Data Provider: **Christina Kennedy**

Title: **Effects of landscape matrix and species traits on Neotropical migrant bird responses to forest fragmentation in Jamaica**

**Research Background & Question**

Land cover and land use surrounding fragmented habitat can greatly impact species persistence by altering resource availability, edge effects, or the movement of individuals throughout a landscape. Despite the potential importance of the landscape matrix, we still have limited understanding of the relative effects of different types of land cover and land uses on species patterns and processes. Thus, I investigated the responses of Neotropical bird communities to forest fragmentation across four different landscape mosaics in central Jamaica. Specifically, I examined patterns of bird species richness, community composition, and abundance patterns, and occupancy dynamics in forest fragments embedded in three dominant land use types in the Caribbean: agriculture (i.e. pasture), residential development, or mining for bauxite (i.e. human-dominated matrices) relative to sites in continuous forest (i.e.natural ‘‘matrix’’). This research is novel compared to other fragmentation studies in that sampled forest patches in replicate human-dominated landscapes were similar in the major components of fragmentation (i.e. forest amount and configuration), which allows for the isolation of the influence of the surrounding matrix.

To elucidate potential mechanistic explanations underlying bird responses to forest conversion, I have collected information on a suite of traits proposed to influence species persistence in fragmented systems: phylogenetic relatedness, body size, rarity, geographic and altitudinal ranges, territory size, clutch size, nest type, nest height, diet guild, foraging strata, and habitat association. Each of these traits can affect dispersal ability, resource acquisition, and/or population growth potential, thus, would relate to species responses to human-altered forested landscapes.

To date, I have published on the effects of the landscape matrix and species traits on the Neotropical ***resident*** bird community, and found that species **richness, community composition, and abundances were matrix-dependent**, with agricultural landscapes supporting greater avian diversity and more intact community assemblages than either peri-urban or bauxite landscapes. Traits related to resource use best predicted specfies responses (including diet guild, nest height, habitat association, and foraging strata), which lends support to the hypothesis that ***resource availability*** may be a primary factor driving Neotropical resident bird responses to fragmentation (Kennedy et al. 2010). I also employed multi-season occupancy models to determine the relative influence of patch area, patch isolation, within-patch vegetation structure, and landscape matrix on occupancy dynamics of nine ***resident insectivorous***birds, and found that within-patch vegetation structure and the matrix type between patches were more important than patch area and patch isolation in determining ***local colonization***and ***local extinction probabilities*** (Kennedy et al. 2011). The landscape matrix influenced local extinction more than local colonization, indicating that ***extinction processes, rather than movement***, likely drive interspecific differences in occupancy dynamics in fragmented landscapes.

For a project in the Bayesian modeling course, **I propose to examine whether the response patterns found for Neotropical resident bird community (as describe above) also hold for the Neotropical *migrant* bird community.**

**Description of Dataset**

***Species Responses***

I have data to examine **richness, community composition, abundance, and occupancy patterns** (that can account for **detection** biases) for **21 Neotropical migrant species** across **20 replicate landscapes** comprising continuous forest (N=6 landscapes), forest fragmented by agriculture (N=5), forest fragmented by residential development (N =4), or forest fragmented by bauxite mining (N = 5). In total, **99 forest patches were sampled,** of which 22 fragments were embedded in an agricultural matrix, 19 in residential matrix, and 27 in a bauxite-mining matrix. Because forested landscapes comprise continuous forest cover, we sampled 31 ‘‘pseudo-patches,’’ which were transects whose length (i.e. number of point-count locations) were proportional to patch sizes in fragmented landscapes.

I have point count data for almost **300 locations** on **two or three separate occasions** from early February to mid-June during the height of migratory activity each year for **three consecutive seasons (2005–2007)**. Point counts were conducted along a centrally placed transect within each of the 68 forest patches in anthropogenic landscapes and along randomly placed transects in forested landscapes. We sampled 1–13 stations per patch, proportional to patch area, and 12–15 stations on average per replicate landscape per occasion.

***Covariates***

Community-level and individual migrant bird responses can be assessed in relation to patch- and landscape-level characteristics (matrix type, patch area, patch isolation, and local vegetation structure, see Kennedy et al. 2011 for details), as well as relevant species traits (phylogenetic relatedness, body size, rarity, geographic and altitudinal ranges, territory size, foraging distance, diet guild, foraging strata, and habitat association, see Kennedy et al. 2010 for details).

**Sources Cited:**

Kennedy, C., P. Marra, W. Fagan, and M. Neel. 2010. Landscape matrix and species traits mediate responses of Neotropical resident birds to forest fragmentation in Jamaica. Ecological Monographs 80(4): 651–669.

*\* Published as a case study for the National Center for Case Study Teaching in Science.*

Withey, J., and C. Kennedy. 2012. Does the Matrix Matter? Testing the Influence of Matrix Type on Bird Responses to Forest Fragmentation. National Center for Case Study Teaching in Science, University at Buffalo, State University of New York. http://sciencecases.lib.buffalo.edu/cs/collection/detail.asp?case\_id=649&id=649.

Kennedy, C., E. Grant, M. Neel, W. Fagan, and P. Marra. 2011. Landscape matrix mediates occupancy dynamics of Neotropical avian insectivores. Ecological Applications 21(5): 1837–1850.