



# Quantitative Analysis of Movement: Measuring and Modeling Population Redistribution in Animals and Plants

*Peter Turchin*

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From the Back Cover: “Peter Turchin's book is a classic in movement ecology and an authoritative synthesis that has retained its value over the years. What makes this book so special is the author's expertise in both field biology and theoretical ecology—the text is insightful in both directions. This is your best entry to the quantitative study of plant and animal movements.” —Ilkka Hanski, University of Helsinki “The study of animal movement is one of the most exciting and salient areas of conservation biology and ecology. While data and theory have advanced enormously in the last twenty years, Peter Turchin's book is still the best place to go for one point of entry into quantitative approaches to movement and dispersal modeling. It still has no rivals.” —Peter Kareiva, the Nature Conservancy “This book stands out for presenting a perspective that merges general theoretical models with approaches to estimating parameters from data. It continues to be a classic in the field.” —Elizabeth Crone, Tufts University “If you are engaged in research exploring plant and animal movement, this book is essential. It is well written and informative from both practical and theoretical perspectives. It is a delight to have this reference. I recommend it wholeheartedly.” —Steven L. Peck, Ecology Book Description The spatial dimension—the interplay between environmental heterogeneity and individual movement—is an extremely important aspect of ecological dynamics. Ecologists are investing an enormous amount of effort in quantifying movement patterns of organisms. Connecting these data to general issues in metapopulation biology and landscape ecology, as well as to applied questions in conservation and natural resource management, however, is not a trivial task. One of the main impediments to a theoretical/empirical synthesis in the field of spatial ecology is a lack of a single source describing and systematizing quantitative methods for analyzing and modeling movement of organisms in the field. The goal of *Quantitative Analysis of Movement* is to provide such a source for empirical ecologists interested in quantifying movement in an ecological context. But the book goes beyond a simple compendium of existing approaches. It presents a general and coherent framework for studying and modeling movement that melds together individual-based simulations, reaction-diffusion models, and empirical curve-fitting approaches. The quantitative approaches discussed in the book are extensively illustrated with case studies selected from a wide variety of organisms, including plants (seed dispersal, spatial spread of clonal plants), many kinds of insects (such as butterflies, beetles, and ants), and vertebrates (fish, birds, and mammals). This book is aimed at active researchers and graduate students working in spatial ecology, including applications in conservation biology, pest control, and fisheries. Because analysis of movement patterns has to be approached with an explicit model, the text contains a significant mathematical component. However, all efforts have been made to make it not too intimidating to an empirical ecologist. In chapters directly focusing on data analysis mathematical details have been either placed in boxes or banished to the appendix. In addition, the appendix provides a popular account of the mathematical aspects of diffusion and random walks, models that are of particular relevance to modeling ecological movement. In general, the exposition of mathematical ideas assumes that readers have studied calculus at the college level, although some exposure to differential equations would be helpful.

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