVI) results for 50 species assessed to date



Example: *Brodiaea orcuttii*

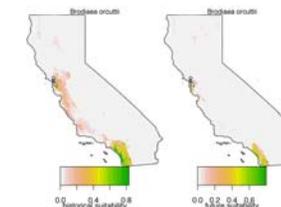
Preliminary result: highly vulnerable

- Prefers vernal moist grasslands and is dependent on a seasonal flood regime.
- Predicted climate change exposure is + 2.2-2.4 C for half of the *B. orcuttii* occurrences and + 2.5-2.7 C for the other half of the *B. orcuttii* occurrences (Figure 2).
- Anthropogenic barriers: Development and construction are major threats; the majority of its range is surrounded by high density urban interface.
- Renewable energy production within the species range also threatens the species, decreasing its ability to shift range and, therefore, increasing its susceptibility to climate change.



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Figure 2: Maxent's predicted historical (1951-2006) and future (2080) climate suitability



Ongoing work

- Consulting expert opinions to improve scoring accuracy of ranks for species with little or no life history data.
- Critiquing distribution models and their sensitivity to climate variables.
- Continuing research and climate vulnerability assessment for the remaining 100 rare and endemic plant species.

Collaborators

- US Fish and Wildlife Service/LCC (Primary funding)
- NatureServe (Bruce Young, Anne Frances)
- DFG (Roxanne Bittman, Todd Keeler-Wolf)
- UC Davis (Robert Hijmans, Susan Harrison, Jim Thorne, Nick Jensen, Robin Thorpe)
- California Native Plant Society (Aaron Sims)