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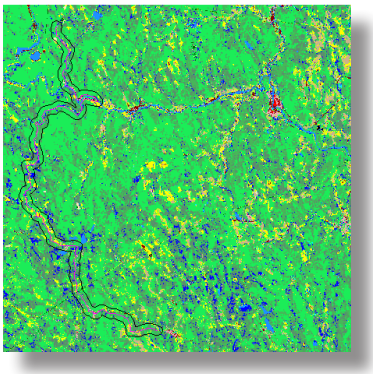
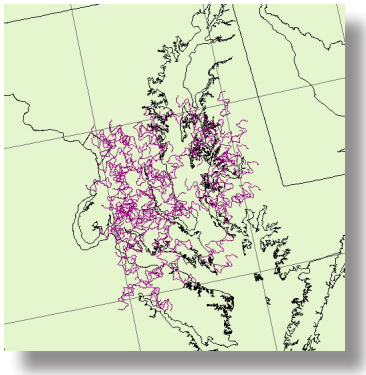
Patuxent Wildlife Research Center

Implementing cross validation approaches for model selection and evaluating goodness of fit in complex hierarchical models



The Challenge: Many critical wildlife surveys, such as the North American Breeding Bird Survey (BBS), are analyzed using complex hierarchical models. These models are generally multi-scale and contain random effects; the standard approaches to model selection and assessment of model fit are often inappropriate and no simple way exists to compare alternative models. However, a clear need exists for these assessments. Many alternative models new exist for analysis of BBS data, and simply presenting multiple results without clear guidance on which model is most appropriate will lead to confusion among users of BBS data and limit use of this important survey.

The Science: We are evaluating the use of Bayesian cross-validation as a general tool for comparison of complex hierarchical models. In cross-validation, a model is fit to a data set from which an observation is omitted and the resulting model and estimated parameters is then used to predict the missing observation. The process is repeated many times, comparison of the true value with the prediction of the model in the absence of the data provides a measure of how well the model fits the data.



The Future: As expected, there are differences in land cover occur between roadside and non roadside habitat. However, the differences between on- and off-road land cover vary regionally. Analysis is in progress regarding relative change in habitats on verses off roads. Roadside traffic has significant effects on observer's ability to perceive many species of birds, but the magnitude of these effects are generally small and have not been a significant source of bias for estimates of population change. Analyses of these and other aspects of the survey design are continuing, with the goal of documenting and controlling for factors that limit the ability of the survey to monitor North American birds.

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