



# Simulation of Ecological and Environmental Models

*Miguel F. Acevedo*

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## **Simulation of Ecological and Environmental Models** Miguel F. Acevedo

Given the importance of interdisciplinary work in sustainability, **Simulation of Ecological and Environmental Models** introduces the theory and practice of modeling and simulation as applied in a variety of disciplines that deal with earth systems, the environment, ecology, and human–nature interactions. Based on the author’s many years of teaching graduate and undergraduate students in the United States, Spain, and Latin America, the textbook shows how to implement simulations and analyze the results using an open-source software platform.


### ***Learn How to Use a Broad Range of Environmental Models***

The textbook is organized into three parts to allow greater flexibility using the material in various countries and types of curricula. The first part provides a tutorial-style mathematical review and a gentle introduction to the basics of R software. The second part explains the fundamentals of modeling methodology through one-dimensional models. After a review of matrix algebra, the third part progresses to multidimensional models, focusing on structured populations, communities, and ecosystems. The final chapters show how simple models are hooked together to generate more comprehensive models.

### ***Build from Fundamental Concepts to Problem Solving***

Each chapter starts with conceptual and theoretical material to give a firm foundation in how the methods work. Examples and exercises illustrate the applications and demonstrate how to go from concepts to problem solving. Hands-on computer sessions let students grasp the practical implications and learn by doing. Throughout, the computer examples and exercises use *seem*, an open-source R package developed by the author, which lets students quickly produce simulations and explore the effects of changing conditions in the model.

This practical book is a comprehensive, unified presentation of ecological and environmental models. It describes the mathematical fundamentals to analyze models and the methodology to simulate them, with a focus on understanding environmental change—a key element of environmental management and problem solving.

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