# Addressing Conservation Needs of Birds During the Migratory Period: Problems and Approaches[1]

**Mark S. Woodrey,[2] Dean Demarest,[3] and Ernesto Ruelas Inzunza[4]**

The conservation of declining intercontinental landbird and shorebird migrants is complicated by the migratory nature of these organisms. Although debate over the causes of declines in most species will no doubt continue for some time, continued attention has focused largely on events associated with the breeding and wintering phases of the migrant's annual cycle. What has been largely overlooked in our developing conservation strategy is the importance of the migratory period and the issues associated with conserving these diverse and often sporadically used stopover habitats throughout the hemisphere (e.g., Moore and Woodrey 1993, Moore 2000). Although we have learned much recently, we still lack fundamental data regarding issues such as species-specific migration routes, which habitats are most important at various locations along the migratory route, where these critical habitats occur, and how their distribution and abundance are changing as a result of development and land conversion. The importance of these data gaps in our knowledge, and thus our ability to develop comprehensive bird conservation plans, are highlighted in two recent North American bird plans: the United States Shorebird Conservation Plan (Brown et al. 2000) and the North American Landbird Conservation Plan (Rich et al. 2004). Although we currently know little about migrant-habitat relations for many of these species, increased attention in both the research and conservation communities are focused on gathering these types of data.

Given the recent attention to the importance of migration ecology in the development of bird conservation plans, we organized this session to consider aspects of migration ecology that have direct application to planning and implementation of conservation efforts (e.g., identification, protection, management, restoration, or creation of stopover habitats) and to assess current planning and delivery efforts in addressing the unique demands imposed by migration. Specifically, this series of papers addresses the importance of spatial aspects of stopover habitats; discusses methods for the identification of important stopover/staging sites and migration routes; provides an assessment of how well existing conservation planning and delivery programs address migratory periods; and provides information on how to better integrate needs of *en-route* migrants into current conservation efforts.

One of the most important biological and conservation related issues when developing conservation plans for migratory birds is migrant-habitat relations. Although we have a general understanding of these relationships for land- and shorebirds, what the conservation community is lacking is a more comprehensive strategy for addressing these relationships at various ecological scales. Moore et al. (this volume) provide a scale dependent approach consisting of four components for understanding migrant-habitat relations: (1) radar, (2) census, (3) telemetry, and (4) behavioral or direct observation. Using published and unpublished data, Moore and his colleagues provide examples illustrating the importance of both the census and direct observation components of their framework. In addition, they briefly discuss the utility of their framework in that it provides a broader context for the interpretation and understanding of the behavioral ecology and conservation biology of migrants during the en-route period.

One of the biggest obstacles facing the avian conservation community involves the development of an understandable and practical approach for explaining the importance of stopover sites which incorporates the extreme daily and annual fluctuations in migrants using a particular area. The senior author has found himself, on several occasions, in a situation where he is asked whether a particular stopover site warrants protection, either through direct purchase or some type of conservation easement. Often, recommendations are made with little or no information and can be hard to explain to individuals not familiar with the ecology of migratory birds, particularly when they see few migrants during a site visit to an area they have worked hard to protect. This is exactly the issue addressed by one presentation of this session. Duncan et al. (2002), in a

---

[1]A version of this paper was presented at the **Third International Partners in Flight Conference, March 20-24, 2002, Asilomar Conference Grounds, California**.

[2]Mississippi State University, Coastal Research and Extension Center, Grand Bay National Estuarine Research Reserve, 6005 Bayou Heron Road, Moss Point, MS 39562. U.S. Fish and Wildlife Service, 6578 Dogwood View Parkway, Suite B, Jackson, MS 39213. E-mail: mark.woodrey@dmr.state.ms.us

[3]Southeastern PIF, 116 Rum Creek Drive, Forsyth, GA 31029. Present Address: Southeastern Regional Office, U.S. Fish and Wildlife Service, 1875 Century Boulevard, Suite 240, Atlanta, GA 30345

[4]Pronatura Veracruz, Xalapa, Veracruz, Mexico 91000. Present Address: Division of Biological Sciences, University of Missouri - Columbia, 105 Tucker Hall, Columbia, MO 56211

Nature Conservancy Issue Paper, outline a practical approach to protecting stopover sites as part of The Nature Conservancy's (TNC) *Conservation by Design* planning process. Although based on this TNC process, this work is applicable to anyone interested in the conservation and protection of stopover sites. Interestingly, the basis of their approach is scale-dependent, an approach proposed by Moore et al. (this volume). In addition, they define three types of stopover sites – "Fire Escapes," "Convenience Stores," and "Full-service Hotels" – and provide a list of functional attributes for each category.

Technological advances over the past three decades have provided fertile ground for the development of hi-tech tools by scientists interested in avian research and conservation. Perhaps the most recent influential technological advance in the identification of stopover sites and migration routes has been the development of the WSR-88D (NEXRAD) Doppler weather surveillance radars (Diehl and Larkin this volume). As with any new technique, an understanding of the applications and limitations of the technology are critical. These researchers address several of the issues associated with the interpretation of WSR-88D imagery and quantification of data. In particular, they discuss some of the challenges associated with relating bird numbers from radar imagery to specific habitats or landscape features.

Another key component in the identification of stopover sites for migratory birds involves determining the availability of suitable habitat. Many of the bird conservation plans have developed population objectives which in turn are based on an estimate of the number of individuals supported by a habitat type (e.g., Loesch et al. 2000). Thus, these models assume that we know how much and what kinds of habitats are available to birds (and other organisms). However, it is obvious to those of us within the bird conservation community that we often lack this critical information (e.g., Woodrey et al. 2000). Using ground surveys of field conditions and shorebird counts correlated with spectral signatures, Jeske et al. (this volume) discuss the utility of aerial video as one tool useful for assessing availability of highly ephemeral wetland habitats. The authors note several advantages in using an aerial video system, including a reduction in labor required for ground-based surveys, reduction in the costs associated with these surveys, and the elimination of access to private lands, which can make broad-scale statistical approaches to habitat sampling nearly impossible. Further, they suggest a major advantage of using a digital aerial video system is the short-duration repeatability of surveys in highly ephemeral wetland habitats utilized by shorebirds.

There are many possible measures which could be used to determine the "importance" of a stopover site. However, to define what is meant by "important" is almost certainly problematic. For instance, is a small patch of coastal maritime forest, which is used very infrequently, maybe only once a migration season, considered important, as compared to a large forested wetland system which is used regularly by a large number of migrants? Although some would argue that the larger forested system is more important than the smaller woodland, the availability of this smaller site is likely critical to the survival of migrants using the area on a given day (*sensu* "Fire Escapes" as discussed in Duncan et al. 2002). However, at the level of the migrant, there are some measures which one could argue are related to its survival, and ultimately, the fitness of the individual. These measures could include, but are not limited to body mass change (e.g., Dunn 2001) and stopover length (Morris et al. this volume). Morris et al. (this volume) address the difficult issue of using stopover length to evaluate the importance of a stopover site. Traditionally, studies have reported minimum length of stopover, using the difference between the date of initial and final capture. However, recent studies have demonstrated that estimation of stopover length based on mark-recapture models, such as stopover duration analysis (SODA), are likely to provide a better overall estimate of the stopover length of migrants (Schaub et al. 2001). Based on the results of both empirical data and computer simulations, Morris et al. (this volume) suggest that SODA methods are not without problems and biases and recommend that care be used when analyzing and interpreting stopover data based on mark-recapture models, especially with regards to pooling data.

Integration of conservation actions relating to the migratory period for both shorebirds and landbirds is complicated by their migratory nature. Because we are dealing with several hundred species of migratory birds, a "cookie-cutter" or "one-size-fits-all" approach to conservation action will not lead to successful bird conservation. Various groups of migrants often exhibit different migration strategies which can have profound consequences for developing our conservation efforts. Traditional programs such as the Western Hemisphere Shorebird Reserve Network have been extremely successful at protecting shorebird species that stage in traditional areas. However, recent attention has been focused on species and populations that disperse broadly on the landscape and are opportunistic in their use of dynamic ephemeral wetlands. Unfortunately, this unpredictability makes the conservation of these wetland systems challenging. Skagen et al. (this volume) note that site based approaches are less effective in prairie wetland systems where habitats are dynamic, and thus difficult to predict their availability as suitable shorebird stopover habitat. Based on some modeling efforts, they suggest that wetland complexes

be considered as a single unit and that these complexes be extensive to account for shifting distributions of habitat conditions and migrant densities.

Finally, in a case study of the stopover ecology of neotropical migrants in Mexico, Ruelas et al. (this volume) provide data on species occurrence, review prevailing weather patterns which influence bird behavior and their ecology during spring and fall migration, and use a landscape analysis approach to better understand the relationship between migrants and the factors which affect their migration. Using the relationships they identified, they provide specific recommendations for future stopover ecology research and define the conservation priorities for the continued protection of these long-distance migrants. Case studies such as this one, where the local factors influencing the behavior and ecology of migrants are described, provide the kind of insight which, when combined with similar studies covering a broader geographic area, can provide a regional understanding of the factors which are impacting migrant populations. This regional understanding can be used to develop effective conservation practices which can, in turn, be integrated into bird conservation plans, leading to the full implementation of a truly comprehensive bird conservation strategy.

## Acknowledgments

We would like to thank the organizers of this conference for inviting us to organize a stopover ecology session. We also would like to thank each of the participants who contributed to the oral presentation portion of the workshop which formed the basis for these published manuscripts: F. Moore, J. Buler, B. Abel, C. Duncan, D. Ewert, D. Mehlman, R. Sutter, R. Diehl, R. Larkin, C. Jeske, S. Wilson, W. Barrow, P. Chadwick, S. Morris, D. Sheets, E. Turner, D. Leibner, A. Larracuente, S. Skagen, S. Brown, R. Johnson, J. Corven, and B. Harrington. This manuscript was improved by the valuable comments provided by W. Barrow, C. J. Ralph, and L. Yates.

## Literature Cited

Brown, S., C. Hickey, and B. Harrington, editors. 2000. **The U.S. shorebird conservation plan.** Manomet, MA: Manomet Center for Conservation Sciences.

Diehl, R. H., and R. P. Larkin. This volume. **Introduction to the WSR-88D (NEXRAD) for ornithological research.**

Duncan, C. D., B. Abel, D. Ewert, M. L. Ford, S. Mabey, D. Mehlman, P. Patterson, R. Sutter, and M. Woodrey. 2002. **Protecting stopover sites for forest-dwelling migratory landbirds: A Nature Conservancy issue paper.** The Nature Conservancy, Arlington, VA. Available at http://www.conserveonline.org, accessed 12 July 2004.

Dunn, E. H. 2001. **Mass change during migration stopover: a comparison of species groups and sites.** Journal of Field Ornithology 72:419-432.

Jeske, C. W., S. Wilson, P. C. Chadwick, and W. Barrow. This volume. **Shorebird habitat availability assessment of agricultural fields using a digital aerial video system.**

Loesch, C. R., D. J. Twedt, K. Tripp, W. C. Hunter, and M. S. Woodrey. 2000. **Development of management objectives for waterfowl and shorebirds in the Mississippi Alluvial Valley.** In: Bonney, R., D. N. Pashley, R. J. Cooper, and L. Niles, editors. Strategies for bird conservation: The Partners in Flight planning process; proceedings of the 3rd Partners in Flight workshop; 1995 October 1-5; Cape May, NJ. RMRS-P-16. Ogden, Utah: U. S. Department of Agriculture, Forest Service, Rocky Mountain Research Station; 8-11.

Moore, F. R., editor. 2000. **Stopover ecology of Nearctic-neotropical landbird migrants: Habitat relations and conservation implications.** Studies in Avian Biology No. 20. Lawrence, KS: Allen Press.

Moore, F. R., and M. S. Woodrey. 1993. **Stopover habitat and its importance in the conservation of landbird migrants.** Proceedings of the Forty-Seventh Annual Conference, Southeastern Association of Fish and Wildlife Agencies 47: 447-459.

Moore, F. R., M. S. Woodrey, J. J. Buler, S. Woltmann, and T. R. Simons. This volume. **Understanding the stopover of migratory birds: A scale dependent approach.**

Morris, S. R., E. M. Turner, D. A. Liebner, A. M. Larracuente, and H. D. Sheets. This volume. **Problems associated with pooling mark-recapture data prior to estimating stopover length for migratory passerines.**

Rich, T. D., C. J. Beardmore, H. Berlanga, P. J. Blancher, M. S. W. Bradstreet, G. S. Butcher, D. W. Demarest, E. H. Dunn, W. C. Hunter, E. E. Inigo-Elias, J. A. Kennedy, A. M. Martell, A. O. Panjabi, D. N. Pashley, K. V. Rosenberg, C. M. Rustay, J. S. Wendt, and T. C. Will. 2004**. Partners in Flight North American landbird conservation plan.** Ithaca, NY: Cornell Lab of Ornithology.

Ruelas I., E., S. W. Hoffman, and L. J. Goodrich. This volume. **Stopover ecology of neotropical migrants in Central Veracruz, Mexico.**

Schaub, M., R. Pradel, L. Jenni, and J.-D. Lebreton. 2001. **Migrating birds stop over longer that usually thought: An improved capture-recapture analysis.** Ecology 82: 852-859.

Skagen, S. K., S. Brown, and R. Johnson. This volume. **Implications of different shorebird migration strategies for habitat conservation.**

Woodrey, M. S., W. C. Barrow, W. C. Hunter, F. R. Moore, K. Ouchley, C. M. Riley, B. D. Watts, and R. R. Wilson. 2000. **Habitat associations and management issues of migratory landbirds in the Southeastern United States. Management of migratory birds of the Southeast: State of knowledge and research needs.** Southeast Partners in

Flight Workshop, 28-30 January 1999, Biloxi, Mississippi.
Unpublished draft supplied by author.