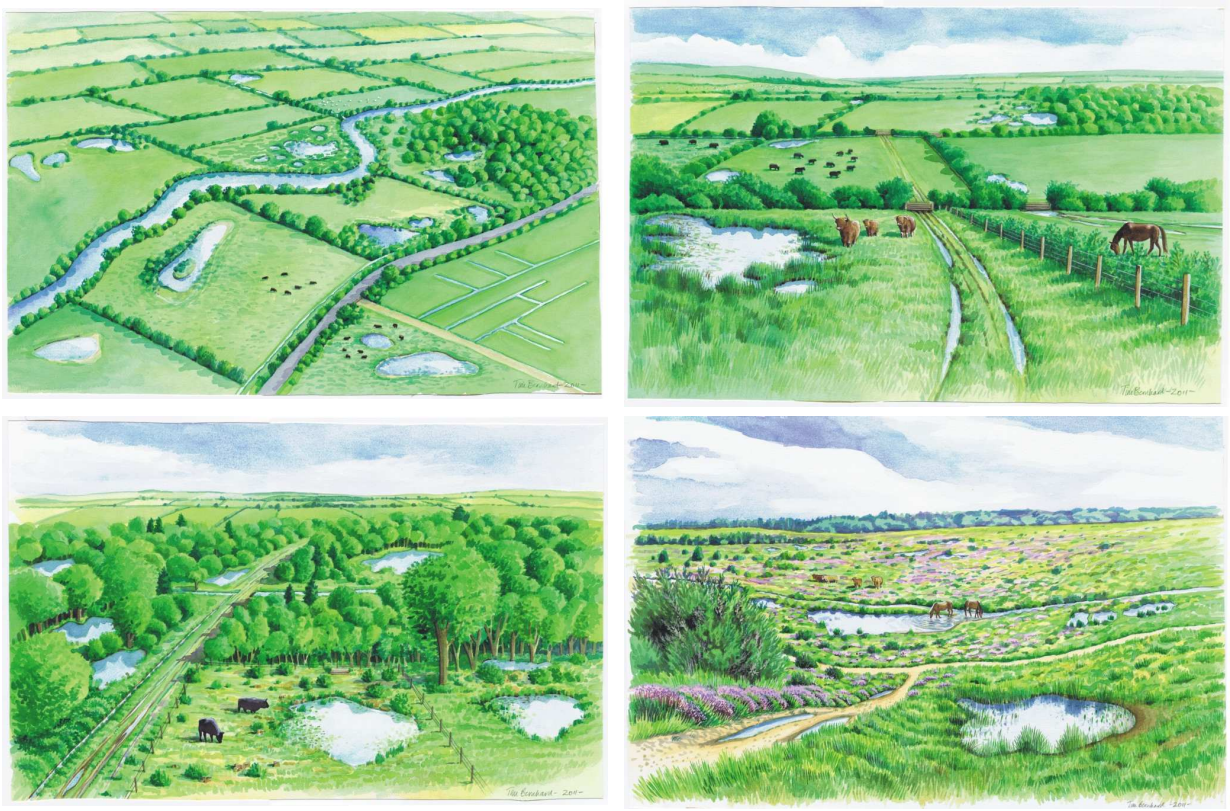
The national context for the conservation of ponds in the High Weald AONB, with a particular focus on the Brede River Catchment



February 2012

A report produced by:

Pond Conservation:
The Water Habitats Trust

A report produced for:

High Weald AONB Unit

Table of content

1. Introduction

1.1 Report aims

This short report was prepared for the High Weald Area of Outstanding Natural Beauty (AONB) to support the development of pond conservation projects in the area.

It aims to provide:

- A **review** of the national and regional scientific and policy context for the pond resource in the High Weald, covering (i) biodiversity, (ii) heritage, and (iii) ecosystem services.
- **Recommendations** for practical action, with an emphasis on community involvement, to achieve biodiversity gain for both the pond resource and the wider freshwater landscape.

The report focuses on a particular area of the High Weald, the Brede River catchment, where the High Weald AONB Unit will be focusing its work in the short to medium term.

1.2 Pond definition

For the purposes of this report, ponds are defined in standard terms as waterbodies between 1m^2 and 2 ha in surface area. They include manmade ponds and those created by natural processes. Ponds vary across a wide range of water permanence, and include temporary ponds and scrapes, as well as larger, more permanent waterbodies.

2. National overview of the importance of ponds

2.1 Biodiversity value

Key messages:

- Ponds are biodiversity hotspot in the landscape
- Ponds are stepping stones habitats, that increase landscape connectivity
- Both pond networks and isolated ponds are important for supporting biodiversity
- Ponds are a critical habitat for many rare and threatened species

Ponds are a critical habitat for biodiversity in the freshwater landscape. Studies in the UK and abroad have shown that, regionally, ponds support more species and more uncommon species than other freshwater habitats including rivers, streams and ditches (Figure 1; Williams et al, 2004; Davies et al, 2008). One of the reasons for this is that individual ponds are very varied depending on soil type, age and landuse. Even ponds located next to each other can have very different physico-chemical conditions, and so support distinct plant and animal communities. Rivers and streams, in contrast, drain much larger catchments and this, combined with the

mixing action of flowing water, means that they generally have more similar physico-chemical conditions along their length.

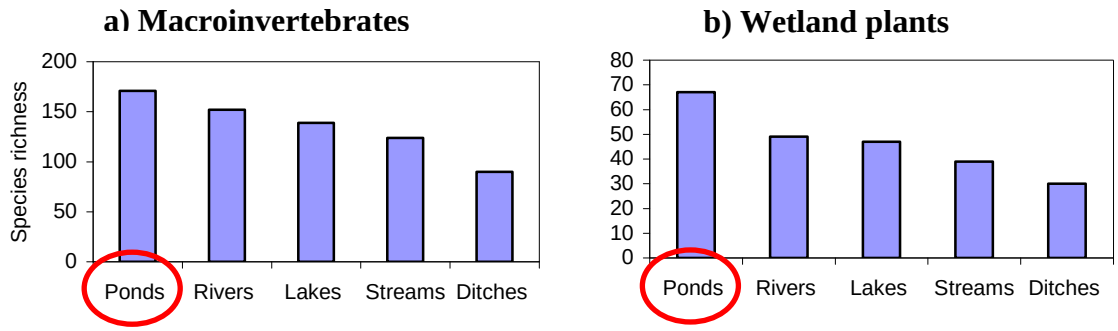


Figure 1. Regional diversity in the catchment of the River Cole (UK), which shows that, regionally, ponds support more species than other waterbody types.

Overall, around 70% of *all* freshwater species in the landscape use pond habitats and a significant proportion are unique to this habitat type (Williams et al, 2004). Ponds are also important for many semi-aquatic invertebrates and plants that occupy 'ecotones', on the boundaries between land and water.

Ponds are a critical habitat for rare and threatened species. In the UK, 105 BAP species live in or are associated with ponds – this represents 10% of *all* BAP species (see a list of pond-associated BAP species in Appendix 1). Many of these plants and animals are typically associated with unpolluted, clean water ponds. Thus, in semi-natural landscapes in Britain, 1 in 5 ponds support *at least* 1 Red Data Book species. In contrast, only 1 in 100 ponds in the wider countryside support Red Data Book species (Pond Conservation unpublished data).

Both single sites and pond networks can be important for biodiversity. Single ponds can act as biodiversity 'hotspots' and refuges for both terrestrial and aquatic organisms, particularly within intensively farmed landscapes. Networks of ponds are a critical component of the habitat of amphibians, many wetland plant species, fish on river floodplains, and for wetland mammals and birds that range over large areas. Many invertebrate species, including dragonflies, are thought to require networks of ponds to sustain their populations in the long term. The role of ponds as stepping-stones - increasing the connectivity between freshwater habitats – is recognised by the Habitats Directive (Article 10, Council Directive 92/43/EEC).

2.2 Natural and cultural heritage value

Key messages:

- Ponds have always been a common and natural habitat in the landscape
- Ponds are an important part of our history and culture
- Ponds are a link between people and wildlife
- Ponds can be used as 'outdoor laboratories' for education and research

Although in Britain today many ponds are manmade, there is evidence from the geological record that ponds have always been a common habitat in the landscape – forming anywhere that water collects in surface irregularities. For example, studies of relatively undisturbed ancient woodland in the UK show that the past land surface was full of seasonal and permanent ponds, and that human activity, including ploughing, has effectively smoothed the land surface so that only a fraction of these now remain (Rackham, 1985; Williams et al, 2000).

Natural ponds can be created as part of short-term processes, e.g. tree-fall pool, or very long-term processes such as glaciations. On the floodplain of natural river systems, which are now almost extinct in western Europe, ponds are incredibly common: created as part of the scouring effect of flood events, and from cut off meanders and channels.

In the more recent past, ponds have been created by man as part of industrial and agricultural activities, many of which have now ceased (Box 1). Particularly important to our history are the many thousands of village ponds used to provide fish and water for people and livestock for thousands of years. Some of these ponds have sediment records that have built up over millenia, and provide a unique 'section through time'. The sediments and artefacts within them provide information both about the pond itself, about its surroundings, and about the way of life of our ancestors.

Box 1. Some historical and cultural uses of ponds (from EPCN, 2008)

Historically, ponds were made for many agricultural and industrial purposes. Ponds generally had multiple uses, for example water and food supply, or defence and status. Often they are integral to the wider historic character of a site, perhaps part of an industrial complex, associated with dwellings, or part of an historic landscape design. Examples of the historical and cultural uses of ponds are listed below.

Cooling ponds
Curling ponds
Decoy ponds
Dew ponds
Distillery ponds
Drinking water tarns
Droving ponds
Duck ponds
Dye ponds
Extraction ponds
Fish ponds
Flax retting ponds
Forge/furnace ponds
Hammer ponds
Heathland ponds
Ice ponds
Irrigation ponds
Laundry ponds
Livestock watering ponds
Marl pits
Mill ponds
Moats
Old Farm ponds
Ornamental garden ponds Peat ponds
Pond bays
Reclamation ponds
Retention ponds
Sauna ponds
Silt ponds
Stew ponds
Subsidence ponds
Swimming ponds
Traction engine ponds
Watercress beds
Wagon wheel soaking pond

Ponds can still play an important role in maintaining and encouraging the link between people and wildlife, both in urban areas and in the countryside. They are an ideal place to bring together messages about water and wildlife management. Because they are small and easy to create, ponds are also a place to focus group action.

Ponds can be a valuable tool in teaching and research. They are often created in schools as outdoor classroom, used to teach core curriculum subjects (e.g. maths, literacy, science IT), as well as other areas (e.g. art, drama, history and geography), in ways that are both practical and fun. In higher education and research, ponds have been used as model ecosystems to test scientific theories in areas such as conservation biology, ecology, evolutionary biology and climate change modelling.

2.3 Ecosystem services and economic value

Key messages:

- Ponds can be used as a tool to address water management and pollution issues
- Ponds can help mitigate the impact of climate change
- Ponds are an important asset for recreation and agriculture
- Ponds used for ecosystem services and economic functions tend to provide low value wildlife habitats

It is often assumed that ponds were an economic asset in the past (e.g. watering stock in rural economies), but have little value in today's world. In fact, ponds continue to play an important economic role in delivering a range of ecosystem services.

Around 50% of ponds are linked to streams and play a valuable part in intercepting floodwater to alleviate flooding (Williams et al, 2010a; Jones, 2010). Ponds and pond sequences remove diffuse pollutants from surface waters, including sediment, phosphorus and nitrogen. For example, in the UK small ponds have been shown to reduce phosphorus concentrations by 50% (Penny Williams, pers. com). In urban areas, ponds are being created as part of now widely implemented Sustainable Urban Drainage Systems (SUDS). More recently, there has been increasing interest in creating strategically located ponds in rural landscapes to intercept water run-off from intensive agriculture in order to significantly reduce the nutrient load of receiving waters through denitrification, sedimentation and uptake from wetland plants.

Ponds may also offer sustainable solutions to some of the key issues of climate change. For example, recent research suggests that collectively, because of their huge number coupled with their high productivity, farm ponds may sequester as much carbon as the oceans (Downing et al, 2008). This opens up opportunities for the use of pond creation to help ameliorate climate change, and emphasises the importance of considering the pond resource *as a whole* rather than as individual sites.

Financial benefits from agri-environment schemes have encouraged pond creation and restoration activities as part of whole farm diversification in the context of agri-tourism, for example nature trails, bird watching and low intensity fishing. Sports like waterfowl shooting and angling have long been popular, and still promote widespread creation and management of ponds.

Whilst ponds used for low intensity recreation activities can, with good design, provide high quality wildlife habitats, ponds used for example to alleviate nutrient pollution or for intensive fisheries will by definition become degraded relatively quickly

after creation. Water quality is the most important factor in creating and maintaining pond biodiversity - so clean water ponds would be kept separate from such degraded waterbodies with high ecosystem service value, but much more limited biodiversity potential.

2.4 The biological status of the UK pond resource

Key messages:

- Pond quality is declining nationally
- The major cause of degradation is landuse intensification leading to poor water quality
- After a major loss during the last century pond numbers are now increasing

There is incontrovertible evidence that most of Britain's freshwaters are significantly polluted, especially in the lowlands. Some three-quarters of rivers in England and Wales and two-third of lakes fail the minimum water quality standard set by the UK Water Framework Directive (Environment Agency, 2011). The results for ponds are similar: Countryside Survey data show that pond quality is declining, and that currently 80% of ponds in the UK are in poor or very poor condition (Williams et al, 2010b; Figure 2). Comparisons of ponds in semi-natural areas from the National Pond Survey and ponds in more intensive landuse from the Lowland Pond Survey show that, on average, ponds in the 'ordinary' countryside support only half of the expected number of wetland plant species found in undegraded ponds (Williams et al, 1998).

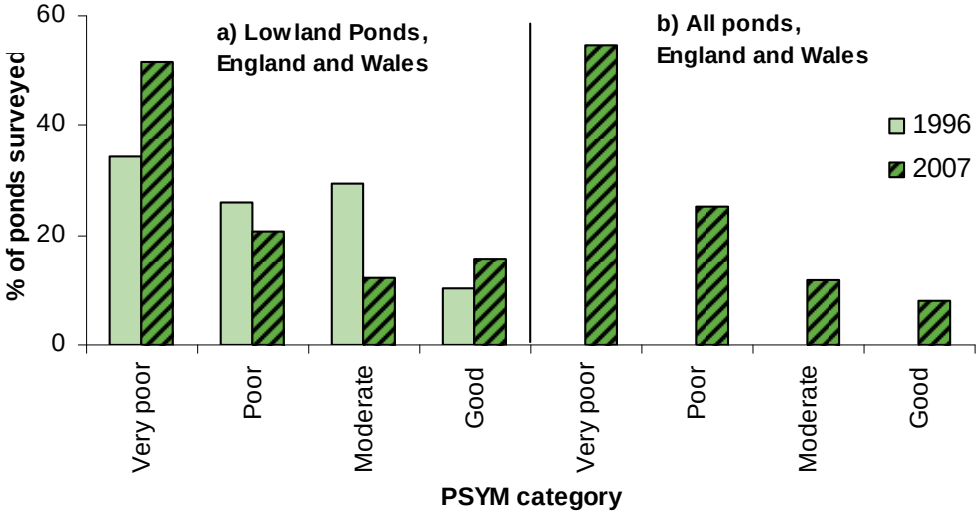


Figure 2. Percentage of ponds which fall within one of four PSYM categories in England and Wales. Left: comparison of lowland England and Wales in 1996 and 2007 showing the decline in pond quality. Right: England and Wales in 2007. (From Williams et al, 2010a)

Ponds are an exceptionally vulnerable habitat type and face many threats. Nationally, it is clear from Countryside Survey data that one of the major causes of the degradation of freshwaters is poor water quality caused by diffuse pollution from

intensive agriculture, and in particular arable land. Ponds, because of their small volume, can also be affected by very small scale impacts such as fish stocking, duck feeding and road run off.

Streams or ditch inflows are particularly damaging to ponds because watercourses bring high levels of pollutants draining from their catchment, as well as silt which significantly reduces the longevity and quality of the waterbody. In contrast, ponds without inflows can sometimes survive in the landscape for millennia – with most persisting in a very long lasting stable phase as temporary ponds (e.g. the pingos of East Anglia, created during the last glaciation), particularly when they are grazed and poached by animals.

Both inappropriate management, and lack of management, can also lead to a loss of pond biodiversity. So pond management needs to be undertaken with care. For example, unpublished data from studies carried out by Pond Conservation show that plant diversity can be affected by (i) an increase in shade in heathland ponds due to the lack of grazing, or (ii) the sudden removal of tree shade in lightly shaded ponds which can give a competitive advantage to invasive species, both native and alien (e.g. Bulrush *Typha latifolia*, New Zealand Pigmyweed *Crassula helmsii*).

In the future, climate change is also likely to exacerbate the threats to ponds. Inland, changes in site hydrology is likely to lead to temporary ponds drying out completely and to more permanent ponds becoming shallower, perhaps reducing dilution of pollutants. It is possible that some losses of seasonal ponds may be balanced by the shallowing of existing deeper sites, but there is the potential for a very large-scale loss of shallow water habitat. Rising sea levels may also flood coastal dune slack and grazing marsh systems.

Set against concerns about declines in pond quality, there is evidence of the protective effects of freshwater networks. Ponds with a high proportion of other wetlands in their surrounds, including both standing and running waters, are more likely to maintain their quality in terms of species richness and rarity. This shows the importance of maintaining the density of ponds and other wetlands in the landscape and of creating ponds near existing wetlands.

After major losses from the mid-19th century onwards, ponds numbers are currently increasing after reaching an all time low in the 1980s (Figure 3). This is good news. However, the number of ponds is still less than half that known at the turn of the 20th century. In addition, these estimates do not take into account the millions more small freshwater ponds or pools that were never recorded on maps, including the trackway ruts and shallow temporary depressions which are an integral part of the freshwater landscape. These very shallow wetland features are easily lost as a result of the intensification of the countryside, particularly drainage, and very few of any quality now remain except in the most natural landscapes.

Although pond numbers are now increasing in the UK, there are strong indications that the design and usage of most new ponds is sub-optimal for biodiversity. For example, a high proportion of new ponds are fed by ditches or streams that are to polluted, and anecdotal evidence suggests that most new ponds are stocked with fish.

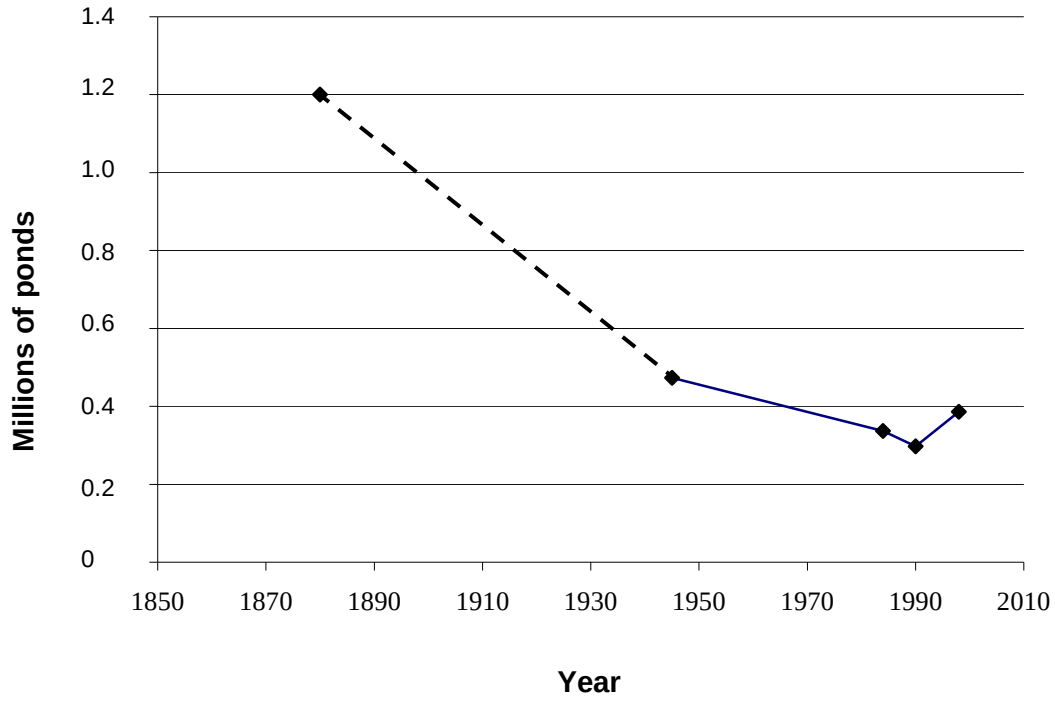


Figure 3 Estimate of pond number from the late 19th century to the late 1990s (from Biggs et al, 2005). Note that these do not include the millions of small ponds and pools which would have been present before landuse intensification.

2.5 The UK policy framework for the protection of ponds

Key messages:

- High Quality Ponds are a BAP priority habitat (=Priority Ponds)
- Priority Ponds are defined by set criteria
- The Pond Habitat Action Plan provides a framework for the conservation of the pond resource

Until recently, ponds have received little statutory protection. Implementation of the two main pieces of European legislation – the Habitats Directive and the Water Framework Directive – is focused on larger waterbodies and is ineffective in protecting ponds and their biodiversity (c.f. Keeble et al, 2009 for a review).

The most significant development to protect ponds in recent years was the 2007 addition of high quality ponds (Priority Ponds) to the list of UK Biodiversity Action Plan (BAP) Priority Habitats. Priority ponds are waterbodies which fulfil one of five criteria based on the species or assemblages they support (see Appendix 2). Overall it is estimated that Priority Ponds represent about 20% of the total pond resource. Although high quality ponds can occur in any habitat type including improved and urban environments, examples are more likely to occur within blocks of semi-natural habitat, where human impacts are generally lower.

The subsequent development of the Ponds Habitat Action Plan (HAP) has provided a framework to maintain and enhance the pond resource in the UK. The four main

targets of the Pond HAP are included in Appendix 2. A first step in the development of the Habitat Action Plan (HAP) for ponds is to obtain information on the most important pond sites and areas across the UK - this led to the development of the Important Areas for Ponds concept. IAPs for the South-East Environment Agency region have already been identified (Keeble et al, 2009) and those relevant to the AONB are presented in the next section.

The Pond HAP emphasises the importance of creating new high quality ponds, and the Pond Conservation's partnership project, the Million Ponds Project, was developed specifically to address this (see Box 2). New ponds, when well-designed and protected from surface water pollution, can be exceptionally rich and valuable habitats. A pond complex designed by Pond Conservation at Pinkhill Meadow in Oxfordshire in the early 1990s, for example, quickly became as rich as the top 5% of sites in the National Pond Survey database of high quality minimally impaired sites (Williams et al., 2008).

Box 2. The Million Ponds Project

The Million Ponds project seeks to reverse a century of loss and decline in Britain's ponds, so that once again we have a million ponds in the British countryside. The primary aim of the project is to bring clean water back to many landscapes, creating vital new wildlife habitats.

The Million Ponds Project is a partnership of over 30 major UK landowner and land managers, led and coordinated by Pond Conservation. Partners include Natural England, the Environment Agency, the Forestry Commission, the Defence Infrastructure Organisation and the RSPB.

In the first four years (2008-2012), the project partners and others aim to create 5,000 clean water ponds across England and Wales. This first phase also aims to raise the profile of pond creation so that it becomes embedded in policy and in the culture of organisations involved in land management and restoration. As part of this work, the project team has developed The Pond Creation Toolkit - a range of factsheets which are available to download freely from the project's website. The toolkit includes dossiers with technical information on how to create and manage ponds for over 50 pond-associated BAP species. These were published in partnership with specialist organisations including Plantlife, Buglife, the Aquatic Coleoptera Trust and the Bat Conservation Trust. The online BAP species map helps target pond creation for some of our most threatened species. Currently over 1000 people from both partner and non-partner organisations have been trained as part of the project.

www.pondconservation.org.uk/millionponds

3. Overview of the High Weald AONB pond resource with a focus on the Brede River catchment

3.1 Pond density

Reliable data on pond numbers for the weald area are not currently available and mapped counts (based on OS data) are notoriously unreliable because of the irregularity at which map base layers are updated. Maps also tend to miss out small or temporary waterbodies. We can however use map data to a provide ball park figure for the number of ponds in a particular area.

The estimated pond density in the High Weald AONB as a whole is 9 ponds/km^2. This is 5 times higher than national estimates from the Countryside Survey, which gives a pond density of 1.8 ponds per km^2 for England as a whole (Williams et al, 2010a). In the Brede catchment, mapped pond density is 6.6 ponds/km^2, which is nearly four times greater than the national average. Overall, there are an estimated 1,300 ponds in the Brede River catchment.

3.2 Pond type, underlying substrate and geology

The small size of ponds means that these waterbodies can occur in all terrestrial environments, from the coast to hill tops. Generally, ponds are often *particularly* numerous (i) on impermeable substrates such as heavy clays, and (ii) nested in other wetland habitats where the water table is high, such as floodplain grassland, fens and bogs.

Geologically, the High Weald AONB is dominated by the sandstones and siltstones of the Hastings Beds. The erosion of these complex sedimentary deposits has resulted in a hilly terrain, comprising ridges and valleys with deep gills draining into them. More recent alluvial drift deposits are confined to the lower reaches of the river valleys around the Lower Rother and Brede, where there is a network of grazing marshes drained by ditch networks, with few ponds.

Historically, many Wealden streams and river valleys were dammed to create a head of water to power the forges of the iron industry. These so-called hammer ponds are a characteristic feature of the wooded hills of the Weald. Although in some cases the pond dams have now fallen into disrepair and failed. The wooded hills of the Weald have a range of other ponds with high heritage including moats, decoy ponds, and fish ponds, particulalry associated with some of the larger manor. Woodland pond complexes created from mineral extraction are also commonly seen. More recent ornamental lakes and ponds have been created in landscaped gardens and on golf courses.

On floodplains, isolated examples of naturally formed ponds can still be seen in the region, including ponds created as cut-off meanders, floodplain undulations and naturally wet hollows. However, as in other parts of the UK, these waterbodies are now in a minority, due to drainage, agricultural intensification and river channelisation which reduces the natural ability of rivers to move across their floodplain to create ponds. Set against this, floodplain scrapes and ponds are now being re-created for nature conservation purposes, mainly to provide a feeding habitat for wading birds.

3.3 Biodiversity value

A number of areas in the High Weald AONB have been identified as Important Areas for Ponds (IAPs)[1]. Three IAPs occur in the Brede River catchment (see Figure 4): Winchelsea IAP, Pevensey IAP, and the more wide-ranging Great Crested Newt (*Triturus cristatus*) IAP.

Figure 4. Important Areas for Ponds in the High Weald. Note that Great Crested Newt IAP is not shown here and covers the whole AONB area. (Source: Ponds on the map, Pond Conservation website)

Of these, two IAPs cover significant areas of the Brede Catchment: the Winchelsea IAP covering the coastal area, and the Great Crested Newt IAP which includes the whole of the Brede River catchment and extends more broadly over the High and Low Weald. The Brede River catchment itself is not a Great Crested Newt hotspot but there is further potential to create ponds for this species. This could be seen as a priority, given that the species is protected by European legislation under Annex II of the Habitats Directive. The high density of ponds and woodland in the High Weald does make this area, however, ideal for other amphibian species including Common Toad which is a BAP species.

The Winchelsea IAP mainly covers the coastal plains area between Pett and Rye, extending north-west into the Brede Valley towards Westfield. This coastal margin includes a complex network of saline, brackish and freshwater bodies, including many ponds. These support rich assemblages of uncommon water beetles and populations of Medicinal Leech *Hirudo medicinalis*. Plants in this IAP also include uncommon species like Frogbit *Hydrocharis morsus-ranae*, Lesser Water-plantain *Baldellia ranunculoides* and the BAP species *Oenanthe fistulosa* Tubular Water-dropwort. All three of these plants are associated with low intensity grazing and clean water. There are also records of Water Vole *Arvicola terrestris*.

[1] Areas with ponds or group of ponds that have been identified as being of international or national importance (Keeble et al, 2009)

Bearing in mind the general dearth of detailed survey data documenting the pond plants and invertebrates in the Brede River catchment, it is likely that many other ponds may have Priority Status in this area, particularly where there are (i) they are fed by clean water, and (ii) where they occur in clusters near to existing traditional wetlands or in areas of semi-natural landuse. Ponds are likely to be of particular importance where they occur in ancient woodland or heathland. Ponds in woodland, for example, are generally under-surveyed and can be particularly important for true flies and bats. Small features including ruts in trackways, are also often ignored by habitat surveyors. In south-east England, these waterbodies can support uncommon species such as Fairy Shrimp *Chirocephalus diaphanous* and the BAP species Three-lobed Water-crowfoot *Ranunculus tripartitus*.

Ponds on floodplains dominated by intensive agriculture are more likely to be degraded by nutrient enrichment from agricultural run-off and direct input of floodwater. Indeed, Environment Agency data shows that the Brede River and its tributaries, with a few exceptions, are of only Moderate status according to the Water Framework Directive classification (Figure 5). Ponds on floodplain, however, are important in providing a habitat for those species, such as wetland birds and water vole, less sensitive to water quality. There may also be opportunities to create new clean water ponds on floodplain lands not regularly flooded by the river. New ponds like these often become exceptionally rich.

Ponds degraded by a high density of fish or a large duck populations, which is typical of many farm and village ponds, are unlikely to support species or assemblages or conservation concern. However, these waterbodies may have high social and historic value.

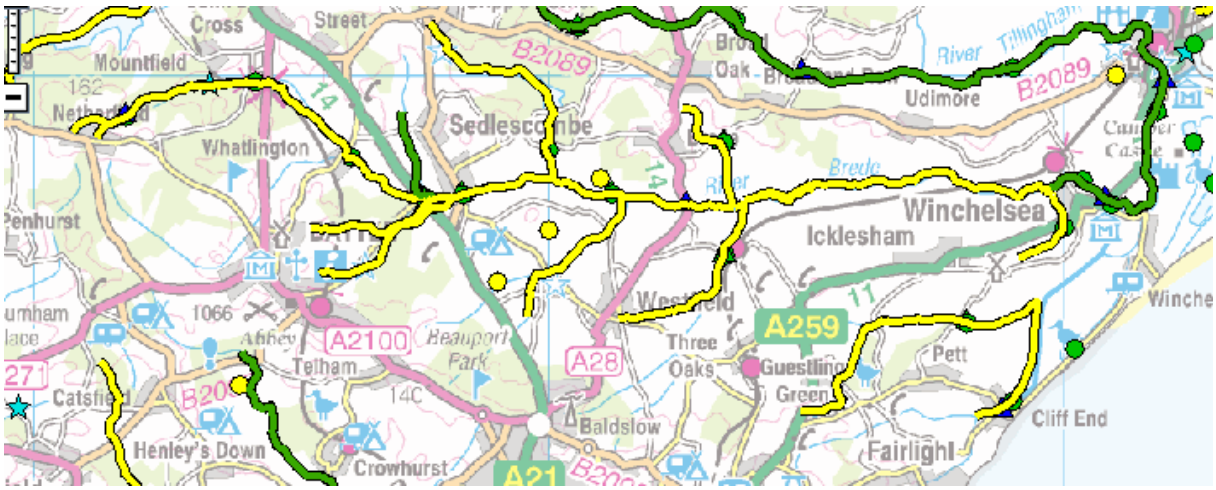


Figure 5. Status of rivers and streams in the Brede catchment. Green: good status, yellow: moderate status. (Source: Environment Agency website)

4. Recommendations

4.1 Overview

There are many opportunities within the High Weald AONB and the Brede catchment to improve the pond resource for biodiversity and heritage.

Key objectives to achieve this include:

- Building the AONB pond information base
- Developing a knowledge-based conservation strategy
- Engaging the local community and stakeholders
- Carrying out practical action
- Long-term monitoring

4.2 Building the AONB pond information base

The AONB has already established an information base to warehouse heritage and biodiversity data from the area. However, for ponds, there are key information gaps which need to be filled to ensure that future practical action is targeted, effective and appropriate.

This information is also critical to ensure that the knowledge disseminated to the local communities is accurate and helps them to develop a more in-depth understanding of key issues.

For biodiversity, the information collated for the Important Areas for Ponds (IAP) in South-east England provides a first step. However, for the AONB, these data can now be refined and added to, with knowledge from local biological recording groups, and further surveys. Pond Conservation's BAP species map, an online tool which provides information about the distribution of BAP species, can also help target practical action to maintain or expand the population of key species (see www.pondconservation.org.uk/millionponds/bapspeciesmap).

Professional surveys of pond ecological quality – based on plant communities and (ideally also) invertebrate assemblages - can be expensive because they require high levels of taxonomic skill. They do, however, provide a sound base for further work. Plant surveys can also be carried out by volunteers, if skilled botanists are available. Pond Conservation is currently also developing a pond quality assessment method for use by volunteers, which will be available in Spring 2012.

With training and supervision, single species surveys or those involving easier groups (e.g. amphibians) can be carried out by a wider range of volunteers and bring useful information in assessing the Priority Status of ponds.

New survey work should focus on identifying Priority Ponds and recording pond-associated BAP species, particularly those with a restricted distribution (see Appendix 1). Ponds in ancient woodland, including small features such as track ruts which can support species which have been particularly affected by landuse changes, could also bring new and valuable information.

Surveys to identify the past and present location of high heritage value ponds should also be carried out. Again, with suitable protocols, training and support, these could be carried out by volunteers from the local community.

4.3 Developing a knowledge-based pond conservation strategy for heritage and biodiversity

Based on the information available for the AONB pond resource, an outline strategy with clear objectives and targets should be developed to enhance biodiversity and protect heritage value. The development and delivery of this strategy needs to engage the local community sustainably to benefit both. Working in partnership with stakeholders and key organisations is important to ensure effective prioritisation of, and buy-in to, long-term monitoring objectives (see monitoring section below). A pond conservation strategy is currently being developed by Pond Conservation for the New Forest National Park Authority, and this could act as a template for the High Weald AONB.

Within the strategy, biodiversity and heritage goals need to be considered objectively based on risk, likely outcomes and cost effectiveness. For example, de-silting a historic village pond may improve its visual appeal, but heritage value may be damaged if artefacts are dredged up without due care. If the pond's water source is polluted, then biodiversity gains may ultimately also be limited. Given the cost involved in dredging, it may be less risky, and more beneficial for both wildlife and heritage to create a clean water pond complex in a suitable location with public access. Conversely, positive examples include working with old maps to identify historic pond clusters and potential links between them, e.g. drove roads. This would contribute to building an inspirational vision of how the freshwater landscape in the AONB has developed and changed throughout its history, and help set restoration objectives.

4.4 Engaging the local community and stakeholders

We recommend that a tiered approach is adopted when engaging the local community and other stakeholders (e.g. farmers, anglers, local authorities), in the conservation of ponds and other freshwaters:

- **Broad engagement and awareness raising** can be achieved through events and publicity. It is important that the real issues are presented, as well as the fun side of ponds. It can be difficult to communicate water quality issues or how important invertebrates are to pond biodiversity - whereas everybody likes pond dipping and furry animals!
- **More in-depth training, advice and support** needs to be provided to volunteers involved in surveys and monitoring, and to landowners or communities seeking to improve the management of their land for biodiversity and/or heritage.
- **Champions** need to be identified in particular areas to provide a point of contact and support for the general public and landowners. Pond warden schemes have been set up in the past, some of which have been very successful (e.g. Sussex), but in all cases long-term coordination and support is need to ensure their sustainability.
- **Expert advice** from national or local organisations, for example from Pond Conservation or the Kent Amphibian and Reptile Group should be secured to

provide in depth knowledge (e.g. to support champions), carry out training courses and review or develop technical information for practical measures. In many cases, on site support is also required to maximise benefits of practical schemes.

Published information, freely available, could easily be tailored for the High Weald AONB or the Brede River catchment to develop a 'Pond Heritage and Biodiversity' toolkit. For example, Pond Conservation has published the Pond Creation Toolkit (Pond Conservation, 2011) – a series of factsheets on all aspects of pond creation, including technical information on pond creation and management for BAP species.

Interactive material for teaching and learning could be developed specifically for pond heritage and biodiversity in the AONB, including identification keys and decision making frameworks for archaeological assessment, and pond creation and management for biodiversity and amenity.

Well-sited and designed pond trails and walks[2] can also be useful to make local communities aware of their pond resource. Again the focus should be on expanding understanding of both pond biodiversity and heritage, rather than only focusing on the easy hits – such frogs and fish.

4.5 Carrying out practical action

A number of practical measures can be put in place to maintain or enhance pond biodiversity and heritage in the AONB. Stakeholders engagement is key here as is working in partnership with existing land advisors, e.g. Natural England and RSPB.

The main types of measures are:

- Managing existing ponds
- Clean water pond creation
- Using ponds to protect and manage the freshwater landscape

4.5.1 Managing ponds

Pond management (=restoration) for biodiversity should aim to (a) improve the habitat for target species or groups, (b) increase biodiversity more widely, particularly by increasing water quality (e.g. by buffering ponds from pollution) and by increasing the range of pond types at a landscape scale.

For heritage, where the focus is on restoring the characteristics of a pond back to a pre-determined time, or increasing access for learning and amenity, the aims need to be considered in assoc with archaeological experts, taking into account the existing amenity and biodiversity value.

Amenity and leisure aims are also sometimes at odds with heritage and biodiversity. To avoid conflict, it can be helpful to zone waterbodies so that individual waterbodies are prioritised according to their main value, rather than trying to enforce multiple objectives

[2] The High Weald AONB has already set up 'wellie walks' for schools.

Before invasive management (e.g dredging) is carried out for either biodiversity or heritage purposes, a pond should be surveyed to assess its ecological value and identify target species, and ensure that management does not result in biodiversity loss. To help assess the potential conservation value of a pond, Pond Conservation has developed the 'Pond Management Risk Assessment' (Williams et al, 2010c). This provides a framework to assess the need for detailed ecological information prior to management, taking into account the landscape scale, finding out about local target species and pond quality. Detailed guidelines on pond management for biodiversity are provided in the Pond Book (Williams et al, 2010c). Similar guidelines could easily be developed from existing information for heritage.

4.5.2 Creating new clean water ponds

New clean ponds can be easily created at low cost. Using simple design principles, they can rapidly attract a wide range of freshwater wildlife, including species of conservation concern. This is because pond catchments tend to be relatively small, and can be more readily protected from pollution than lake, river or stream catchments. So it is quite feasible to create new ponds with entirely semi-natural catchments that will prevent a large component of surface water pollution impacts in the long-term. At the landscape scale ponds can, collectively, build together to create a network providing significant regional or national benefits for the whole freshwater landscape.

The overall aim of pond creation in the AONB should be to create a wide range of pond types, including the smaller, shallow water features typical of natural landscapes. Pond creation should be carefully risk-assessed in areas of high potential archaeological value, such as ancient woodland. New ponds can be located strategically to increase landscape connectivity and strengthen population of pond-associated BAP species.

There are opportunities to create shallow ponds and wet grassland habitats by damming or 'ponding' ditches, particularly where they drain unpolluted catchments. Where water quality is an issue, the focus should be on creating shallow/temporary habitat which will particularly benefit wading birds.

Ponds can also be created for amenity or social value, or for education. In many cases, if they also have a clean water source and good design, these can provide good wildlife habitat. Pond creation is exciting for people – and involving the local community or private landowners in a pond creation scheme (e.g. a new pond complex per parish?), and then later in monitoring what colonises the pond can be a very effective way to engage people.

Detailed information on creating clean water ponds for wildlife can be found in the Pond Creation Toolkit. Experience from the Million Pond Project shows that written information is, however, often not enough. Many landowners and land managers benefit from training and on site support (ideally from experienced pond makers) to identify potential sites, and plan and implement schemes.

4.5.3 Using ponds to improve the water environment

Water quality issues are all pervasive today in the UK. The scale of river and lake catchments mean that usually many landowners are involved, and so coordinated catchment de-intensification for the benefit of the water environment can be very difficult. Another major issue is flooding, which is exacerbated by draining systems designed to get rid of water, rather than holding it back.

The use of Sustainable Urban Drainage System is now becoming widespread and their effectiveness has been established (see Environment Agency website for further information). These systems can be small scale and, where space allows, can be retro-fitted to improve the quality of surface waters. There may be opportunities to work with communities at the parish level to identify where such measures could be applied to mitigate pollution from road run off, for example.

The effectiveness of small scale measures to manage pollution in agricultural landscapes – such as pond creation, silt traps etc - and address these issues at the *catchment scale* has not however been demonstrated and is currently being researched. At the *local* scale, pond creation and other small features (e.g. blocking ditches) could be used to hold back pollution and sediments and help maintain or improve the quality of waterbodies *locally*. Direct engagement with landowners and land managers is needed to identify where to locate these wetland features. Support and funding may be obtained for such work from agri-environment schemes or the Environment Agency.

4.6 Long-term monitoring

Monitoring the status of ponds and their biodiversity in the High Weald AONB, as well as the results of practical measures is essential to measure success. Bearing in mind the remarks about surveying ponds in Section 4.1.1, the most cost-effective way to do this would be to build on existing national or local recording schemes, which are mainly volunteer-led. The Sussex Amphibian and Reptile Group, for example, may be keen to attract new members from the Brede area (and elsewhere in the AONB) to survey ponds on a regular basis. There are many similar recording schemes in the UK, including plants (Botanical Society of the British Isles, BSBI), dragonflies (Dragonfly Society), and birds (British Trust for Ornithology).

For more obscure taxonomic groups, or where there are gaps, the High Weald AONB could develop and support its own volunteer mentoring scheme. This would require local expertise to be available – and willingness for those skilled surveyors to train and supervise new recorders (e.g. water beetles, true flies, freshwater lichens).

5. Conclusions

The High Weald AONB is a pond-rich landscape with many opportunities to further enhance its pond resource. Their high biodiversity and historical interest make ponds an ideal focus for engaging local communities in wider land management issues – in an enjoyable way.

Bearing in mind the role ponds play as stepping stones, and that many freshwater species live both in running and standing water, creating and managing ponds to

create clean water habitats can help protect and enhance the whole freshwater landscape.

6. References

Biggs J, Williams P, Whitfield M, Nicolet P, Weatherby A (2005) 15 Year of pond assessment in Britain: results and lessons learned from the work of Pond Conservation. *Aquatic Ecology: Marine and Freshwater Ecosystems* 15: 613:714.

Davies B, Biggs J, Williams P, Whitfield M, Nicolet P, Sear D, Bray S, Maund S (2008) Comparative biodiversity of aquatic habitats in the European agricultural landscape. *Agriculture Ecosystems & Environment*, 125: 1-8.

Downing JA, Cole JJ, Middleburg JJ, Striegl RG, Duarte CM, Kortelainen P, Prairie YT, Laube KA (2008) Sediment organic carbon burial in agriculturally eutrophic impoundments over the last century. Global Biogeochemical Cycles, 22.

Jones M (2010) Farming floodplains for the future. Staffordshire Wildife Trust

Keeble H, Williams P, Biggs J, Athanson M (2009) *Important Areas for Ponds (IAPs) in the Environment Agency Southern Region*. Pond Conservation, Oxford.

Pond Conservation (2011) *The Pond Creation Toolkit*. Download from www.pondconservation.org.uk

Rackham O (1985) *The History of the countryside*. J. M. Dent.

Williams P, Biggs J, Crowe A, Murphy J, Nicolet P, Weatherby A, Dunbar M (2010a) *Countryside Survey: Ponds Report from 2007*. Technical Report No. 7/07. Pond Conservation and NERC/Centre for Ecology & Hydrology.

Williams P, Biggs J, Nicolet P (2010b) New clean water ponds – a way to protect freshwater biodiversity, British Wildlife.

Williams P, Biggs J, Whitfield M, Thorne A, Bryant S, Fox G, Nicolet P **(**2010c) *The Pond Book: a guide to the management and design of ponds.* 2nd Edition. Pond Conservation, Oxford. pp105.

Williams P, Whitfield M, Biggs J (2008) Making new ponds biodiverse? A case study monitored over 7 years. *Hydrobiologia* 597:137–148

Williams P, Whitfield M, Biggs J, Bray S, Fox G, Nicolet P, Sear D (2004) Comparative biodiversity of rivers, streams, ditches and ponds in an agricultural landscape in Southern England. *Biological Conservation* 115: 329–341.

Williams P, Biggs J, Whitfield M, Fox G, Nicolet P (2000) Modern ponds in ancient landscapes. *Proceedings of the Pond Conference 1998*. Pond Conservation, Oxford.

Williams PJ, Biggs J, Barr CJ, Cummins CP, Gillespie MK, Rich TCG, Baker A, Baker J, Beesley J, Corfield A, Dobson D, Culling AS, Fox G, Howard DC, Luursema K, Rich M, Sampson D, Scott WA, White R, Whitfield M (1998) *Lowland Pond Survey*

1996. Pond Action and the Institute of Terrestrial Ecology for the Department of the Environment, Transport and the Regions, London.

APPENDICES