

Western Ecological Research Center

Publication Brief for Resource Managers

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Predicting Patterns of Non-native Plant Invasions

One of the major issues confronting management of parks and reserves is the invasion of non-native plant species. Effective management of non-natives would be assisted by information on their potential distribution that can be generated by predictive modeling techniques. In a recent issue of the journal *Diversity and Distributions*, USGS ecologist Peggy Moore and Drs. Emma Underwood and Rob Klinger of the University of California, Davis, reported on the use of plant species occurrence information and spatial environmental data to predict the potential distribution of non-native species.

The researchers identified environmental factors that were correlated with the percent cover of non-native species and then developed a predictive model using the Genetic Algorithm for Rule-set Production (GARP) technique. They performed a series of analyses using community-level data on species composition in over 230 plots located throughout Yosemite National Park. A total of 41 non-native species were recorded which occurred in 23.7% of the plots. Plots with non-natives occurred most frequently at low- to mid-elevations, in flat areas with other herbaceous species. Based on the community-level results, they selected elevation, slope, and vegetation structure as inputs into the GARP model to predict the occurrence of non-native species in unsurveyed areas. They verified the results using plot data not included in model development and calculated the correct prediction of non-native species occurrence as 76%.

The majority of the western, lower-elevation portion of the park was predicted to have relatively low levels of non-native species occurrence, with highest concentrations predicted at the west and south entrances and in the Yosemite Valley. Distribution maps of predicted

Management Implications:

- Non-native plant species occurrence information along with environmental data can be used to predict the potential distribution of non-native plants.
- Results of predictive modeling should be useful in stratifying inventory, monitoring, and non-native plant control efforts.
- Multiple species were found to have similar habitat preferences, which has implications for creating efficient control strategies.

occurrence can be used by management to stratify monitoring of non-native species, to prioritize inventory and control efforts according to the likelihood of non-native occurrences, and to inform decisions relating to the management of non-native species in postfire environments.

With the expected increase in the spread of non-native plants, this approach provides a tool for assisting decision makers in managing non-native species and can be adapted to target non-native species in other locations. The broader implication of this research is that similar predictive models can be developed for other national parks where suitable plot data exist to increase the efficiency and reduce the costs of field work. The approach may be useful for other conservation issues such as rare plant distributions.

Underwood, E. C., R. Klinger and P. E. Moore. 2004. Predicting patterns of non-native plant invasions in Yosemite National Park, California, USA. Diversity and Distributions 10:447–459.