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Great Plains Quarterly

Great Plains Studies, Center for

Spring 1983

**Review of *Grasses and Grasslands: Systematics and Ecology*
Edited by James R. Estes, Ronald J. Tyrl, and Jere N. Brunken**

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Kaul, Robert B., "Review of *Grasses and Grasslands: Systematics and Ecology* Edited by James R. Estes, Ronald J. Tyrl, and Jere N. Brunken" (1983). *Great Plains Quarterly*. 1702.

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BOOK REVIEWS

Grasses and Grasslands: Systematics and Ecology. Edited by James R. Estes, Ronald J. Tyrl, and Jere N. Brunken. Norman: University of Oklahoma Press, 1982. Illustrations, references, subject index, taxonomic index. 312 pp. \$25.00.

The past decade has seen a revival of biologists' interests in grasslands, and the results are papers, books, and symposia on grassland plants and ecosystems. This book is the product of a symposium at the thirtieth annual meeting of the American Institute of Biological Science at Oklahoma State University, Stillwater, and as such will appeal mostly to biologists.

The two parts of the book are integrated by the theme of evolution, the first part dealing with the taxonomy and evolution of grasses themselves and the second part with the evolutionary ecology of grasslands as systems. While taxonomy is one of the oldest biological fields and its integration with evolutionary theory is far advanced, the application of evolutionary thought to ecological systems is very recent and has developed rapidly as a major area of biological inquiry.

One goal of biology is to determine the relationships of groups of organisms. This has proven exceptionally difficult in the grass family, whose affinities remain obscure. Here, Stebbins suggests a tropical, grasslike family, the *Flagellariaceae*, as the closest living relatives. He also reviews the criteria for evaluating evolutionary trends in the family and summarizes the morphological, biochemical, and genetic evidence.

A topic seldom mentioned but ripe for further investigation is given an entire chapter: the role of human activity in influencing evolution in grasses, whether directly through artificial hybridization and domestication or indirectly through alteration of habitats by such activities as clearing of forests and agricultural distur-

bance of natural ecosystems.

Four chapters in the first part of the book deal with a single tribe of the grass family, the tribe *Triticeae*, which includes wheat, barley, and numerous other grasses. The taxonomic circumscription of this important group is unusually difficult because of such phenomena as parallel evolution, persistence of intermediate forms, and genetic homogeneity, all of which confuse biologists' understanding. Biologists try to devise taxonomic nomenclature that reflects actual relationships, and these chapters cover a variety of procedures and approaches used in determining those relationships.

The second half of the book deals first with the physiological ecology of grasslands and includes material on some of the many non-grasses that occur in grasslands. Despite their apparent simple physiognomy, grasslands are shown to be physiologically complex. Their intimate historical relationships with grazing animals, especially large grazing animals such as buffalo, and with fire are reviewed. Drought-induced changes are examined as well, as are the roles of smaller herbivores such as grasshoppers. While grasslands generally have fewer kinds of animals than most other ecosystems, the combined mass of the plant-eating animals is perhaps greater than in any other ecosystem.

Several chapters deal with the flow of carbon, nitrogen, water, and minerals through grasslands, topics of vigorous research in recent years. The role of fire in mineral recycling and in keeping out invasive shrubs and trees, and thus keeping grasslands as grasslands, is reviewed.

The second half of the book deals almost entirely with North American grasslands, where most of the research on the subject has been done, but the ideas are applicable to all grasslands.

The chapters, all by different authors, are exceptionally even in their coverage for a book

of this sort. While some of the ideas and much of the data have been published elsewhere in the technical literature, they have not been brought together in a single volume until now. The book is generously provided with graphs, tables, and line drawings, but there are no maps or photographs of grasslands. Although it is clearly intended for biologists, other readers could find much of interest, especially in the second part of the book.

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