Recent Peer Reviewed:

- **A review of methods for the assessment of prediction errors in conservation presence/absence models**, Alan H. Felding and John F. Bell, Environmental Conservation **24** (1): 38–49, 1997, Foundation for Environmental Conservation

Summary

Predicting the distribution of endangered species from habitat data is frequently perceived to be a useful technique. Models that predict the presence or absence of a species are normally judged by the number of prediction errors. These may be of two types: false positives and false negatives. Many of the prediction errors can be traced to ecological processes such as unsaturated habitat and species interactions. Consequently, if prediction errors are not placed in an ecological context the results of the model may be misleading. The simplest, and most widely used, measure of prediction accuracy is the number of correctly classified cases. There are other measures of prediction success that may be more appropriate. Strategies for assessing the causes and costs of these errors are discussed. A range of techniques for measuring error in presence/absence models, including some that are seldom used by ecologists (e.g. ROC plots and cost matrices), are described. A new approach to estimating prediction error, which is based on the spatial characteristics of the errors, is proposed. Thirteen recommendations are made to enable the objective selection of an error assessment technique for ecological presence/absence models.

- **Good practices for estimating area and assessing accuracy of land change**, Pontus Olofsson, Giles M. Foody, Martin Herold, Stephen V. Stehman, Curtis E.Woodcock, Michael A. Wulder, 2014, Remote Sensing of Environment 148 (2014) 42–57

Abstract

The remote sensing science and application communities have developed increasingly reliable, consistent, and robust approaches for capturing land dynamics to meet a range of information needs. Statistically robust and transparent approaches for assessing accuracy and estimating area of change are critical to ensure the integrity of land change information. We provide practitioners with a set of “good practice” recommendations for designing and implementing an accuracy assessment of a change map and estimating area based on the reference sample data. The good practice recommendations address the three major components: sampling design, response design and analysis. The primary good practice recommendations for assessing accuracy and estimating area are: (i) implement a probability sampling design that is chosen to achieve the priority objectives of accuracy and area estimation while also satisfying practical constraints such as cost and available sources of reference data; (ii) implement a response design protocol that is based on reference data sources that provide sufficient spatial and temporal representation to accurately label each unit in the sample (i.e., the “reference classification” will be considerably more accurate than the map classification being evaluated); (iii) implement an analysis that is consistent with the sampling design and response design protocols; (iv) summarize the accuracy assessment by reporting the estimated error matrix in terms of proportion of area and estimates of overall accuracy, user's accuracy (or commission error), and producer's accuracy (or omission error); (v) estimate area of classes (e.g., types of change such as wetland loss or types of persistence such as stable forest) based on the reference classification of the sample units; (vi) quantify uncertainty by reporting confidence intervals for accuracy and area parameters; (vii) evaluate variability and potential error in the reference classification; and (viii) document deviations from good practice that may substantially affect the results. An example application is provided to illustrate the recommended process.

- **Death to Kappa: birth of quantity disagreement and allocation disagreement for accuracy assessment**, Robert Gilmore Pontius Jr & Marco Millones, 2011, International Journal of Remote Sensing, 32:15, 4407-4429, http://dx.doi.org/10.1080/01431161.2011.552923 (Accessed 25Jan15)

  Abstract

  The family of Kappa indices of agreement claim to compare a map's observed classification accuracy relative to the expected accuracy of baseline maps that can have two types of randomness: (1) random distribution of the quantity of each category and (2) random spatial allocation of the categories. Use of the Kappa indices has become part of the culture in remote sensing and other fields. This article examines five different Kappa indices, some of which were derived by the first author in 2000. We expose the indices' properties mathematically and illustrate their limitations graphically, with emphasis on Kappa's use of randomness as a baseline, and the often-ignored conversion from an observed sample matrix to the estimated population matrix. This article concludes that these Kappa indices are useless, misleading and/or flawed for the practical applications in remote sensing that we have seen. After more than a decade of working with these indices, we recommend that the profession abandon the use of Kappa indices for purposes of accuracy assessment and map comparison, and instead summarize the cross-tabulation matrix with two much simpler summary parameters: quantity disagreement and allocation disagreement. This article shows how to compute these two parameters using examples taken from peer-reviewed literature.

Other Resources:

- **Lightning Talk: Understanding Error Matrices (Accuracy Assessment),** Brenna Schwert, 2015, USDA Forest Service,Remote Sensing Application Center. Salt Lake City, UT, http://bit.ly/1C2sVZ9 (Accessed 25Jan15)
- **An Urban Tree Canopy QA/QC Process**, D. Hartel, 2015, USDA Forest Service, Urban Forestry South, Athens, GA, http://bit.ly/1CTS44O (Accessed 25Jan15)