August 4, 2014

Dr. Evan Cooch

Subject Matter Editor

Journals of the Ecological Society of America

Dear Dr. Cooch:

Please accept our resubmitted manuscript entitled “**Improved state-space models for inference about spatial and temporal variation in abundance from count data**” for potential publication in *Ecology* (previous submission MS# 13-2233). The work described in this manuscript is based on our original research.

Fitting population models to field data can be challenging due to process and observation error. State-space models have been developed to deal with these problems by directly modeling both the observation error and the temporal dynamics of a population. However, conventional state-space models have several important limitations. In this manuscript, we demonstrate how several of these limitations can be addressed by using a class of models proposed by Dail and Madsen (2011; Biometrics). We expand this class of models to accommodate classical population growth models, immigration, zero-inflation, and random effects. We also present methods for forecasting population size under future environmental conditions, and demonstrate the strength of these new models with simulation studies and an analysis of Breeding Bird Survey data. Code for performing these analyses using both frequentist and Bayesian methods is provided.

We respond to the reviewer’s comments and suggestions in another file. In short, we have added a robustness simulation study section to the manuscript in which we test our Poisson distributed process error versions of the model against data underdispersed or overdispersed compared to the Poisson. We found that many estimates were biased in these cases, but that a model selection procedure (AIC) generally did a good job of showing whether the data was Poisson distributed or underdispersed. We also present another model extension allowing for overdispersed data.

This manuscript represents an important step forward in the analysis of population count data. By uniting two classes of state-space models, we have developed a key tool for the analysis of population limitation and regulation. Furthermore, we believe this modeling approach will be useful for quantitative assessments of species’ vulnerability to threats such as climate change. Therefore, we are confident that this paper will be of substantial interest to applied and theoretical ecologists worldwide.

I thank you for your kind consideration of our manuscript, and I look forward to hearing from you.

Sincerely,

Jeffrey A. Hostetler