

Western Ecological Research Center

Publication Brief for Resource Managers

Release:

November 2008

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Effect of Species Rarity on the Accuracy of Species Distribution Models

Species distribution models are widely used, at multiple scales, to predict the geographical distribution of habitat suitability or species occurrence. Several studies have found that more accurate predictive models of species occurrences can be developed for rarer species. One recent study, however, found the relationship between range size and model performance to be an artefact of sample prevalence (i.e., the proportion of presence versus absence observations in the data used to train the model). In a new study, USGS scientists and colleagues at San Diego State University further explored the effect of species rarity on models. They found that species in classes with higher rarity were more accurately predicted than common species, and this effect was independent of sample prevalence. Their study was published recently online in *Diversity and Distributions*.

The authors used distribution data collected at the landscape scale, comprising observations of species presence and absence in field plots as part of a regional monitoring program in southern California. They examined the effect of model type, species rarity class (assigned by experts), species survey frequency, detectability, and manipulated sample prevalence on the accuracy of distribution models developed for 30 reptile and amphibian species. Using a variety of modelling methods, more accurate species distribution models were developed for rarer than for more common species. This was presumably because it is difficult to discriminate suitable from unsuitable habitat for habitat generalists, and not as an artefact of the effect of sample prevalence on model estimation. Differences in accuracy among model types were slight.

Management Implications:

- Species distribution models provide more accurate predictions for rarer than more common species.
- Predictive maps for common species will tend to have lower specificity.

The authors identified a positive relationship between expert-assigned species rarity class and model performance. This relationship was robust when sample prevalence was manipulated by subsampling the data: model accuracy was higher for those rare species whose underlying prevalence in the survey data was lowest. This suggests that accurate species distribution models can be developed for rarer species that are of particular concern in conservation planning and resource management using regional faunal survey data even when the spatial sample design may be less than ideal. This finding also helps guide the appropriate interpretation of predictive habitat maps for specialist and generalist species.

Franklin, J., K. E. Wejnert, S. A. Hathaway, C. J. Rochester, and R. N. Fisher. 2008. *Effect of species rarity on the accuracy of species distribution models for reptiles and amphibians in southern California. Diversity and Distributions.* DOI: 10.1111/j.1472-4642.2008.00536.x

[Note: This journal article will also appear in a later print issue of *Diversity and Distributions*.]