The Biology of Freshwater Wetlands

Global wetlands range from moss-dominated arctic peatlands to seasonally-flooded tropical floodplains, and exhibit significant differences in both hydrology and species composition. However, rather than concentrating on the detailed characteristics of specific wetland types, this concise textbook emphasizes their universal environmental and biological features. A combination of hydrology, low oxygen levels, and dense plant canopies are the major defining features of wetland habitats. Due to the slow diffusion of oxygen in water, oxygen in wetland soils and water columns is often very low or absent. The adaptations of wetland micro-organisms, invertebrates, plants, and vertebrates to anaerobic conditions (and their functional consequences) are a major theme of this book. Plant canopies create complex gradients of light, temperature and oxygen that change daily and seasonally. The book demonstrates how these shifting environmental gradients are responsible for the distribution of algae, invertebrates, and vertebrates in wetlands. Another major focus is on water level fluctuations and how they can affect the flora, fauna, and functions of wetlands. The future of wetlands is also examined, including the potential impacts of global climate change and efforts to restore wetlands.

The Biology of Freshwater Wetlands provides a concise, easy to read introduction for anyone working in the field of wetland ecology. It will be ideal for undergraduate and graduate students as well as professional researchers in the fields of limnology and freshwater ecology requiring a concise overview of the topic.

Dr Arnold G. van der Valk is a professor in the Department of Ecology, Evolution and Organismal Biology at Iowa State University.

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Front panel. MAIN IMAGE: Freshwater wetland in Keoladeo National Park, India. © A. G. van der Valk. INSET: © Clive Newson.
Back panel: Freshwater wetland (backwater) of Kissimee River, South Florida. © Patrick Lynch

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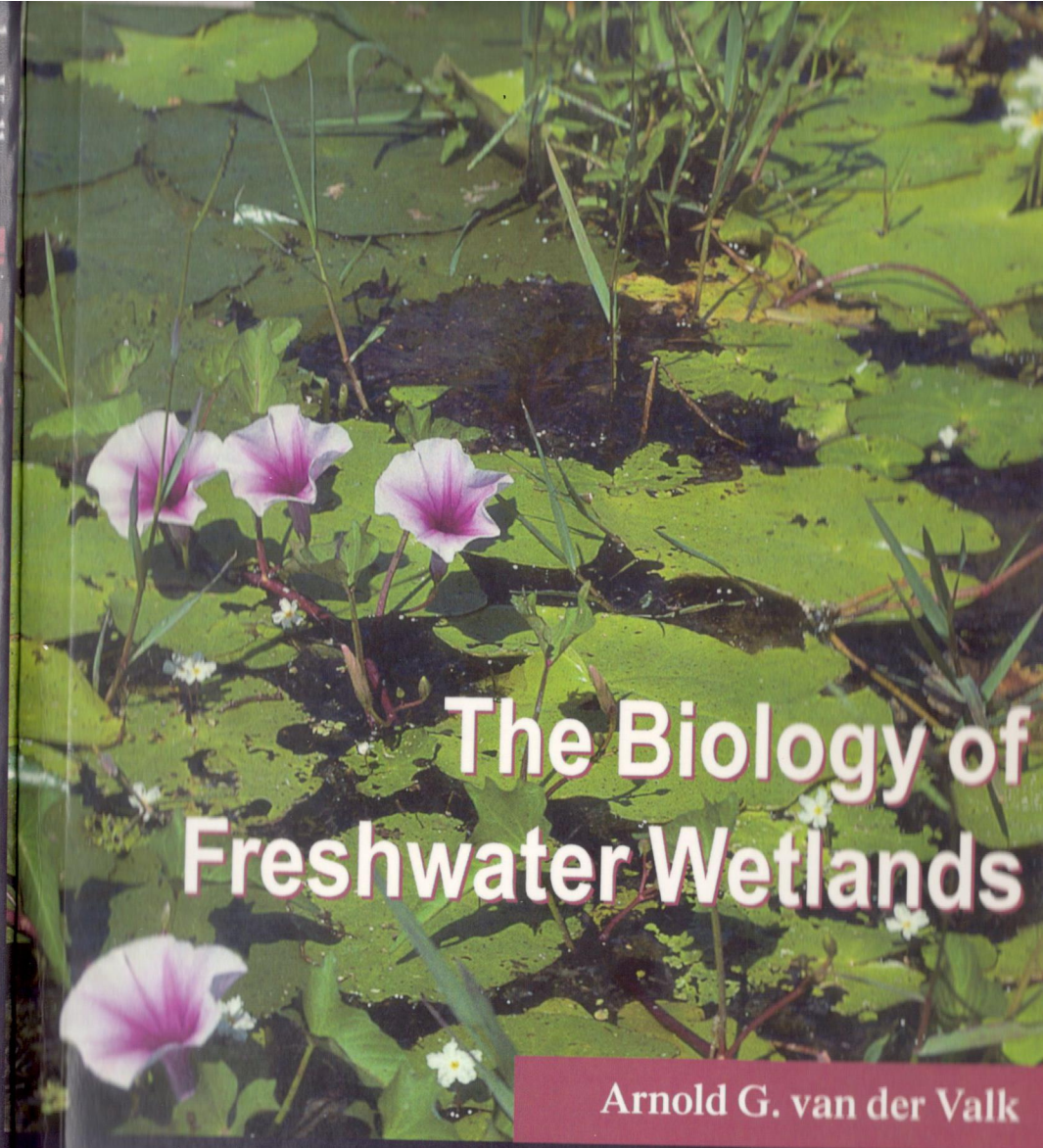

The Biology of Freshwater Wetlands

Arnold G. van der Valk

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Preface

The recognition that freshwater wetlands are more than a transition zone between terrestrial and aquatic systems is relatively recent. If wetlands were considered at all, they were treated as either wet versions of terrestrial vegetation by ecologists or the shallow portions of lakes and ponds by limnologists. For both, wetlands were a peripheral topic. Even the term wetland is relatively new. Wetland is not found in the index of C. D. Sculthorpe's (1967) *The Biology of Aquatic Plants*, G. E. Hutchinson's (1975) *A Treatise on Limnology*: Vol. III. *Limnological Botany*, or the first edition of Robert G. Wetzel's (1975) *Limnology*. However, by the second edition of *Limnology* (Wetzel 1983), this had changed. In 1978, *Freshwater Wetlands: Ecological Processes and Management* edited by R. E. Good, D. F. Whigham and R. L. Simpson was published to which Robert Wetzel contributed a paper. In 1980, the Society of Wetland Scientists was founded. In the same year, the first international meeting on wetlands was held in New Delhi, India, under the aegis of INTECOL. In 1983, the journal *Wetlands* was launched by the Society of Wetland Scientists, and John R. Etherington published his classic book, *Wetland Ecology*. Today, wetlands are widely studied around the world and the literature on wetlands is huge. Typing 'wetlands' into Iowa State University's electronic library catalogue brings up nearly 1000 books, monographs, and government publications. I make no claim to have read all of them, or even most of them.

Although it might seem that wetland ecology as a discipline is only about 25 years old, this is misleading. Wetlands had been studied for many years prior to the 1980s by a variety of people, including waterfowl or waterbird biologists, palaeoecologists, and especially peatland ecologists. In fact, *Peatlands* by Peter Moore and David Bellamy, which was published in 1973, is arguably the first book published on freshwater wetland ecology. Peatland ecology and wetland ecology are very similar disciplines that continue to coexist but are beginning to unite. Peatland ecology originated and was initially centred in northern Europe. Wetland ecology originated and was initially centred in North America. From my perspective, peatlands are just a type of wetland and

adequately in a book of this length. Consequently, there will be another book in this series on peatlands. In the meantime, Charman's *Peatlands and Environmental Change* (2002) provides an excellent introduction to them.

A complete account of the species in any given wetland would be much longer than this entire book. Consequently, only a small number of representative species of microorganisms, plants, and animals are described. Likewise, it was impossible to describe in any detail even one specific wetland. Fortunately, there are good books on a variety of wetlands around the world, including Australian wetlands (McComb and Lake 1990), the Pantanal in South America (Heckman 1998); the Great Dismal Swamp (Kirk 1979), pocosins (Richardson 1981), the Everglades (Lodge 2005), prairie potholes (van der Valk 1989), patterned peatlands (Wright et al. 1992) in North America; and the Kafue Flats in Zambia (Ellenbroek 1987). There are also some excellent and well-illustrated books on the wetlands of the world (Finlayson and Moser 1991, Dugan 1995).

Today the importance of wetlands is widely recognized around the world, and the number of people who work in wetland-related jobs in universities, government agencies, non-governmental organizations, and private companies continues to increase. Universities have responded to this increasing need for people trained in wetland ecology by offering courses in the field at both the graduate and undergraduate level. This book is designed to be a textbook for beginning courses in wetland ecology. It is, in fact, largely based on such a course that I teach. I have assumed that anyone taking a wetland ecology course has already had an introductory ecology course. Consequently, some ecological jargon and concepts are used that are not defined or explained in detail in the text. For anyone whose background in ecology is limited, a glossary is included that defines these technical terms. This book focuses on the organisms found in wetlands. Wetland ecology is a field that has developed unevenly, and some topics, for example, wetlands as nutrient sinks or as duck habitat, are much better developed than others. I have tied to provide a balanced overview of the discipline rather than to cover various topics in proportion to the amount of information available.

Nevertheless, the information and ideas that have made it into this book are inevitably based largely on my own experiences and those of my colleagues from around the world whose work I know, respect, and admire. I am particularly indebted to colleagues with whom I have worked on research projects, with whom I have had the opportunity to talk about wetlands over the years at meetings and conferences, or whose writings have inspired me: Bruce Batt, Bill Crumpton, Craig Davis, Max

Middleton, Henry Murkin, Bill Patrick, Eric Seabloom, Fred Sklar, Bill Streever, Jos Verhoeven, Milton Weller, Paul Wetzel, Robert Wetzel, Dennis Whigham, Tom Winter, and Joy Zedler.

I would also like to thank my wife Suzanne whose editorial work improved the readability of the text significantly. Any shortcomings and errors in fact or interpretation are my own. This book is dedicated to Suzanne who over the years has learned more about wetlands than any other English major.

Ames, June 2005

Arnold van der Valk

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