

Book Reviews

Agroecology: Ecological Processes in Sustainable Agriculture

Stephen R. Gliessman. 1998. *Ann Arbor Press, Chelsea, Michigan*, 357 pages, \$49.95, ISBN 1-57504-043-3.

As the title implies, this book offers an ecological viewpoint of agriculture. The reader will come away with an understanding of the basic ecological processes and principles that govern the structure and function of agroecosystems, and—more importantly—an awareness of how these principles can be applied to solve the environmental and sustainability crisis of modern agriculture.

Guided by his plant ecology background, as Gliessman explains in the preface, the first part of the book is basically an autoecological treatise. It describes the interactions of crops and abiotic factors such as temperature, radiation, fire, and soil, all important relationships that regulate water, light, and nutrient use in crop communities. Perhaps some readers would have liked a deeper look at the ecophysiological responses of crops to environmental factors. For example, can guidelines be developed on how to optimize photosynthesis at the crop field level rather than at the level of an individual plant?

The second half of the book is a synecological treatise that delves into aspects of community ecology at the agroecosystem level and focuses on questions such as How complex are biotic interactions in agroecosystems? What are the ecological roles of biodiversity and genetic diversity? What is the relationship between agroecosystem diversity and stability of production? What are the ecological effects and benefits of diversified

cropping systems such as polycultures and agroforestry systems?

Gliessman makes it clear that ecosystem processes in agriculture require an understanding of small- and large-scale (landscape-level) interactions between crops, arthropods, microorganisms, and their environment. This is why a landscape perspective is required and why agroecologists should borrow tools from the emerging science of landscape ecology to analyze the dynamics of agroecosystems and their interactions with natural systems.

One of the final chapters delineates the ecological basis needed to guide the conversion of agroecosystems to sustainable management. After going through the initial steps of input use efficiency and input substitution, the final goal of the conversion process is the design of diversified farming systems that can sponsor their own fertility, protection, and production. Parameters that could measure the level of sustainability attained after the conversion are offered, but methodologies on how to use them are lacking.

Finally, Gliessman argues that we need to focus beyond ecological sustainability at the farm level and move toward a sustainable food system. Processing, distribution, marketing, and access are all key issues in addition to food production. Although the book depicts the varied interplay in defining the global food system, no scenario is offered of an alternative social organization, policy framework, or economic system that could make such global food systems more equitable.

Overall, the book is an important contribution; if the price does not impede it, Gliessman's book should become a major agroecology textbook throughout the United States.

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The Tallgrass Restoration Handbook for Prairies, Savannas, and Woodlands

Stephen Packard and Cornelia F. Mutel, editors. 1997. *Island Press, Washington, D.C.*, 463 pages, \$25.00, ISBN 1-55963-320-4 (paperback).

Since prairie restoration began only a half century ago at the University of Wisconsin at Madison Arboretum, considerable progress has been made in the realm of ecological restoration as a science. The scope of restoration has expanded both ecologically and geographically since these humble beginnings, now including various ecosystems throughout the world. *The Tallgrass Restoration Handbook for Prairies, Savannas, and Woodlands* attempts to consolidate the progress made in restoration ecology and to provide a basic framework for the restoration of these fire-dependent upland communities throughout the midwestern United States and adjacent Canada. A limited amount of information on associated wetlands also is included.

The call to restore native tallgrass prairies, oak savannas, and woodlands is certainly warranted. Tallgrass prairies once covered an area in central North America extending from Indiana southwest into Texas and north into Manitoba, while oak savannas and woodlands existed as a transition zone between prairies and eastern deciduous forests. Today, these ecosystems occupy less than 1% of their original area. Although many people are aware of the demise of tallgrass prairies, fewer know about the scarcity of oak savannas and woodlands. These areas have become so degraded that they now surpass prairies as primary restoration candidates.

Although restoration ecology attempts to base its application on objective knowledge, applied restoration is actually as much of an art as a science. Because restoration ecology is a young science, relatively little research has been conducted. For this

reason, restoration ecologists have come to rely on intuition as well as scientific experimentation. Although some may argue that this lack of science removes credibility from the profession, the rate at which degradation occurs necessitates the application of some techniques not yet tested by science. Fortunately, an increase in current research and publication is allowing restoration ecologists to incorporate scientific knowledge into everyday management decisions.

While largely an application manual, *The Tallgrass Restoration Handbook for Prairies, Savannas, and Woodlands* does attempt to unite the divisions of restoration science and application. The result is a compilation of reports from over 20 practicing restorationists, including some in academia. This book is appropriately named because it truly is a handbook that spans the restoration process and includes information applicable to everyone from a backyard gardener to a natural area manager. The book's 21 chapters encompass many aspects of restoration, including the abiotic and biotic components of native prairies, oak savannas and woodlands; restoration planning; obtaining, treating, and mixing seeds; planting methods; monitoring; and the protection and inclusion of animals in restoration. A few chapters cover specific restoration situations, including remnant restoration, rare plant restoration, and hand-planted prairies. As a vehicle for further investigation, each chapter contains several references that provide insight into scientific and applied literature. In addition, the appendices include useful information on a variety of subjects of interest to the experienced restorationist as well as those curious about the basic ecology of tallgrass prairies, oak savannas, and woodlands.

The book also includes chapters on controversial areas in restoration ecology such as prescribed fire and exotic plant control. Few will argue

the historical role of fire in presettlement times, but many are unsure of how to mimic the spatial and temporal variation of historical fire, and some question whether prescribed fire is useful in all restorations. The advocacy of prescribed fire that is prevalent throughout the book is countered by a chapter on insects. Unfortunately, insects are often ignored when prescribed fires are implemented. Ignorance of the biology of this component of native tallgrass prairies can lead to the demise of many insect species. Exotic plant control with the use of herbicides is another controversial area. Again, few will argue against the need for exotic plant control in natural-area restoration, but many are unsure of the most efficient and ecologically sound method for control. Reflecting the controversial status of these subjects, the authors do not necessarily advocate any one technique but rather provide information on commonly used methods for natural-area management. The ultimate decision to use the described methods is left to the restoration practitioner and should be based on personal philosophy and restoration objectives.

Because the book is written as a compilation of nontechnical reports, it is easy to read. It provides a relaxed forum of science, opinion, and passion to keep the reader captivated. A student of restoration ecology may choose to read the book from cover to cover to gain an understanding of the restoration process as a whole, while the practicing restorationist may read individual chapters to obtain advice on management decisions.

Perhaps the best resources of the book are the many tables in the chapters and appendices. Many describe seed mixes for use in various restoration projects. Others include plant lists for savannas and woodlands, seed collection dates, propagation methods for prairie and woodland plants, and herbicide use and appli-

cation for invasive plants. Appendices provide comprehensive information on the geographic distribution and habitat requirements of vascular plants and vertebrate animals of tallgrass prairies and on the ecology and status of natural communities of the tallgrass region. Useful to the nonbotanist or to those using older plant identification guides is an appendix that cross references common and synonymized plant names. For those beginning a restoration project, other appendices provide contacts for equipment and seed supplies, and for guidance from restoration organizations.

The book does have a few shortcomings, however. One may notice a lack of material on the role of animals in the restoration process. Although individual chapters and an appendix discuss the ecology, distribution, and restoration of insects, reptiles, amphibians, birds, and bison, the book is primarily plant oriented. Perhaps this approach is taken because the restoration of communities starts from the ground up. In addition, the authors realize that the role of animals in restoration is less well understood than that of plants. Nevertheless, if restoration is to be based on ecological accuracy and authenticity and if it is to result in dynamic interacting systems, animals need to be considered in the process.

Readers may also discover a lack of consensus among authors on methodologies and the philosophies that underlie them. Disagreements among authorities are common in many rapidly growing fields, however, and this is not surprising of a science in its nascent stages. In addition, the lack of research in many controversial areas of restoration science, such as prescribed burning and exotic plant control, does little to consolidate management techniques. Most authors are quick to point out this lack of research and are calling for future work in these areas.

The Tallgrass Restoration Handbook for Prairies, Savannas, and Woodlands

will be valuable to a variety of audiences. Not only is the book of great value to those directly involved in restoration, including natural area managers, consultants, agency personnel, restoration volunteers, and backyard gardeners, but also to those interested in the ecology of natural

communities and to those charged with educating the public about conservation. Although the book emphasizes application rather than theory, it does elucidate research ideas for those in academia. Overall, this book is a useful resource and a worthwhile investment to anyone engaged

in the many facets of tallgrass restoration.

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