

Guidelines for Wetland Management and Reconstruction

Klaus Dierßen & Silvia Opitz

Ecology Centre, Schauenburger Strasse 112, Christian Albrecht Universität, Kiel, Germany

Wetlands are characterised by the presence of water at or near the soil surface. Their soil properties differ from adjacent areas, and their vegetation and flora is adapted to permanently or seasonally wet conditions and oxygen deficient soils or water bodies.

Wetlands comprise about 6 per cent of the world's surface. In Europe, these wetlands are widespread and exhibit ample variety, including arctic and alpine lakes, rivulets and springs, extensive boreal and oceanic peatlands, coastal intertidal marshes, inland lakes, reservoirs and floodplains as well as river deltas in temperate and Mediterranean areas. This variability of wetland types reflects a wide range of landscapes, climatic differences and patterns of human activities.

In the past, wetlands were mostly considered as wastelands without any economic value. Strategies to change and transform marshes, swamps and mires into productive farmlands and forests have been the predominant goals. In the course of centuries, the affected systems have largely changed their structures and functions. In many areas wetlands are still being reduced in size and restricted in quality as a consequence of modern draining techniques in agriculture, increasing industrialisation and population pressure including activities such as waste dumping, river embanking and alteration of catchment land use. As a result, many areas were altered or destructed, and wetlands became truly threatened ecosystems and even landscapes. In more recent decades the focus is changing. The value of wetlands increased as their hydrological, chemical, biological, social and economical benefits were taken into consideration. Wetlands are among the world's most important environmental resources. The preservation of mires, for instance, not only involves unique biological assemblages and cultural monuments as repositories for archaeological artefacts, but also fulfil important ecosystem functions as carbon and nutrient sinks and in that way contribute considerably to regulate greenhouse gas emissions at global scale. Flood control, production of food and water quality improvement are of high economical value. Many wetlands nowadays also serve social and recreational activities.

In order to maintain the values provided by wetlands, integrated concepts are necessary for a wise protection, management, monitoring and reconstruction of wetlands. Although local, regional and national wetland classifications and inventories exist and have successfully been applied, the relationship between processes, functions and values of wetlands needs further detailed studies as a prerequisite of economical and political decision-making.

Preservation and amelioration of existing natural wetlands and reconstruction of former wetlands are necessary components of a future, more general rehabilitation of natural environments within Europe. Wetland rehabilitation and reconstruction are a subject of general public concern but neither general guidelines nor an evaluation system of the results are presently available.

Recognising the need for an integrated approach to improve and remedy this situation, seven research teams working in the field of wetland research from six European member states have co-

operated within the EU sponsored training and mobility network 'Wetland Ecology and Technology WET'. The unifying idea behind WET was the comparison and integration of data and expertise from monitored wetlands of different types and from different geographic zones and climates. This would then lead to identification of knowledge gaps and clarification of goals of various management approaches through international cooperation and discussion.

WET aimed at providing potential users with guidelines and assessment instruments indicating location and design of an appropriate wetland for a proposed management target such as maximising pollution abatement in the surface water and /or protection /restoration of valuable wildlife for rehabilitation and reconstruction of wetlands in different regions of Europe. These general guidelines and evaluation tools for wetland management and reconstruction presented in this volume have been developed throughout the cooperation and consist of three parts:

1. Monitoring and experimenting in wetland ecosystems,
2. Modelling of structural components and processes effective in wetland systems and
3. Designing reconstruction and management of wetland systems.

Each of the seven European research teams contributed to the project with its specific expertise. The Ecology Centre at the Christian Albrechts University in Kiel, Germany, being the coordinating institution, provided data and models of natural wetlands and offered an Ecological Information System (EIS) as a common information base and as tool for wetland design and management. The Royal Danish School of Pharmacy (DFH) in Copenhagen, Denmark, contributed with the use of modelling and ecological engineering approaches in environmental management particularly of non-point source pollution. The Freshwater Laboratory of the University of Copenhagen, Denmark, was measuring and modelling the changes in nutrient dynamics in a newly constructed wetland. The Laboratory of Analysis of Environmental Systems (LASA) at the University of Padua, Italy, was involved with monitoring and modelling the development of structure and processes in a reconstructed wetland as a case study. The Netherlands Centre of Geo-ecological Research (ICG) at the University of Utrecht, was modelling hysteresis processes in nutrient availability in soil water and groundwater and vegetation responses to these environmental changes. The Institute of Marine Research (IMAR) at the University of Coimbra, Portugal, was monitoring and modelling structure and processes in a natural wetland in the Lower Modego river region. The Limnology Department at the University of Lund, Sweden, was contributing with the evaluation of alternative design and management of wetlands for the reduction of nitrogen transport to the sea.

Principal partners for collaboration and implementation of results of WET were public authorities and private consultancy enterprises. The majority of WET-partners had established cooperations with public authorities and consultancy enterprises before the start of the cooperation. These contacts could be intensified during the contracting period.

Apart from the scientific cooperation another important objective of WET was the training of young – mainly – postdoctoral European researchers. WET has funded more than 360 person months of employment of young researchers during the contracting period. These young researchers have been trained in wetland ecology and technology with emphasis on interdisciplinary, cooperative team work at a European scale. The training program included research activities as well as a series of intensive theoretical and practical courses. Subjects of the courses represented a wide range of expertise in the field of wetland research. A selection of these young researchers has taken a leading part in the preparation of the guidelines that are presented in this volume.

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Klaus Dierßen (*coordinator*) and Silvia Opitz (*manager*)

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