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MURKIN, H. R., A. G. VAN DER VALK, AND W. R. CLARK [EDS.] 2000. **Prairie wetland ecology. The contribution of the Marsh Ecology Research Program.** Iowa State Univ. Press. xiv + 413 p. $80. ISBN 0-8138-2752-3.

Over the past 5 yr, I have witnessed striking ecological transformations in several small wetlands lying in glacial kettles near the Kellogg Biological Station in southwestern Michigan. When I began my observations, these depressions had probably contained surface water continuously since a protracted dry period in the mid-1960s. Each one supported a unique and seemingly stable assemblage of aquatic plants with submersed or floating leaves, often resembling the plant life in the littoral zones of local lakes. Then came 1998 and 1999, years in which precipitation was below normal and temperature was above normal, resulting in decreased inputs of water and increased evaporative losses. Lake and groundwater levels fell markedly—sometimes by >1 m—and many of the isolated wetland basins dried entirely. As soon as anaerobic pore waters no longer saturated the muck soils, a plethora of emergent wetland plants sprouted to life, including grasses, sedges, cattails, and bulrushes. Summer 2000 brought abundant rainfall and the return of surface water to many of these depressions, and the verdant meadows thrived under these conditions—as expected, because these plants are well adapted to life with their roots in anaerobic sediments. Yet I suspect, after reading *Prairie Wetland Ecology,* that if these wetlands return to a state of continuous inundation, the newly established emergent plant communities will not sustain themselves over the long term. As in the prairie wetlands, the seeds of these plants will generally not sprout underwater, and as a result of progressive losses that exceed vegetative propagation, the emergent vegetation will gradually give way to the submerged and floating aquatic plants I had first observed. These transformations in the wetland vegetation have implications for biogeochemical functions of these ecosystems, as well as for the wildlife they support.

In North American prairie wetlands, such cyclic fluctuations are known as the wet–dry cycle (van der Valk and Davis 1978). The earliest descriptions of these cycles in the ''prairie pothole'' depressions followed the protracted drought of the 1930s, and ecologists and managers were reminded of the importance of these phenomena during the 1960s drought. By the mid-1970s, there was a foundation of observational research on the responses of vegetation and wildlife to the wet–dry cycle, but most wetland management was still a product of trial and error. Weller (1978) summarized that state of knowledge and bemoaned the paucity of theory and experimentation to guide managers. He emphasized the need for an in situ experimental approach in which water levels could be manipulated in experimental units, while a multidisciplinary team studied the responses of the wetland ecosystem over multiple years.

This multiauthored volume summarizes the contributions of the Marsh Ecology Research Program (MERP), a joint endeavor between the Delta Waterfowl and Wetlands Research Station and Ducks Unlimited Canada that embodied Weller's recommendations. Support for the research arose from the desire of natural resource managers to better understand the implications of the wet–dry cycle for the productivity of wetlands, and especially for waterfowl production. A series of diked marshes was created within the Delta Marsh on the south end of Lake Manitoba. Water levels within replicated enclosures were manipulated while intensively studying the responses of the major ecosystem components over a 10-yr period (1980–1989). The core results have now been published and include >50 articles in the primary scientific literature, most of which deal with the ecology of the wetland vegetation. None appeared in *Limnology and Oceanography,* even though many are within the realm of interest of our readership.

A major emphasis of MERP was to determine the pools and fluxes of nitrogen, phosphorus, and carbon during the various stages of the wet–dry cycle. Hence, a substantial fraction of the book is dedicated to nutrient budgets for the experimental units. Despite my interest in this topic, I did not find these chapters to be the most interesting part of the book, perhaps because the changing biomass of macrophytes exerted the predominant influence on nutrient pools, resulting in rather similar mass balances for the three elements under study. The emphasis on macrophyte primary production in this project is understandable given the linkage with waterfowl production, but attention to microbial processes is conspicuously lacking. This gap in the MERP research is acknowledged when one of the chapters concludes that even after 10 yr of research on the question, ''it is not clear what controls the nutrient cycles in prairie wetlands.'' Had this project been organized in the 1990s rather than the 1970s, it is likely that the biogeochemical and microbial components would have been stronger, reflecting the increased attention to biogeochemical functions and the roles of wetlands in trace gas exchange with the atmosphere.

I found the subsequent chapters on various components of the wetland biota to be the most informative. The chapter on vegetation dynamics by van der Valk provides an excellent overview that is valuable for understanding wetland plant zonation and change, not only in prairie wetlands but in any wetland that experiences hydrological variability. Indeed, this chapter topic encompasses much of the scientific literature that resulted from MERP. The chapter on wetland algae by Robinson, Gurney, and Goldsborough is unique in its comprehensive consideration of the four kinds of algal assemblages found in wetlands (phytoplankton, epipelon, epiphyton, and metaphyton) and should discourage any limnologist from exclusively sampling phytoplankton in shallow, vegetated waters. The chapter on invertebrates by Murkin and Ross presents an unprecedented view of the interannual variability of aquatic invertebrates in the MERP experiments, and the chapters on birds and muskrats present thorough reviews on the ecology of these animals, as well as how their presence affects the wetland ecosystem. All of these chapters place their results in the context of the wet–dry cycle, which is the recurrent theme of the book.

Wetland managers have often sought to manipulate wetlands for the benefit of waterfowl by maintaining the ''hemi-marsh'' state, in which a wetland has approximately equal proportions of open water and emergent macrophytes. The summary chapters consider the management implications of the MERP research and emphasize that although this state may provide optimal conditions for a wide range of species, it is difficult to maintain for long periods. Instead of seeking this transitory state, managers should seek to maintain the entire wet–dry cycle for maximum long-term benefit and should work with natural successional processes rather than against them.

This book presents a timely summary and synthesis of one of the first major long-term experiments that was conducted to understand the ecology of wetlands. I found the chapters to be well written and edited overall, with a good degree of consistency and little unnecessary redundancy. There is a wealth of information in this book that applies to wetlands in general, and given its reasonable price, I feel that it deserves a spot in the library of any wetland scientist.

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