Climate Change Vulnerability Index

Brian Anacker, Krystal Leidholm, Melanie Gogol-Prokurat, Steve Schoenig
California Department of Fish and Game, Biogeographic Data Branch
1807 13th Street, Suite 202, Sacramento, CA 95811
(916) 324-5198; sschoenig@dfg.ca.gov; http://www.dfg.ca.gov/biogeodata

Introduction

- Climate change impacts on biodiversity need to be addressed in resource management decisions and included in revisions of key planning documents.

- The NatureServe *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, representative rare plant species using the climate change index.

- Create future MaxEnt distribution models and maps to aid in the assessment of vulnerability.

Methods

- Assess 156 rare plant species in California based on CCVI factors:

1. Predicted exposure to climate change
   - Use Climate Wizard data and Maxent to create climate models

2. Climate change sensitivity
   - Indirect exposure to climate change
     - a. Land conversion
     - b. Development
   - Species specific factors
     - a. Dispersal ability
     - b. Habitat restrictions

3. Documented response to climate change
   - A2 emissions scenario
   - Predicted for the year 2080

© 2003 Charles E. Jones

Results

- Most species fall into the **moderately vulnerable to climate change** category, followed by presumed stable, and highly vulnerable.

- Overall, MaxEnt spatial climate models indicate a decrease in climate suitability for most of the species we have assessed to date.

©1998 Jim Jokerst

Species Vulnerability

Figure 1: Climate change vulnerability index (CCVI) results for 156 species assessed to date
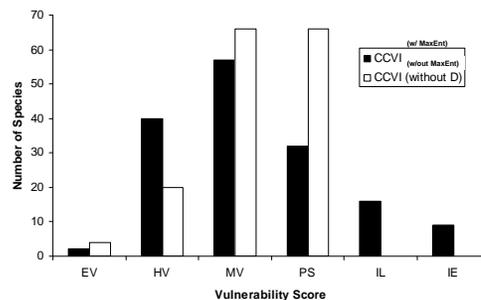
EV = Extremely Vulnerable; **HV** = Highly Vulnerable; **MV** = Moderately Vulnerable;
**PS** = Presumed Stable; **IL** = Increase Likely; **IE** = Insufficient Evidence

Example: *Brodiaea orcuttii*

Preliminary result: highly vulnerable

- Prefers vernally 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.

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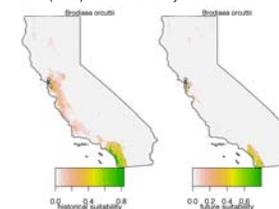
Acknowledgements

- US Fish and Wildlife Service/California 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)