Steve Schoenig
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To <rebecca_fris@fws.gov>
cc
bcc
Subject Re: update

Rebecca - I cleaned up what Brian sent me below. Let me know if you would like any other sort of background, results, interpretation, etc. We just had a great meeting with Bruce Young, the creator of the Nature Serve CC Vulnerability Index and a number of folks from states who are using it.

Steve

>>> Brian L.Anacker <blanacker@ucdavis.edu> 05/11/11 9:32 AM >>>
Here's what I came up with; too long, but you can hack away!
Brian

We are creating a CA Rare Plant Climate Change Vulnerability Assessment Methodology and applying it to the rare plant species in the state. Below is a description of activities and results to date.

1) We have reviewed climate change vulnerability indices created for other taxa (e.g., birds, mammals) and reviewed spatial modeling techniques for climate change vulnerability assessment, especially for rare plant species. The review process has included literature review and consultation with conservationists and modelers at UC Davis, UC Berkeley, TNC, NatureServe, the Chicago Botanical Garden, and other institutions. We found that the NatureServe's Climate Change Vulnerability Index (CCVI) was the most complete, useful, and widely used index available. We determined that it takes approximately one day to score a species using the index, and thus we sought to create a focal list of ~150 species to process in this calendar year. Regarding spatial modeling techniques, we determined Maxent was the most widely used and accepted modeling technique for presence-only occurrence data, with several applications in rare plant biology.

2) We have chosen 156 taxa (of 2168 in the CA Natural Diversity Database [CNDDB]) for our focal species list, selected to include representatives of each of eight categories of rarity, representing the intersection of three factors: range size, population size, and habitat specificity ("Rabinowitz's rarity types"). We also added some charismatic common species and some island endemics to our species list.

3) We have so far processed 31 species using the NatureServe CCVI. The results include:
0 extremely vulnerable species,
3 highly vulnerable species,
16 moderately vulnerable species,
8 presumed stable species,
0 increase likely species,
2 species that could not be scored due to insufficient information.

4) We have created species distribution models for the 156 taxa on our focal list using four climate variable inputs (annual temperature, annual precipitation, temperature seasonality, precipitation seasonality). Downscaled climate data (historic and future) were acquired from WorldClim and from Jim Thorne at UC Davis and point occurrences were extracted from CNDDB. We modeled

climate suitability for historic and future conditions for the 156 focal taxa and determined a method to quantify vulnerability based on the difference between future and historic predicted suitability ("suitability anomaly").

The results show clearly that most species will experience reductions in climatic suitability by 2080. However, vulnerability is quite variable among the taxon, allowing for rank of the species from most vulnerable (often species from Sierra Nevada) to the least (often desert species, which may be favored by future climates).

On going work is first to finish the NatureServe CCVI scoring. For modeling, we are creating models using additional environmental data, including statewide layers for slope and aspect, soil type, soil pH, soil organic matter, and soil clay content, and beginning a sensitivity analysis to describe the range of vulnerability predictions possible given different model configuration and modeling assumptions. Finally, we will cross-walk the results of the CCVI and modeling efforts, identifying the most vulnerable species given the combined results, and make recommendations for expanding vulnerability assessments to the remaining 2000 species in CNDDB.