

REGIME DETECTION MEASURES FOR THE PRACTICAL ECOLOGIST

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# REGIME DETECTION MEASURES FOR THE PRACTICAL ECOLOGIST

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Forecasting undesirable change is, arguably, the holy grail of ecology. Paired with an understanding of system interactions, a forecast is ideal if it provides reliable predictions in sufficient time to prevent or mitigate unwanted systemic change. Early warning systems (or early warning signals, early warning indicators) have been developed and tested for some ecological systems data, but have been mostly applied to marine fisheries time series and nutrient loadings in shallow lakes. Despite the numerous quantitative methods proposed for identifying or forecasting regime shifts in ecological data, few are used in practice. This dissertation contributes to our understanding of the utility and limitations of early warning systems for ecological regime shift detection, referred to here as 'regime detection measures'. Using both theoretical and empirical data, I evaluate the efficacy of multivariate regime detection measures in identifying abrupt shifts in ecological communities over time and across space. I also introduce a method which I refer to as 'velocity' (of a system's trajectory in phase space) as a potential regime detection measure. Using resampling techniques, I find the velocity method is more robust to data loss and data quality than are the Fisher Information and Variance Index methods which have been previously applied to empirical systems data. This dissertation demonstrates that, while potentially useful, regime detection metrics are inconsistent, not generalizable, and are currently not validated using probabilities or other statistical measurements of certainty.

## DEDICATION

To those not yet exposed to the great outdoors, first generation college students, Mike Moulton, S, and myself.

PREVIEW

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