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Developing the Pond Manifesto

E.P.C.N.

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Abstract

Ponds are an essential freshwater habitat for plants and animals, and they play a central role in maintaining high regional biodiversity. In addition, ponds have many other functions relating to education, recreation, economy, hydrology, culture and aesthetics. Despite their importance, relatively few resources are invested in pond conservation in Europe. Furthermore, the scientific basis for the management and conservation of ponds is currently weak compared to the information available for other freshwater habitats. Some national environment agencies from countries such as France, the United Kingdom and Switzerland, have recently developed elements of a national strategy for pond conservation. There is now need to strengthen and develop these initiatives and to build a common framework in order to establish a sound scientific basis for pond conservation in Europe. The European Pond Conservation Network (EPCN, www.europeanponds.org) was established at the First European Pond Workshop in Geneva, October 2004. The mission of the Network is to promote awareness, understanding and conservation of ponds in a changing European landscape. Specifically the objectives of the Network are: (1) to exchange information on pond ecology and conservation between researchers, managers and practitioners, (2) to promote understanding of pond ecology by encouraging the development and coordination of fundamental and applied research, (3) to raise the profile of ponds and guide national and supra-national policies for their protection, (4) to promote effective practical pond conservation, and (5) to disseminate information on the importance, attractiveness and conservation of ponds to the people. The "Pond Manifesto" presents the background and the motivations of the EPCN.

Keywords: pond ecology, conservation biology, environmental policy, education, Europe

Introduction

Ponds are small bodies of water which exist permanently or temporarily in the landscape. Their origin may be natural but by far the majority of sites in Europe have been created by centuries of human endeavour. Known as ponds, pools, small water bodies, these terms are interchangeable and there is no universal definition of how *large* or how *small* a pond might be. Research from across Europe has demonstrated that they are a significant biodiversity resource, very high when compared to other water bodies. This diversity is a function of chance processes such as dispersal and colonization, the size and characteristics of the regional species pool, habitat characteristics, water quality and the local biotic interactions. In many places ponds occur with great regularity and should be viewed as a network of patches. These pond *landscapes* were once common, especially in parts of northern Europe. Today, however, the number of ponds in the landscape continues to decline in some countries as a result of the scale and intensity of agriculture, urbanization, socio-economic pressures, and climate change. This loss is further exacerbated when ponds no longer have any major economic or social value. Accordingly, as ponds disappear from the landscape, whether it be as a result of natural processes or human development, new ponds are not replacing those which are being lost. During the twentieth century as many as 90% of ponds have been lost in some countries, with most countries in western Europe recording a loss rate in excess of 50%. Furthermore, a large part of the remaining ponds are heavily impaired (excessive nutrient loading, pollution, degraded buffer zone and littoral vegetation belt, presence of exotic species, loss of connectivity between the ponds, etc.). This terminal decline has not been halted by intervention. The protection of ponds, with a few exceptions, is not a high priority. Many countries in Europe have ignored the natural capital associated with ponds and legal protection remains patchy across the continent. There is therefore a need to safeguard the pond environment through national policies for protection and by means of appropriate statutory designations. The pond environment should also be safeguarded through national, regional and local planning policies. Additionally, the development of ecological networks has started to inspire European nature conservation at different levels and provides a meeting point and partnership with land use planning. Knowledge of pond ecology is not enough to stop the decline of biodiversity – there is a need to understand society. Protecting nature and biodiversity means dealing with social processes and

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dynamics. Nature and culture has become a key duality in the approach to nature conservation and sustainable development in the 21st century. Apart from their wildlife value, the pond resource needs to be recognised in terms of its intrinsic, exploitable and aesthetic-ethical values. In particular ponds have to be valued in terms of their historical origins and cultural value; their economic value; as distinctive features of local landscapes; their visual attraction and the knowledge that they help local people keep in touch with nature.

In order to address these issues, The European Pond Conservation Network (EPCN, www.europeanponds.org) was established at the First European Pond Workshop in Geneva, October 2004 (Oertli et al. 2004, 2005). The overall mission of the Network is to promote awareness, understanding and conservation of ponds in a changing European landscape. Specifically the objectives of the Network are:

1. To exchange information on pond ecology and conservation between researchers, managers and practitioners.
2. To promote understanding of pond ecology by encouraging the development and coordination of fundamental and applied research.
3. To raise the profile of ponds and guide national and supra-national policies for their protection.
4. To promote effective practical pond conservation.
5. To disseminate information on the importance, attractiveness and conservation of ponds to the people.

Although the focus of the network is on European ponds (Céréghino et al. 2007, Nicolet et al. 2007), the network welcomes researchers and practitioners from other areas in the world, and wants to have a broad global view on sustainable management of pond habitats. This paper is the summary of the discussions held during the first and second EPCN Workshops.

Scientific approach to pond ecology, to their threats and responses

Understanding pond ecology

Ponds are reservoirs of biodiversity. They do not only harbour a relatively high local diversity, but recent studies suggest that their contribution to regional diversity is very high compared to other water bodies. To understand how this diversity is maintained and how ponds function, we need an encompassing research program involving different but complementary approaches and focusing on the relevant ranges of temporal and spatial scales. Ponds not only have important landscape functions, they also contribute significantly to regional diversity (from gene to ecosystem and processes).

Research approaches

Field surveys – revealing the patterns

There is a need for field surveys to reveal where ponds are in relation to landscape, soil and land use characteristics, and to reveal patterns of diversity and structure in pond ecosystems along *relevant spatial, temporal and environmental gradients*. There is a need for intelligent standardization of sampling schemes to allow large-scale surveys. These surveys should cover the broad range of pond types along broad geographical, altitudinal and environmental gradients, and should also be used to refine the typology of ponds. The surveys should try to involve the full range of taxonomic groups (i.e. different trophic levels, keystone taxa, umbrella taxa, flagship species). Special attention should be focused on endangered species (Red List species; Habitat Directive Appendices 1 and 2); in this respect the surveys may actually lead to a re-evaluation of the status of species. In addition to presence / absence data, there is also a need to assess population status (e.g. presence of reproductive or young stages). Special attention should also be focused on the occurrence and relative abundance of introduced species. Large-scale surveys should focus on relevant geographical and altitudinal ranges, covering N/S and E/W gradients, altitudinal gradients, seasonal and year-to-year variation.

There is a need for high quality large-scale national and regional data sets covering the important gaps in our knowledge, as well as for an integration of the already existing data sets into a *standardized database* so that they can be analyzed in an integrated way. This analysis, in addition to giving a first taste of large-scale patterns, will be very informative in identifying gaps in the knowledge, obtaining a first typology of ponds at a European scale, optimizing the design of new surveys and standardize sampling schemes.

In addition to surveys on patterns of species occurrence and relative abundance, patterns of *genetic diversity and structure* are important in getting insight into (meta)population structure, in identifying management units, and in identifying model species that may be representatives of larger groups (e.g. based on dispersal or life history strategies).

Experimental work – disentangling the processes

There is a need for well-designed experimental work to understand the mechanisms and processes underlying the patterns of ecosystem, community and population genetic structure observed in natural ponds. Experimental work should include the main driving

forces of community dynamics in ponds, and should thus include both *regional* (dispersal, external forcing) and *local* factors (abiotic conditions, changing biotic interactions). Importantly, *disturbance regimes* are likely to be a key driving force explaining the structure and diversity of pond communities, and can operate at both the regional and local scale. Also, it is of crucial importance that work is conducted covering *multiple trophic levels*, so that bi- and tritrophic interactions are taken into account.

Given that ponds function as stepping stones, our understanding should include the landscape perspective, thus incorporating *metapopulation and metacommunity dynamics*, as well as taking into account catchment-wide influences.

This experimental work should involve field experiments, outdoor mesocosm / cattle tank experiments, and mechanistic laboratory experiments. In search of the optimal compromise between repeatability and relevance, there will often be a need to combine several approaches and scales of experimental work. There is a great need for a concerted effort in performing experiments that incorporate spatial gradients (N/S, W/E) at the European level. For this reason, the establishment of replicate experimental pond or cattle tank areas across the relevant spatial scales should be a priority.

Studying the responses to environmental change

An important issue is the capacity for ponds and pond communities to respond to (anthropogenically induced) environmental change. Attention should be focused on factors mediating the *resilience* and *resistance* of pond ecosystems to disturbance. These factors include, amongst others, species *diversity*, the presence of *dormant egg and seed banks* (internal recolonization potential), and *evolutionary potential* (genetic variation). Importantly, regional characteristics may also contribute significantly to the adaptive response of pond communities to environmental change, and should be taken into consideration: dispersal rates (*metacommunity structure*), richness of the regional species pool, density and diversity of source habitats, etc. In measuring evolutionary potential, it is important that attention is focused on ecologically relevant traits (traits under selection). These traits may involve responses to both abiotic and biotic stresses, and there is a great need for micro-evolutionary studies on the response of traits and species to anthropogenic impacts (e.g. pollution). In order to understand how anthropogenic impact on species presence and abundance may interact with the structure and *functioning of ecosystems*, there is a strong need for experiments that investigate the link between biodiversity and community composition (across trophic levels) and ecosystem functioning (productivity, resilience, energy flow, etc.).

Ponds as model systems for testing general theory

Whereas most of the above aims at understanding the structure and function of pond populations, communities and ecosystems, we here also want to emphasize that ponds and pools are *excellent model systems* to study general ecological theory (e.g. relative importance of regional and local factors in determining community structure; relationship between diversity and ecosystem function, …). There are several reasons why ponds are so attractive as ecological model systems: (1) ponds are abundant, (2) there is a very wide variety in pond types – ponds and pools span a very broad range of ecological gradients (e.g. hydroperiod, size, nutrient concentration, anthropogenic impact), (3) they are very well delineated in the landscape, so that populations are easily identified, (4) given that for aquatic organisms, ponds are suitable habitat patches in a hostile landscape, ponds are ideal model systems to study metapopulation and metacommunity dynamics, (5) because of their small size, ponds and pools are relatively easy to sample, so that one can involve many systems in a given study, (6) as pond communities are relatively simple, they are amenable to standardized experimental manipulation, (7) pond ecosystems can be relatively well mimicked in mesocosms and cattle tanks, increasing the scope for large-scale replicated experimental work.

Giving the encompassing nature of the research needed, including the need to cover relevant spatial and temporal scales, it is clear that the above requires an integrated approach, in which research groups working in different regions and research areas, and having complementary expertise, are engaged in networking and intensive collaboration.

Threats and responses

A pond's diversity is a function of chance processes (dispersal, colonization), the size and characteristics of the regional species pool, habitat characteristics (permanent/temporary; vegetation cover), water quality and the local biotic interactions. Hence, to understand threats and responses, small water bodies cannot be considered in isolation but should be viewed as a network of patches in a landscape that is in continuous change due to transformation in the scale and intensity of agriculture (e.g. eastern-western EU countries, N-S gradients), socio-economic pressures and climate change. Human impact should be included in the study

of ponds, since many ponds are man-made and because their small size makes them very prone to threats as well as to management.

Stressors

As size matters, any change in the surface and volume of ponds and pools through habitat fragmentation may have direct (e.g. area – diversity relationship) or indirect (e.g. due to reduced littoral zone) effects on local diversity. As small water bodies do not function in isolation, any change in the *surrounding landscape* may affect the condition of each pool in its matrix. Landscape fragmentation, for example, can impact the connectivity between water bodies (disruption of pond networks) and ultimately disturb metacommunity dynamics.

Ponds and pools often occur on, often fertile, plains and are therefore prone to *destruction or loss due to land use changes* (e.g. filling). Loss of individual pools, in turn, will have an impact on the distance (connectivity) between remaining pools, and these effects can ultimately cascade down to each pool in the network.

Depending on the size of the watershed, run-off is an important component in the hydrology of small water bodies. Consequently, all activities in the surrounding landscape will be reflected in the physical/chemical and biological condition of the pools. Important stressors can be the *inflow of nutrients, pesticides and heavy metals*, often derived from agriculture. Industrial activities or road works in pond areas can be a source of a variety of other xenobiotic substances that through run-off and/or precipitation can affect the water bodies.

Any artificial modification of *hydrology* or *abstraction of water* adversely affects the functioning and biodiversity of ponds. Temporary pool diversity is sensitive to changes in hydrology; the duration that pools contain water determines to what extent succession can take place, which species are able to complete their life cycle, and / or the level of predation pressure. Changes in hydrology due to ground water abstraction or climate change (rainfall patterns and temperature regime) can therefore be important stressors, especially in arid and semi-arid areas (including large part of the Mediterranean). In many areas, there is serious competition for the use of water from ponds and pools. Ponds and pools often serve as drinking places for cattle, reservoirs for drinking water, rinsing places for agricultural instruments, etc.

Introduced species can be very invasive and may replace local species. They may also considerably alter the food chain in the water bodies. Ponds and pools are often strongly impacted by the release of pet animals such as goldfish or turtles.

Responses

Depending on the nature of pollution, the extent of habitat fragmentation, loss and destruction, the level and the nature of the changes in the hydrological cycle, the activities and changes taking place in the landscape, the type of introduced species invading the water bodies, effects may be revealed and measured at various levels. At the level of the *ecosystem*, indicators can be the functioning of the water bodies (e.g. nutrient cycling), the quality of the water (including turbidity), the level of permanence and the structure of the habitat (e.g. sediment thickness and quality, vegetation cover). At the level of *metacommunities* and *local communities*, responses can be in the ratio of dominant versus rare species, species composition, abundance and diversity patterns, including the occurrence of ecological specialists. At the level of *individual populations*, responses may become clear in the demography of individual populations, patterns of neutral genetic variation that reflect chance processes (e.g. due to bottlenecks, dispersal and colonization), or patterns of genetic variation in ecologically relevant characters (e.g. reproduction, tolerance levels) that indicate local adaptation.

Approaches

It is important that assessments are hypothesis based. As such, monitoring campaigns can focus on the comparison of specific sets of ponds and pools, different kinds of exposure, specific regions, and compare response variables with standard values, etc. Whenever possible, near-pristine systems should be identified as references in a given area, and long-term monitoring is necessary to assess temporal responses of ponds to local practices and/or global changes. Making use of explicit hypotheses will reduce the number of variables that will need to be assessed and analysed. It is also advisable that descriptive field observations are integrated with controlled experiments in the field (e.g. mesocosm or whole pond experiments), in outdoor containers and/or in the laboratory (e.g. comparison of tolerance levels, life history characteristics). In this way, indications for the impact of specific threats in the field data can be falsified in a more simplified environment. It is crucial that suggested management techniques are not only based on the patterns derived from fundamental research (e.g. biodiversity indices as indicators of land use change), but are also tested and evaluated in the field. It is often overlooked that populations can adapt to local conditions. In order to predict the fate of particular populations (and ultimately maybe the entire species), it is advisable to assess evolutionary potential, which may allow the populations to track environmental change and persist. This local adaptation may in

turn influence ecological structure and function (feedback from micro-evolution to ecology). Adaptations to stressors (e.g. pollution) may, for instance, trade-off with the performance of the organism in its interactions with other species (e.g. predator avoidance) and thus ultimately influence the entire community. In general terms, investing in local adaptation to stressors may impact morphological, physiological or behavioral characteristics of the organism, and thus alter its function in the ecosystem.

Societal value

Ponds reflect a familiar bond between local society and wetlands. For many centuries they were omnipresent features in the rural landscape and as such they have witnessed the day-to-day history of man's relationship with nature. Today, however, ponds and the biodiversity they support are threatened by human activity (agriculture, industry, urbanisation). As a result of large-scale habitat loss, many species are also endangered, thus motivating multi-disciplinary studies towards understanding pond ecology and the role of ponds in the landscape. It is now well established that pond management and conservation is closely linked to our knowledge of the biota they host, and to their usefulness in terms of social and economic services.

Social Interaction

Knowledge of pond ecology is not enough to stop the decline of biodiversity – there is a need to understand society. Protecting nature and biodiversity means dealing with social processes and dynamics:

- Sustainable management of pond biodiversity requires changes in individual and institutional behaviour;
- Support for pond conservation varies from group to group and from country to country, and is linked to social, cultural and economic factors;
- Implementing biodiversity and pond management plans usually involves communication and negotiation with a wide range of stakeholders (see below);
- Europe's cherished landscapes and biodiversity developed over centuries through the interaction of social practices and ecosystems.

Bridging the gap between society and nature is not always easy:

- Nature conservationists are looking for clear guidance and advice on how to communicate with different stakeholder groups;
- Conflicts concerning the management of nature and biodiversity can run deep – mediating and facilitating towards a solution can be a difficult and slow process;
- Nature conservation professionals are often unaware of what social sciences can offer;
- On the other hand, many social scientists still think that they have nothing to contribute to nature conservation and biodiversity management.

Many organizations involved in the protection of nature and biodiversity have realised that they need to know as much about society as they know about ecology to be effective. Nature conservation is already becoming more social - communication is considered essential, and more efforts are made to involve stakeholders at an early stage. Increasingly, the social sciences are becoming involved in investigating issues related to nature and biodiversity.

Valuing ponds

Nature and culture has become a key duality in the approach to nature conservation and sustainable development in the 21st century. Apart from their wildlife value, the pond resource needs to be recognised in terms of its intrinsic, exploitable and aesthetic-ethical values. In particular ponds have to be valued in terms of their historical origins and cultural value; their economic value; as distinctive features of local landscapes; their visual attraction and the knowledge that they help local people keep in touch with nature.

Historical origins and cultural value

Many ponds are important historic features both in their own right, and as a result of their structure and sediments which may contain valuable information about the history of the site and the surrounding land. Ponds were created for a great diversity of agricultural and industrial purposes, particularly during the eighteenth and nineteenth centuries, and were a vital ingredient to local economies across the continent. These uses include the production of fish, the extraction of minerals, for cooling purposes, the storage of ice, the watering of livestock, domestic water supply, for fire fighting, defence, and textile manufacture. Few ponds had a single use and in many cases they are just part of the historic character of the site and may also be associated with dwellings or be part of a historic landscape design. In many cases, a pond may be the last remnant of a historic site or landscape. Apart from the visual record in the landscape, pond sediments and artefacts may reveal important information about environmental change and archaeological information which can help to create a better understanding of life in the past.

Economic value

The economic value of ponds has changed over time. Today many ponds have little value other than fulfilling

an educational, leisure or amenity role with their function in the agricultural or industrial landscape being little more than a remnant of a past age. However, financial benefits associated with pond creation and restoration are becoming commonly associated with agri-environment funding where small water bodies are seen as a vital part of whole farm conservation planning. Similarly, the use of ponds for recreational activities such as angling, has grown considerably across much of Europe. Increasingly, ponds are being created for purposes of drainage, retention, detention, water cleansing (Sustainable Urban Drainage Systems, SUDS) in which the economic value is more obvious and as the value of *natural capital* becomes widely recognised ponds of all kinds will have a higher perceived value.

Wildlife and landscape value

Indirect benefits can also be accrued by incorporating ponds into landscape schemes such as the planting of community woodlands and the development of agri-tourism. As mentioned earlier, there is a strong bond between ponds and people and incorporating small water bodies into these schemes enhances both wildlife and landscape value.

Heritage value

Ponds are a resource for *people* as well as for wildlife. Interest in heritage continues to increase and the public desire to learn about their surroundings and local distinctiveness. In some countries in Europe, heritage is interpreted broadly to include both cultural and natural capital. Accordingly, ponds satisfy both criteria.

Education and awareness

Education and the national curriculum

The school curriculum presents a highly effective route for educating children about ponds and their value and function. Yet there are several problems making it difficult for teachers to deliver an effective *pond* message in a classroom setting. In many countries, environmental education may not formally be included as part of the curriculum making it difficult to introduce pond and wetland issues. In others, environmental education may be a recognized component of the national curriculum but pond and wetland issues may not be specifically identified as areas to be covered in the classroom. In yet others, where ponds are identified in the national curriculum, teachers may not have the necessary knowledge or training to translate this into classroom activities. Finally, even where all these conditions are met, teachers and curriculum developers are being challenged in many parts of the world to deliver Education for Sustainable Development (ESD). This educational paradigm encourages a more holistic, interdisciplinary approach to developing knowledge and skills to prepare students for life in a sustainable world and it issues a whole new set of challenges to curriculum developers. Whatever the educational paradigm in operation within a country, we must ensure that mechanisms are in place to ensure that pond and wetland issues are appropriately addressed at all levels in school education and that teachers are well prepared to deliver the message.

Higher education

Higher education provides society with key decision makers and it is essential that wherever possible, wetland conservation in its broadest sense is included in relevant degree programmes. We must ensure that this representation is not limited to biological and environmental sciences and that every effort should be made to include wetland conservation into other degree programmes. These should include geographical sciences, land management, planning and, arguably, the social sciences to include both history and economics. Whilst opportunities for wetland research are available in some universities, in most European countries the number of research departments focussing upon small water bodies, such as ponds, is limited. It may be that collaborative research effort, proposed by the EPCN, is directed towards these establishments to ensure a high calibre of research output.

Education for all

Education is a fundamental human right. It provides children, youth and adults with the power to reflect, make choices and enjoy a better quality of life. It breaks the cycle of poverty and is a key ingredient in economic and social development. Education for All (EFA) is the responsibility and prerogative of countries. They are responsible for mobilizing efforts and additional resources and must secure the involvement of all stakeholders. Their determination is key to the success of the EFA drive. Non-governmental organizations, community groups, parents and children and other learners play a major role in educating people about pond conservation. These groups have the advantage of being flexible, more innovative and closer to the grassroots and local cultures and they must be provided with easily accessible, appropriate and cost effective information.

Awareness raising

Ponds are small-scale features, which can be restored and created relatively easily. Across Europe, many

people want to be reconnected with their environment and hands-on work on ponds is a good way to fulfil this desire. Furthermore, they can be cared for by local communities and it follows that people who care about their environment will be less likely to damage it, and will deter others from environmentally unfriendly activity. A growing number of *pond warden* schemes have been introduced across Europe and in these areas local groups are raising awareness about the value of their local pond resource and this movement should be strongly encouraged and promoted. Materials to support these vital initiatives need to be prepared in a user-friendly way having both popular appeal and educational value. Grassroots action offers a great potential for pond conservation and needs to be fully exploited.

Legislation, policy and planning

The aim of this chapter is to raise the political importance and public awareness of ponds according to our network manifesto.

International Agreements and Organisations

The Convention on Biological Diversity

The most important international legislation for European wetland conservation is the Convention on Biological Diversity (CBD), the first legal framework for biodiversity conservation. CBD is an international agreement that came out of the 1992 Rio Earth Summit where it was signed by 159 governments (it has now been ratified by 179 countries). Signatories are required to develop and implement national strategies of the conservation and sustainable use of biodiversity.

The RAMSAR Convention on Wetlands of International Importance

The Convention on Wetlands, signed in Ramsar, Iran, in 1971, is an intergovernmental treaty which provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources. There are presently 150 Contracting Parties to the Convention, with 1590 wetland sites, totaling 134 million hectares, designated for inclusion in the Ramsar List of Wetlands of International Importance. Ponds are defined as wetlands by the Ramsar Convention.

Bern Convention on the Conservation of European Wildlife and Natural Habitats, 1979

The Convention aims to conserve wild flora and fauna and their habitats, promote cooperation between countries, and emphasises endangered and vulnerable species in a series of appendices. Article 2 requires parties to maintain populations at levels that match ecological, scientific and other requirements. Article 6 prohibits capture, killing, keeping, disturbance of, trade in live or dead specimens, and destruction of breeding/resting sites of Appendix 11 species.

Bonn Convention on the Conservation of Migratory Species of Wild Animals

The Convention requires the protection of listed endangered migratory species.

Convention on International Trade in Endangered Species (CITES)

The Convention prohibits or restricts trade in threatened species (or those likely to be threatened and affected by significant trade) that are listed on appendices.

IUCN: World Conservation Union

The World Conservation Union is the world's largest and most important conservation network. The Union brings together 82 States, 111 government agencies, more than 800 non-governmental organizations (NGOs), and some 10,000 scientists and experts from 181 countries in a unique worldwide partnership. The Union's mission is to influence, encourage and assist societies throughout the world to conserve the integrity and diversity of nature and to ensure that any use of natural resources is equitable and ecologically sustainable.

Ponds and Legislation in the European Union

Small water bodies in the Water Framework Directive (WFD)

The Water Framework Directive (Directive 2000/60/EC; WFD) aims to protect *all* inland surface waters. As surface waters include a large number of very small water bodies, the cost of related water management for all separate water bodies may be unrealistic. It should be noted that the Directive does not include a size threshold for water bodies. However, WFD annex II includes two system for differentiating water bodies into types, one of which ("system A") specifies size threshold for lakes (e.g. 0.5 Km^2). Alternatively, system B of the classification (see annex II) leaves to member states the freedom to chose the size limit of water bodies, but this system is rarely taken into account.

In principle it is recognized that the river basins may include many small water bodies. Member States might decide to aggregate those water bodies to a large

one of the same type (when possible), in order to avoid excessive administrative burden. A second argument refers to the significance of those small water bodies in the general context of the Directive aims. Hence small water bodies that have high ecological importance, for example because included into a protected areas (see WFD, annex IV) or under the provisions of other Directives (see below), may be grouped for assessment and reporting purposes. This argument was further developed in one of the guidance documents edited by the European Commission, highlighting the role of wetlands in the WFD.

Although Member States have great flexibility in defining significant water body types, the strict timing of WFD common implementation strategy forced them to adopt a very pragmatic approach. Member States were called to undertake the intercalibration of their ecological quality assessment systems. The intercalibration (IC) process is aimed at consistency and comparability of the classification results of the monitoring systems operated by each Member State for the biological quality elements. The intercalibration exercise must establish values for the boundary between the classes of high and good status, and for the boundary between good and moderate status, which are consistent with the normative definitions of those class boundaries given in Annex V of the WFD. Lake sites to be included in the IC network were selected by each Member State and submitted along with morphological and basic limnological parameters to form a database hosted by the European Commission Joint Research Centre (http://www.jrc.cec.eu.int). Not surprisingly, very few small lakes were included.

Horizontal Guidance on the role of wetlands in the WFD (Guidance Document No 12)

This Guidance Document has been recently finalised in the context of the Common Implementation Strategy (CIS) for the WFD (CEC, 2005). The Directive clearly identifies the protection, restoration and enhancement of the water needs of wetlands as part of its purpose at Article $1_{(a)}$, and refers to wetlands in other points (Recitals 8 and 23, and in Annex VI part $B_{(vii)}$). Nevertheless, it does not define them or provide a size range to indicate their dimension. The purpose of this Guidance Document is to define wetlands, including ponds, and identify their role in the achievement of the environmental objectives of the WFD. According to this Guidance, ponds, small water bodies and wetlands in a broader sense, not identified as water bodies under WFD, are ecosystems relevant to the achievement of the Directive's objectives when they are part of:

- Riparian, shore, and intertidal zone quality elements of surface water bodies (river, lake, transitional and coastal waters);
- Terrestrial ecosystems directly depending on groundwater bodies;
- Small elements of surface water connected to water bodies but not identified as water bodies (for example, detention ponds mitigating the impacts of urban run-off on river water body);
- Ecosystems significantly influencing the quality and quantity of water reaching surface water bodies, or surface waters connected to surface water bodies.

Member States must protect, enhance, restore or even artificially create such ecosystems in the river basin management planning process.

Ponds under other Directives

The protection of small water bodies (ponds) *per se* is, with a few exceptions (Mediterranean temporary ponds; turloughs), not a high priority. However, other EU Directives provide legislation and guidance, for natural habitats and for wetland fauna and flora and, as such, pond conservation can be achieved through this established structure.

The Birds Directive

The Council Directive 79/409/EEC was adopted by the European Commission in 1979 (EC Birds Directive; CEC, 1979). This Directive as well as its amending acts seek to:

- protect, manage and regulate all bird species naturally living in the wild within the European territory of the Member States, including the eggs of these birds, their nests and their habitats;
- regulate the exploitation of these species.

The Habitats Directive

In 1992 the European Community adopted Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora (EC Habitats Directive, CEC, 1992). This is the means by which the Community meets its obligations as a signatory of the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention). The Directive applies to all Member States and has been transposed into national laws which require them to introduce a range of measures including the protection of species listed in the Annexes; to undertake surveillance of habitats and species and produce a report every six years

on the implementation of the Directive. The 189 habitats listed in Annex I of the Directive and the 788 species listed in Annex II, are to be protected by means of a network of sites. Each Member State is required to prepare and propose a national list of sites for evaluation in order to form a European network of Sites of Community Importance (SCIs). Once adopted, these are designated by Member States as Special Areas of Conservation (SACs), and along with Special Protection Areas (SPAs) classified under the EC Birds Directive, form a network of protected areas known as NATURA 2000 (see below). The Directive was amended in 1997 by a technical adaptation Directive. The annexes were further amended by the Environment Chapter of the Treaty of Accession 2003.

Environmental Impact Assessment Directive

The European Union's Environmental Impact Assessment Directive (85/337/EEC) requires that projects which according to type, size and location may have considerable effects on the environment are made subject to an assessment regarding their effects (EC Environmental Impact Assessment Directive: CEC, 1985). The contents of the EIA Directive is outlined in Article 3 which defines the term 'environment'. According to this article the EIA has to identify, describe and assess the direct and indirect effects of a project on human beings, fauna and flora, soil, water, air, climate and the landscape as well as on the interaction of these factors and on material assets and the cultural heritage. Due importance is given for articles under the Habitats and Birds Directives (cf. Habitats Directive, Article 6).

Natura 2000

Natura 2000 is a European network of protected sites which represent areas of the highest value for natural habitats and species of plants and animals which are rare, endangered or vulnerable in the European Community. Establishing the Natura 2000 network is the primary purpose of the Birds Directive and the Habitats Directive. The Natura 2000 network will include two types of area. Areas may be designated as Special Areas of Conservation (SAC) where they support rare, endangered or vulnerable natural habitats and species of plants or animals (other than birds). Where areas support significant numbers of wild birds and their habitats, they may become Special Protection Areas (SPA). SACs are designated under the Habitats Directive and SPAs are classified under the Birds Directive. Some very important areas may become both SACs and SPAs. Large-scale financing of Natura 2000 is primarily accessed through other EC funds, such as EC Structural Funds and Rural Development funds. The implications for ponds under Natura 2000 relates to the wetland species identified under Annex II of the Habitats Directive. For example, SACs have been designated for amphibians listed under Annex II and as part of that designation, ponds receive statutory protection.

The LIFE Programme

Launched in 1992, LIFE (The Financial Instrument for the Environment) is one of the spearheads of Community environment policy. The Programme contributes to the implementation, development and enhancement of the Community environmental policy and legislation as well as the integration of the environment into other EU policies. The LIFE III programme finished at the end of 2006. The Commission adopted in September 2004 a proposal for a future programme, LIFE+, that runs from 2007-2013. From 2007, there are two strands of the LIFE Programme and they are LIFE-Nature and LIFE-Environment.

LIFE-Nature

LIFE Nature projects must primarily focus on improving the conservation status of habitats and species targeted by the Birds and Habitats Directives. LIFE-Nature is not general financial instrument for the financing of NATURA 2000 but is aimed at supporting best-practices demonstration projects. Typical activities of LIFE-Nature projects include preparatory negotiations, inventories and management planning, purchase of land or land use-rights, technical planning and implementation of one-off habitat/species restoration actions, awareness-raising amongst stakeholders, education, information etc. A project should always include appropriate actions for disseminating its results and lessons learnt to the most relevant stakeholders and to the public. If relevant, projects must also include a monitoring stage documenting the conservation impact of their actions.

Nature conservation projects that contribute to maintaining or restoring natural habitats and/or species populations to a favourable conservation status within the meaning of the Habitats Directive are eligible for financial support. Projects must concern Special Protection Areas or Sites of Community Importance and the species listed in the Directives. Projects are chosen purely on their quality and potential conservation impact and not according to national quotas which ensured that only the very best projects got funded every year. Examples of actions supported include the management of temporary ponds in Minorca (LIFE05

NAT/E/000058); the management of fire bellied toads in the eastern Baltic (LIFE04 NAT/DE/000028); amphibian biotope improvement in the Netherlands (LIFE04 NAT/NL/000201); the conservation of Mediterranean temporary ponds (LIFE99 NAT/F/006304).

LIFE-Environment

LIFE-Environment provides funding for demonstration projects developing innovative and integrated techniques and methods, which address community environmental interests. Proposals provide practical demonstration of how policy can be put into practice for the information of the European Commission and others in Member States. Currently proposals fall within the following categories:

- Land use development and planning
- Water management
- Impacts of economic activities
- Waste management
- Integrated Production Policy

Examples of actions supported include the protection and management of ponds in north west England (LIFE94 ENV/UK/000651); the development of and ecological network in parts of the UK and Italy (LIFE99 ENV/UK/000177); and the impact of agriculture on wetlands in Andalucia (LIFE04 ENV/ES/000269); surface water protection from diffuse pollution in north eastern France (LIFE04 ENV/FR/000350).

Ponds and legislation in the rest of Europe

The Emerald Network

The Emerald Network is an ecological network made up of "areas of special conservation interest", which was launched by the Council of Europe as part of its work under the Bern Convention. It is to be set up in each Contracting Party or observer state to the Convention. It involves all the European Union states, some non-Community states and a number of African states (Tunisia, Morocco, Senegal and Burkina Faso are Contracting Parties; Algeria, Cape Verde, and Mauritania have been invited to accede).

The European Community, as such, is also a Contracting Party to the Bern Convention. The Emerald Network is based on the same principles as Natura 2000, and represents its de facto extension to non-Community countries.

Policy

Across Europe, the environment is afforded no fundamental rights. Protection of the landscape is achieved through a complicated web of legislation, policy and administration at the local, regional, national, European and international levels. All European countries have many national, European and international wildlife and landscape designations that afford protection to a number of sites of particular value (either biologically, geologically and/or culturally). The management of these sites is a complex affair, involving legislation, voluntary management agreements with landowners, management by government agencies and non-government organisations (NGOs), and combinations thereof.

Wetland conservation involves government departments (at European, regional, national and local level); a number of government agencies with statutory powers; non-government organisations (NGOs); the private sector, and individuals with particular vested interests. In turn a number of government agencies have statutory powers concerning wetland (and general) conservation.

Planning

Apart from safeguarding the pond environment through national policies for protection and by means of appropriate statutory designations, the pond environment should also be safeguarded through national, regional and local planning policies. Through this hierarchical structure, the pond environment needs to be protected through the development control process by means of environmental assessment and other appraisal procedures. Additionally, the role of planning authorities should promote best practice and provide advice and guidance in managing ponds and pond landscape.

Where ponds occur in large numbers, they should be considered as landscapes in their own right. In many parts of Europe, they certainly meet the basic criterion defining a landscape as a mosaic where a cluster of local ecosystems is repeated in similar form over a wide area.

The worth of a landscape resides primarily in its habitats and wildlife. But planned landscapes also have the requirement to be aesthetically pleasing and publicly acceptable. If they were neither of these, then legitimate questions about the function of planning would be raised. Evidence exists to demonstrate that, at least so far as ponds are concerned, the public holds diver-

gent views on landscape as habitat and landscape as aesthetic spectacle. Ponds have to be managed individually, but in their landscape context. This is not an especially easy task. Planning for dense landscapes raises issues of multiple jurisdictions; a low level of importance (and resources) assigned to landscape elements such as ponds; and, by the very operation of the planning process itself.

Ecological networks

The rapid changes brought by human activities to the European landscape have caused fragmentation of the natural environment and isolation of species and habitats. Nowhere has this been more dramatic than with the loss of ponds over the past half century. An ecological network is recognised today as a framework of ecological components including 'core areas', 'corridors' and 'buffer zones' which provide the physical conditions necessary for ecosystems and species populations to survive in a landscape dominated by human beings. The development of ecological networks has started to inspire European nature conservation at different levels and provides a meeting point and partnership with land use planning. The Habitats Directive and Natura 2000 have been heavily influenced by the concept and it is starting to influence national and regional nature conservation policies throughout Europe. The Habitats Directive identifies the importance of the wider countryside for biodiversity conservation and the vital function of 'stepping stones' such as ponds, noting that *"Such features… which, by virtue of their linear and continuous structure (such as rivers with their banks or the traditional systems for marking field boundaries) or their function as stepping stones (such as ponds or small woods), are essential for the migration, dispersal and genetic exchange of wild species."* (Article 10).

Within the European Union the Natura 2000 network is one of the most important implementation instruments for the development of the Pan-European Ecological Network (PEEN). The challenge, therefore, lies not only in optimising the ecological character of the landscape, but also in maximising public acceptability of both outcomes and of methods of achieving that outcome. This involves working with a range of stakeholders (landowners, farmers, public utilities, etc) to gain acceptance for and to undertake the practical work necessary for landscape improvement. In a very real sense, then, the ecological networks have to be as much about social engineering as about ecological engineering.

Communication and stakeholder involvement

The legislation of the European Union considers stakeholder involvement as a basic element of democracy. Stakeholders are those parties (persons, various organisations) that have the power to 'make' or 'break' successful management of the site or sites important for nature conservation. They have some kind of interest in the site that the conservation organisation tries to protect and they also have the power to interact. This power can be political, economic or it can be the ability to influence the public and other stakeholders through the media or some other established communication network. Labour can also be a sort of power since in many cases pond conservation needs their support for a management plan to be successfully undertaken (e.g. farmers). There is, therefore, a need to get public support and the easiest and most effective way to do this is to let stakeholders benefit. Obviously, conservation should not lose by benefiting other interests. Stakeholder involvement plays an essential role in management planning and it is often a key element of successful project implementation. It is a method that can help in protecting and effectively managing pond sites. However, involving stakeholders is not a goal in itself and should be part of a complete set of activities and it should be remembered that stakeholder involvement is not in all cases needed or equally important.

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