Text Books on Mathematical Modeling in Biology

Compiled from the Internet by Michael Knorrenschild, modified by Louis Gross, Oct. 1995, May 2000, March 2001, June 2003; Modified by H. G. Othmer Jan 2007

Allan, Linda J. S. (2003) An Introduction to Stochastic Processes with Applications to Biology. Pearson Prentice Hall, Upper Saddle River, NJ.
ISBN 0-13-035218-7

Overview of basic probability and stochastic models common in ecology and epidemiology. Level appropriate for advanced undergraduates in math and graduate students in biology. Non-measure theoretic. Includes numerical examples and MATLAB code.

Berg, Howard C. (1983) Random walks in biology. Princeton: Princeton Univ. Press, 142p., ISBN 0-691-08245-6

Edelstein-Keshet, L. (1988) Mathematical Models in Biology. Random House, New York. ISBN 0-394-35507-5

+ good at how and why models are used, assumes only modest math background, good homework problems, good coverage of continuous models
- not solely about in ecology, not so good coverage of discrete models, no stochastic models, many errors in the exercises

Haefner, James W. (1996) Modeling Biological Systems: Principles and Applications. Chapman and Hall, New York.

An overview of many applications of different mathematical approaches, including modern computational ones, to many areas of biology.

Jones, D. S. and B. D. Sleeman (2003) Differential Equations and Mathematical Biology. Boca Raton: CRC Press, 390 p.

Ordinary and partial differential equations in application to various biological problems including heart physiology, nerve impulses, tumour growth and epidemics.

Mazumbar, J. (1989) An Introduction to Mathematical Physiology and Biology. Cambridge: Cambridge Univ. Press, 208 p., ISBN 0-521-37002-7, 0-521-37901-6.

Differential equation modeling introduction, including applications to diffusion, population biology, biogeography, biofluids, and pharmacokinetics.

Murray, J. D. (1989) Mathematical Biology. Springer, Series Biomathematics 19, 767p., ISBN 3-540-19460-6, 0-387-19460-6

Othmer, H. G., F. R. Adler, M. A. Lewis and J. C. Dalton (eds). (1997) Case Studies in Mathematical Modeling: Ecology, Physiology and Cell Biology. Prentice-Hall, Inc. Upper Saddle River, NJ. ISBN 0-13-574039-8

Collection of numerous brief review articles by various experts on math modeling problems, utilizing mainly undergraduate-level math.

Segel, Lee A. (1984) Modeling Dynamic Phenomena in Molecular and Cellular Biology. Cambridge Univ. Press.

Taubes, Clifford Henry (2001) Modeling Differential Equations in Biology. Prentice-Hall, Inc. Upper Saddle River, NJ. ISBN 0-13-017325-8

Unique in that it includes within each chapter that describes some aspect of differential equations, appropriate recent scientific journal articles that illustrate the mathematics discussed.

Vandermeer, J. H. (1981) Elementary Mathematical Ecology. Wiley and Sons, NY, 294p. 1981 Malabar, Fla: Krieger, 1990, 294p., ISBN 0-89464-465-3

programmed learning text + lots of exercises with solutions – boils away a great deal of the biology in favor of the math, holes in coverage