

Flather, C.H. and J.R. Sauer. 1996. Using landscape ecology to test hypotheses about large-scale abundance patterns in migratory birds. *Ecology* 77:28-35.

Overall I liked the approach taken by Flather and Sauer (1996) to study landscape-level patterns of abundance in Neotropical migrant birds in the eastern US. The Breeding Bird Survey (BBS) is an immense, although somewhat biased, pool of information that is well suited for use in broad-scale studies. Particularly, the extent (the US and Canada), intensity (annual), and duration (since 1966) of the BBS program make it a valuable data source. It makes sense to combine BBS data with land-use cover data to do a broad-scale assessment of where birds are found in relation to particular landscape features. Additionally, the BBS is conducted with greatest intensity in the eastern US, so it seems that the authors selected the best possible study area to effectively use this dataset (Sauer et al. 1997).

In relation to the biases in the BBS dataset discussed by Flather and Sauer (1996), the authors tried to be conscientious in dealing with some of the dataset's weaknesses by employing route regressions to estimate population change. However, the argument exists that rank trend analysis often surpasses route regressions in identifying changes in avian population trends (Coppedge et al. 2001). It would have been useful if Flather and Sauer (1996) explained why they chose to use route regressions for population change estimates. The authors can not cite lack of knowledge because Sauer edited a report which covered rank trend analysis as a method of determining avian population change (Sauer and Droege 1990).

A weakness of the paper by Flather and Sauer (1996) is that, while the focus of their study was on Neotropical migrants, they failed to mention the other end of the migration: the neotropics. Patterns of change in the abundance of Neotropical migrants

in the United States are affected not only by local land-use changes, but also by land-use changes and habitat loss on the birds' wintering grounds. The authors would have done well to note that the rate of deforestation in the neotropics has been high throughout the period that the BBS has been conducted (Kleinn et al. 2002, Whitmore 1997). It is quite possible that habitat loss in the tropics contributes to overall patterns of abundance while these birds are in the US for the nesting season (Sherry and Holmes 1995).

I had questions about Flather and Sauer's (1996) comparisons among categories of migratory birds (i.e., Neotropical migrants, temperate migrants, and permanent residents). Specifically, I wondered whether it was meaningful to pool birds based on their migratory habits. It seems to me that not all Neotropical migrants behave the same way in relation to their environment, nor do they have identical habitat requirements. Flather and Sauer (1996) explain that this categorization was necessary for the purposes of analysis to draw regional conclusions about Neotropical migrants, but I don't find this answer altogether satisfying. Most bird species have different distributions and different sets of habitat requirements, so it is possible that these problems could have confounded some of the analyses. Perhaps in the future the authors could select birds from each migratory category with similar distributions and habitat requirements to examine whether the results across migratory category also apply to sets of birds with similar life history characteristics. Coppedge et al. (2001) employed a technique similar to the one just suggested and classified birds by migration type, habitat, and nesting guild. This allowed for more specific comparisons of trends across different categories of birds.

Beyond the grouping of birds into migratory categories, the authors also grouped land-use classifications very broadly. The four categories of land use discussed by

Flather and Sauer (1996) included: forest land, wetland, agriculture, and urban land. I would argue that there is a great deal of variability within these categories. For example, forest land probably runs the spectrum from early-successional forest stands to late-successional tracts of forest. Temporal changes in the successional status of a forest can have a significant effect on bird abundance in forested areas not subject to anthropogenic disturbance (Holmes and Sherry 2001). When successional changes over time are compounded by increased fragmentation of the landscape, there is the potential to either magnify or dampen trends in bird abundance. The range of variation within each land-use category complicates the conclusions drawn by Flather and Sauer (1996) about the response of birds to different land-use types.

While Flather and Sauer (1996) selected a number of landscape metrics to examine landscape structure, the results are of limited utility because of the overly simplistic classification of land-uses. For example, the matrix context is very important to some bird species and can influence survival in a landscape with patchy habitat (Andr n 1994). However, “agriculture” or “urban land” do not tell us much about the structure of the landscape and the potential for available habitat in these regions. Also, the jumble of metrics used in this study was confusing because the authors never discussed the relevance of each metric to the birds in question. A number of the metrics calculated seemed redundant and may have served only to reinforce the paper’s conclusions. The analyses by Flather and Sauer (1996) may have been more effective if they had pared down the number of landscape metrics studied and focused their energy on a few highly meaningful metrics.

This paper is host to some seemingly contradictory results that were not explained by the authors very effectively. Flather and Sauer (1996) found that Neotropical migrant abundance exhibited a positive response to landscapes with a greater proportion of natural habitats and a negative response to areas with higher patch diversity and amount of edge. This part of the analysis was based on current BBS data and current land-cover data. Flather and Sauer (1996) also attempted to combine historical BBS data (1966-1993) with current land-cover data to examine temporal trends in bird abundance in relation to landscape structure. This analysis yielded contradictory results because it was found that Neotropical migrant abundance trends were lower in landscapes with larger forest patches and higher in landscapes with a more edge habitat. On a very basic level, I do not understand the utility of this analysis because temporal changes in species abundance should be related to temporal changes in land-cover. Furthermore, the authors do a poor job of reconciling the differences observed in patterns of Neotropical migrant abundance in relation to landscape structure.

Flather and Sauer (1996) took a regional approach to study Neotropical migrant abundance in relation to landscape features, including forest fragmentation. It was found that associations of Neotropical migrants in relation to fragmentation varied with geographic location in the eastern US. Therefore, the authors concluded that landscape context influenced the relationship between Neotropical migrant abundance and degree of forest fragmentation. Donovan and Flather (2002) also combined BBS data with landscape-level analyses to study the influence of forest fragmentation on ten species of songbirds in the eastern US. They found a link between fragmentation and bird population changes, but did not note any regional differences in this pattern although the

spatial extent of the two studies covered roughly the same geographic region. However, both papers suggest that factors such as land use history and life history traits should be factors in future landscape-level analyses of Neotropical migrant bird abundance.

As was stated earlier, I liked Flather and Sauer's (1996) research approach and think that it was a useful step forward in broadening the applications of the BBS database. I was left with the impression that this is a great starting place for asking questions about bird abundance and distribution in relation to landscape patterns. Indeed, a brief literature search turned up several papers since 1996 that have employed a similar technique (e.g., Coppedge et al. 2001, Donovan and Flather 2002). Methodologically, Flather and Sauer (1996) made an important contribution to the field of avian ecology and their research highlights several other avenues for future research. It seems that sometimes the utility of a paper lies in the fact that it raises interesting spin-off questions. For example, I am now curious about whether overall patterns observed for Neotropical migrants will continue to hold once this group is further broken down into categories of birds with similar ranges and life history characteristics. Also, Flather and Sauer (1996) suggested several possibilities to explain why Neotropical migrants were more sensitive to landscape structure than temperate migrants and permanent residents. I am interested in which of these competing hypotheses is most likely and think this would be a good direction for some fine-scale follow-up studies.

Flather and Sauer (1996) "acknowledge the danger of inferring causation from correlations" in regard to using the information presented in this paper to direct management decisions. Overall, the authors seem disinclined to encourage land managers to base decisions on the results of this or any other descriptive study. In my

mind, this begs the question: When can we use scientific research results to drive decision-making? We will never be completely confident that our land management practices are the absolute best for a given suite of species, but it seems worthwhile to put our scientific evidence to work. I think that scientific support for a particular management decision is a better option for guiding decision-making than is the personal opinion of a few uninformed men and women in a boardroom meeting. Scientists need to take some responsibility for the information they disseminate, and if the work is applied research one of the research goals should be to inform management decisions.

In the case of Flather and Sauer (1996) I am left wondering what management recommendations could or should be drawn from this research. The “Conclusions and Implications” section of this paper is extremely vague and I would have liked the authors to have made a more definitive statement about their results instead of dancing around the management question with the excuse that there is not yet enough information. The results discussed in this paper’s abstract are more clearly stated than in the conclusion and am curious why the conclusions were not more straightforward.

### **Literature Cited**

- Andrén, H. 1994. Effects of habitat fragmentation of birds and mammals in landscapes with different proportions of suitable habitat: a review. *Oikos* 71:355-366.
- Coppedge, B.R., D.M. Engle, R.E. Masters, and M.S. Gregory. 2001. Avian response to landscape change in fragmented southern Great Plains grasslands. *Ecological Applications* 11:47-59.

- Donovan, T.M. and C.H. Flather. 2002. Relationships among North American songbird trends, habitat fragmentation, and landscape occupancy. *Ecological Applications* 12:364-374.
- Flather, C.H. and J.R. Sauer. 1996. Using landscape ecology to test hypotheses about large-scale abundance patterns in migratory birds. *Ecology* 77:28-35.
- Holmes, R.T. and T.W. Sherry. 2001. Thirty-year bird population trends in an unfragmented temperate deciduous forest: importance of habitat change. *The Auk* 118:589-609.
- Kleinn, C., L. Corrales, and D. Morales. 2002. Forest area in Costa Rica: a comparative study of tropical forest cover estimates over time. *Environmental Monitoring and Assessment* 73:17-40.
- Sauer, J.R. and S. Droege. 1990. Survey designs and statistical methods for the estimation of avian population trends. U.S. Fish and Wildlife Service Biological Report 90(1). [Online, <http://www.mbr-pwrc.usgs.gov/bbs/genintro.html>.]
- Sauer, J. R., J. E. Hines, G. Gough, I. Thomas, and B. G. Peterjohn. 1997. *The North American Breeding Bird Survey Results and Analysis*. Version 96.4. Patuxent Wildlife Center, Laurel, MD, USA.
- Sherry, T.W. and R.T. Holmes. 1995. Summer versus winter limitation of populations: what are the issues and what is the evidence? Pages 85-120 *in* T.E. Martin and D.M. Finch, editors. *Ecology and Management of Neotropical Migratory Birds*. Oxford University Press, New York, USA.
- Whitmore, T.C. 1997. Tropical forest disturbance, disappearance, and species loss. Pages 3-12 *in* W.F. Laurance and R.O. Bierregaard, editors. *Tropical Forest Remnants*. University of Chicago Press, Chicago, USA.