

Wetlands perform functions that deliver benefits to society, often referred to as *ecosystem services*, as a result of the interactions that take place among natural processes within the structure of these ecosystems. However, wetlands do not all perform the same functions, nor is any one function carried out to the same extent or intensity among different wetland types. A functional approach to wetland assessment enables a holistic view to be taken of the wide range of services wetlands can provide. Some of these may be mutually exclusive, or else one service may be optimised only by reducing the effectiveness of another. The functional assessment procedures (FAPs) can be used to determine the likelihood of particular functions occurring, and how this may vary with changing environmental conditions and management. Questions can be addressed such as 'what are the implications for biodiversity or water quality regulation if water levels are raised by a given level?' The method can be used to indicate the potential and priorities for management options, and at what point further studies are required to improve the knowledge necessary for strategic land-use or site-specific management decisions to be made with more confidence.

The FAPs provide a methodology, which can be used by both experts and non-experts to assess wetland functioning relatively rapidly. Primarily this is achieved by the identification of key characteristics or predictors, which can be related to functions without the need for detailed studies. The most effective performance of some key functions, such as nitrate removal by denitrification, is sometimes focused on small discrete areas of the landscape. To cater for this, assessments are made of distinctive, often small areas of the wetland, characterised by features of hydrology and landform. Better understanding of such variation can lead to improved management and more satisfactory resolution of planning and land-use conflicts, offering options for alternative uses and addressing development pressures.

Previous development of sufficiently robust, science-based tools for wetland functional assessment has been impeded by the lack of integration of the wide range of specialised scientific and geographical perspectives necessary. However, a sequence of EC-funded research projects undertaken since 1991 was targeted largely to overcome this impediment through international and inter-disciplinary collaboration.

It is anticipated that the FAPs will be used by a range of individuals or organisations concerned with wetland management who wish to gain a better understanding of the processes, functions, services or benefits and potential of the wetlands for which they have responsibility or interests. The FAPs are a first step in providing guidance for on-site management and decision making by presenting information on how a wetland is likely to be functioning and the key processes operating within it. On a different level, the FAPs can assist strategic planners at local and catchment scales to make decisions on wetland management and land-use through assessment of overall wetland functioning and the contribution of wetlands to ecosystem services such as water quality, water quantity and biodiversity. Knowledge of functioning can be used to assist with the implementation of national and wider policy, such as the Water Framework Directive, where they can assist with decisions such as the location, type, number and area of wetland buffer zones required to deliver desired water quality benefits, or the risks to the integrity of water bodies and contiguous wetlands resulting from activities such as abstraction that affect water resources.

The modular structure of the package facilitates its expansion to include additional functions to meet the requirements of other specific users, such as the develop-

ment of a module for wetland archaeologists. The heritage value of wetlands derives mainly from the ability of waterlogged anoxic environments to preserve organic and associated archaeological evidence, which is otherwise rapidly destroyed by biological decay processes under the oxidised conditions that prevail when drying out takes place.

Assessment outcomes from the FAPs can be used in conjunction with other information relating to, for example, societal priorities, costings and policy limitations to assist and support environmental decision making. The FAPs translate best available scientific knowledge into reasonable predictions of how component parts of wetlands function in different landscape contexts. FAP outcomes are linked to societal priorities such as flood control, pollution reduction and biodiversity conservation. The FAPs recognise and emphasise the 'natural capital' of healthy wetland ecosystems, and reinforce the fact that wetland management is a question of choice: for individuals as well as society.

There have been at least three major developments over the gestation period of the FAPs, which underlie their potential significance and points of relevance to operational application:

1. elaboration of the Ecosystem Approach as the primary instrument for delivery of the objectives of the UN Convention on Biological Diversity (<http://www.biodiv.org>);
2. the UN Millennium Ecosystem Assessment (MA: <http://www.maweb.org>), which assesses the links between ecosystems and human wellbeing, governmental support through the Millennium Development Goals and the Plan of Implementation following the World Summit of Sustainable Development (<http://www.un.org/events/wssd/>);
3. in Europe, the development of a more integrated and holistic approach to water management through implementation of the Water Framework Directive (2000/60/EC).

The common philosophy underpinning the rationale behind these initiatives is the recognition that ecosystem functioning is directly or indirectly responsible for the delivery of goods and services that are essential to human welfare. The value of such benefits is sometimes recognised as the 'natural capital' of the world's ecosystems. There is considerable interest from the policy community in the development of methodologies for the assessment of ecosystem services as support to improved decision making in the management of natural resources. Wetlands deliver a wide range of ecosystem services that contribute to human wellbeing, such as water supply, flood regulation, water purification, climate regulation, biodiversity and productivity (e.g. of fish and grazing land) and amenity.

Functional assessment enables the user to predict the functioning of a wetland area without the need for comprehensive empirical research. This provides indicators for the quality and degree of delivery of specified ecosystem services. The link to specific ecosystem services has been developed subsequently through a geographical information system (GIS) mounted decision support tool called the Wetland Ecosystem Decision Support System (WEDSS; http://www.liv.ac.uk/swimmer/research/past_projects.html).

Application of the FAPs enables the user to make more informed and rational decisions about wetlands, based on the better understanding of how they work and what they are contributing, or could contribute, to various sectoral interest groups and to society as a whole.

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