Ecological Restoration

By Susan M. Galatowitsch. 2012. Sinauer Associates, Inc., 23 Plumtree Road, P.O. Box 407, Sunderland, Massachusetts 01375-0407 USA. 630 pages. 46.00 GBP. Cloth.

Ecological restoration is the fraught and complicated business of undoing some of the massive damage humanity has inflicted on natural ecosystems around the planet. Restoration ecology is the emerging science of how to go about it. Adding lime to Norwegian streams to facilitate passage of Atlantic salmon, reestablishing native grasslands in Kansas, or rebuilding degraded sections of Australia's Great Barrier Reef are all examples of ecological restoration. Those who would learn how to carry out a restoration project, or teach others how to do so, have been hindered by the immense complexity of the field, and by the lack of a solid textbook to draw on. Susan Galatowitsch's excellent new text goes a long way toward solving both these problems.

Ecological restoration, at least as a science-based enterprise, is a relatively new undertaking. Though it has roots, as Galatowitsch eloquently describes, as far back as attempts to revegetate tropical colonies by the great European powers of the 18th and 19th centuries, modern, ecologically based restoration has emerged as a discipline in its own right only within the last twenty years. Part of the vexing difficulty of restoration arises from the natural complexity of ecosystems, but at least as much arises from the many disciplines involved in the practice. Restoration projects are frequently grand

in scale and decades in duration, and may incorporate aspects of biology, earth science, hydrology, environmental chemistry, sociology, economics and politics.

Unsurprisingly, given the youth and character of the field, textbooks covering ecological restoration, until now, have been few in number and narrow in scope. The few books on my shelf either cover a great deal of theoretical ecology without specific guidance of what to do on the ground, or they provide summaries of multiple case studies, which may be illustrative of the problems restorers face, but again provide no guidance about how to do it. How-to manuals that do provide practical leads on what a restorer should do in the field are generally restricted to a particular habitat, such as small streams or northern prairies. Dr. Galatowitsch's text largely overcomes these limitations.

The book is intended as a textbook for courses in restoration ecology. As such, it is concerned with the reality of restoring ecosystems and the means and procedures for doing so. While there is an abundance of material on the foundation sciences (ecology, soil science, hydrology, landforms), this information is always integrated tightly into the pragmatic business of restoring lands and waters to their pristine condition. This blend of science and pragmatism is one great strength of the text. The other is its comprehensive coverage. Unlike many other texts and guidebooks, this one provides at least some coverage of all kinds of ecosystems: terrestrial, aquatic, marine, estuarine, forest and prairie, river and lake.

More important, Galatowitsch devotes considerable space to the social and political aspects of restoration, which are frequently neglected or glossed in more standard texts. For examples, an entire chapter is devoted to planning a restoration project, which is as much a sociological enterprise as an ecological one. The next chapter, Social and Institutional Support, even has a section on the dynamics of volunteer organizations. Since degraded ecosystems are always near people, understanding the social, economic and political forces that impinge on a particular site is crucial to successfully restoring it.

The text is organized into three sections. The first, Restoration Process, runs through the conceptual steps of a restoration project from initiation to final evaluation. The second, Restoration Approaches, details the nuts and bolts of restoring ecosystems of various kinds. For example, Chapter 6, Landforms and Hydrology, describes how landscapes are shaped by wind and water, how we degrade rivers, streams, wetlands and even estuaries, and then lays out restoration approaches that are applicable to each situation. The technical descriptions of such jobs as removing a dam on a river are of necessity brief, but sufficient to give the reader a clear idea of the exigencies. The procedures in this section are well supported by background information on earth science, soil chemistry and ecology (biogeochemical cycles are covered in detail in Chapter 7) but again always in the context of ecological restoration.

The third section is a series of 19 case studies drawn from around the world, each described in about 7-8 pages. I said earlier that case studies generally provide more entertainment than education, but Galatowitsch has rather cleverly integrated the case studies into the main text. They are used as examples to illustrate points throughout the text, and appear again in pull-out boxes and illustrations. Finally, the case studies provide background for a series of "Apply What You've Learned" study questions at the end of every chapter. In this way, the case studies become more like worked examples of restoration problems, rather than simple vignettes.

The text is attractively designed and clearly laid out. The writing is crisp, concise and readable, a pleasant rarity in biology textbooks. Appropriate, well-chosen illustrations appear throughout the text; four-colour diagrams are clean and uncluttered, while the full-colour pictures are used to illustrate concepts and not just to make the text look pretty. Each chapter begins with a two-page overview and ends with a useful bulleted summary. The glossary, reference list (chapter by chapter, which I find a tad annoying) and index are all complete and accurate.

I found few deficiencies in the book. The author is clearly more comfortable in some habitats than others; her previous book-length works concerned restoration of prairie wetlands. Thus, Chapter 8, (entitled "Plants") is 50 pages on how to establish native plants and control invasive plants. My own bias would have been pleased by the same attention to river restoration. I concede, however, Dr. Galatowitsch's point that many in-river restoration projects treat a symptom (channel erosion and high peak flows) instead of the broader cause, which is human alteration of the drainage basin.

Galatowitsch emphasizes the importance of statistical analysis of monitoring data, but glosses over the statistics themselves. This is perhaps a sensible compromise in a textbook of reasonable size. I would have liked to see toxicity testing and bioassays included in the sections on pollution and especially soil remediation, where they have proved so useful in tracing the success of clean-up operations. These are minor concerns, however, which do not meaningfully detract from the overall value of this rich and fascinating new textbook. I plan to establish my own course in ecological restoration sometime soon; when I do, Ecological Restoration will be the textbook for the course.

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