



## Book review

3 **Fundamentals of Ecotoxicology, second edition**

4 Michael C. Newman, Michael A. Unger. Lewis Pub-  
5 lishers, Inc., 2002, US \$59.95, Hardback, 512 pp.,  
6 ISBN: 1566705983

7 This second edition of ecotoxicology provides an ex-  
8 cellent compilation of the many advances that have  
9 occurred in ecotoxicology, as a young developing sci-  
10 ence, over the last 30 years. The book is arranged in 15  
11 chapters, 8 appendices, and a glossary. The chapters  
12 are structured so that the readers can go from the gen-  
13 eral principles of ecotoxicology to the exposure and  
14 effects of environmental pollutants at different levels  
15 of organization, from molecules, cells, and tissues to  
16 the individual, populations, communities, ecosystems,  
17 and the biosphere. A new addition to this edition, and  
18 a great addition in my view, is the inclusion of vi-  
19 gnettes in each chapter. The vignettes (often more than  
20 one per chapter) appear more like short review papers  
21 and present specific case studies or themes in which  
22 the principles discussed in the chapter are applied. I  
23 am certain that these vignettes will help some readers  
24 to better understand the principles and concepts dis-  
25 cussed in each chapter.

26 The book chapters are organized into five sections.  
27 Section 1 consists of two chapters that present an intro-  
28 duction to ecotoxicology. Chapter 2 provides a sum-  
29 mary of most of the environmental contaminants that  
30 are addressed in the book and that have been associ-  
31 ated with some adverse effects on the biota. The vi-  
32 gnette on nutrient eutrophication and effects on lakes  
33 is particularly illustrative of the problems associated  
34 with excess nitrogen and phosphorous in the environ-  
35 ment. Section 1 is a good sound introduction that sets  
36 the scientific basis for the study of ecotoxicology.

37 Section 2 covers the topic of bioaccumulation and is  
38 divided into three chapters. In chapter 3, uptake, bio-  
39 transformation, detoxification, elimination, and accu-  
40 mulation processes are reviewed. One common occur-

41 rence throughout the book is the detail placed by the  
42 authors in explaining the terminology used in text. For  
43 example, in the uptake section, effort was placed into  
44 explaining the processes of adsorption, diffusion, facil-  
45 itated diffusion, and endocytosis. Other topics covered  
46 in this section include bioavailability and the chem-  
47 ical and biological qualities influencing bioavailabil-  
48 ity (chapter 4), and bioaccumulation from food and  
49 trophic transfer (chapter 4). The biomagnification pro-  
50 cess is better explained by the vignette on dietary ex-  
51 posure of piscivorous birds to mercury.

52 Section 3 on toxicant effects consists of seven chap-  
53 ters and is by far the largest, making up well over half  
54 of the book. Chapter 6 discusses toxicant effects by  
55 presenting an overview of the many actions of contam-  
56 inants at the molecular level. Topics discussed here in-  
57 clude the detoxication of organic compounds by Phase  
58 I and Phase II reactions of the mixed-function oxidase  
59 (MFO) metabolism, the role of metallothioneins in se-  
60 questrating metals, the significance of oxidative stress  
61 and antioxidant response, and the effects of chemicals  
62 at the DNA level. Of particular relevance are discus-  
63 sions of the cytotoxic effects and DNA and chromo-  
64 some damage (chapter 7), the discussions on effects on  
65 growth, development, and sexual characteristics, and  
66 the vignettes on the effects of environmental estro-  
67 gens on fish, and the role of behavior in ecotoxicology  
68 (chapter 8). In chapter 8, the parts on reproduction,  
69 physiology, and behavior could have been broadened  
70 to include results from other studies on terrestrial ver-  
71 tebrates. The apparent gap in the presentation of data  
72 from studies dealing with terrestrial vertebrates or with  
73 terrestrial environments point out a minor deficiency  
74 in the book. Chapter 9 gives a very good description  
75 of acute and chronic toxicity studies and how to fit the  
76 data to dose–response models. I particularly liked the  
77 provision of many of the equations needed to calculate  
78 effects, including the calculation of TEFs (toxic equiv-  
79 alent factors). Nonetheless, I think the dose-response

80 and models part of this chapter should have been con-  
81 sidered separately as chapter right after the section on  
82 bioaccumulation.

83 When dealing with population level effects (chapter  
84 10), the authors proceed by explaining some aspects  
85 of epidemiology and presenting several vignettes on  
86 the impacts of chemicals on spatially explicit popu-  
87 lations and contaminant effects on population demo-  
88 graphics, and industrial melanism. This vignette on  
89 melanism should be of great interest as a classical ex-  
90 ample of adaptation and contaminant effects on popu-  
91 lation genetics. This chapter could have been improved  
92 by adding examples from birds, i.e. the population  
93 crashes and recoveries of the Brown pelican (*Pele-  
94 canus occidentalis*) and the peregrine falcon (*Falco  
95 peregrinus*) in the United States. If some individual  
96 species are affected, these effects may have some im-  
97 pact on the population and it may result in an im-  
98 pact on the community and the ecosystem. In chapter  
99 11, the authors provide a brief overview of ecological  
100 concepts such as species interactions, predation, com-  
101 petition, and community attributes and structure. This  
102 chapter is more theoretical as there is less information  
103 available about specific cases of effects of contami-  
104 nants on communities and ecosystems. The vignette  
105 on biological integrity and ecological health illustrates  
106 how the index of biotic integrity could be used as  
107 a powerful monitoring tool in contaminant studies.  
108 Landscape to global effects are addressed in chapter  
109 12 in a more descriptive manner as there is less infor-  
110 mation available; however, the authors present a brief  
111 overview of distribution of some contaminants across  
112 continents and the biosphere and further illustrate it  
113 with a vignette on the global effects of mass burning.

114 In its current format, some parts in each chapter in  
115 Section 3 tend to become somewhat repetitive, mostly  
116 because it is difficult to differentiate the effects at the  
117 individual or population level without addressing the  
118 effects at the molecular, cellular, or tissue level. Also,  
119 often it is difficult to separate the sublethal from the  
120 acute and chronic effects on an individual without re-  
peating some of the information. To go along with the

other sections, section three would have been better if  
121 it had been split into several sections to separate ef-  
122 fects at the individual, population, and landscape level  
123 effects. The molecular, cellular, and tissue level effects  
124 as well as the sublethal, chronic and acute effects could  
125 have been included in each section. Notwithstanding,  
126 the section flows well since it follows the trend from  
127 molecular to individual and population level effects.

128 Section 4 deals primarily with environmental risk  
129 assessment. Although the authors' intent to deal with  
130 human and ecological health issues was clearly indi-  
131 cated at the beginning of the book, I believe this book  
132 would have been more effective if it had focused only  
133 on ecological health issues. The information provided  
134 in chapter 13 on ecological risk assessment is ade-  
135 quate, however it could have been expanded to provide  
136 more detail on the ecological risk assessment paradigm  
137 or by including more vignettes with specific example  
138 applications.

139 This book should be a good introductory book to  
140 ecotoxicology and could be used as a textbook for an  
141 upper division or a graduate course in ecotoxicology.  
142 I have used several chapters of the first and second  
143 editions for discussions in graduate seminars. I con-  
144 cur with the authors in that the book is biased towards  
145 lower levels of ecological organization, but also to-  
146 wards aquatic ecosystems; however, it should be ac-  
147 knowledged that currently there is much more eco-  
148 toxicological information available on aquatic than on  
149 terrestrial ecosystems. Overall, I think this is currently  
150 the best comprehensive book in ecotoxicology. The  
151 book is a must read for those with no background  
152 in ecotoxicology and for those ecotoxicologists who  
153 want to expand or refresh their general knowledge in  
154 ecotoxicology.  
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Miguel A. Mora 156

Texas A&M University, US Geological Survey 157

c/o Department of Wildlife & Fisheries Sciences 158

College Station, Texas 77846-22358, USA 159

Tel.: +1 979 845 5775; fax: +1 979 845 5786 160

E-mail address: mmora@tamu.edu (M.A. Mora) 161