Integrating ponds with aggregate afteruses

MILLION PONDS PROJECT
Pond Conservation

A 50-YEAR PROJECT TO CREATE A NETWORK OF CLEAN WATER PONDS FOR FRESHWATER WILDLIFE

1. Introduction

Ponds are cheap and easy to create, quickly add biodiversity value and can be integrated within many aggregate extraction site afteruses, including nature conservation and, with care, sites restored to public amenity, fishing, agriculture and development.

When planning pond creation within a wider restoration scheme there are a number of things to consider in order to achieve the best possible pond biodiversity value, whatever the afteruse.

What's in this factsheet?

Who should read this factsheet?

This factsheet is intended for quarry managers, estates managers, consultants and landscape architects.

What is a pond?

A pond is a permanent or seasonal waterbody between 1m^2 and 2 hectares in surface area (about 2.5 football pitches). This definition includes temporary ponds that dry up during the year, as well as tiny pools and very shallow ponds like 'wader scrapes'.

2. Planning for pond creation

Ideally, the location, objectives and design of the pond creation scheme should be discussed during pre-application meetings and included in the restoration plans submitted with the planning application.

However, it can be difficult to include small features on restoration plans, and as long as ponds are specified, and the number, depth and broad area identified, then many of these small features can be implemented 'on the spot' with little additional planning.

To do this:

- Ensure that a commitment to pond creation is clearly stated in the planning application and include the location, extent and objectives of the pond creation scheme as a minimum.
- Make provision for employing professional advice on pond creation at the time of the site restoration to ensure the maximum benefits are delivered for biodiversity.

3. Considering afteruse in scheme design

Nature conservation

Aggregate extraction sites to be restored to nature conservation afteruse are the best sites to create ponds. Whatever the habitat type to be created, if there is water-holding capacity there, create small waterbodies to add significant biodiversity value.

Ponds in different habitat types will all develop rich wildlife communities and will support their own specialised plants and animals. For example:

- **Woodland / scrub ponds** are often especially good for amphibians, dragonflies and bats. Shelter from trees protects many delicate-winged wetland insects that would otherwise get buffeted about by strong winds. Create shallow, moderately deep and temporary ponds with a large surface area to ensure that they do not become totally overhung by trees.

- **Grassland ponds**, especially animal-grazed pools, are often very rich in wildlife. Where livestock are grazed, keeping the vegetation short, even tiny shallow pools can last for many years. The poaching and churning up of the wet ground by animal hooves also creates an extra level of habitat complexity at the pond edge.

- **Heathland and moorland ponds** are often biodiversity hotspots supporting rare species. A special suite of plants and animals are found in heathland temporary pools, including tiny pools in the wheel-ruts on trackways and around trampled gateways.

- **Wetland ponds** in reedbed, wet grassland, marsh and fens add to the patchwork of habitats at these dynamic sites, helping to maximise their diversity.

- **River floodplains** ponds attract specialised floodplain species and complement other open water habitats nearby such as river channels or gravel pit lakes.

Nature conservation schemes will often provide enough space to create large pond complexes or a network of ponds dotted around the site. Where possible, maximise the number of different types of ponds you create. For example, create some ponds with open aspects, others sheltered by tree lines or hedgerows. Create ponds in as many different habitat types and substrates as you can, ideally including a mixture of surface-water fed ponds and groundwater fed ponds to add to the variety. Include ponds of different sizes, depth and permanence. In planning the site design it's important to consider how the site will be managed in the future (grazing, cutting, unmanaged), and to adapt your pond designs accordingly (see section 5).

For general information on designing and creating ponds in semi-natural habitats, please also consult the *Pond Creation Toolkit*.

More detailed information on designing ponds in specific semi-natural habitats can also be found in the *Supplementary Design Factsheets*:

- *Designing wildlife ponds in woodland*
- *Designing wildlife ponds in grassland*
- *Designing wildlife ponds in heathland*
- *Designing wildlife ponds in wetlands and reedbeds*
- *Designing wildlife ponds in river floodplains*

Ongoing pond creation within nature conservation after-use

➤ An ongoing programme of pond creation at King's Dyke Nature Reserve in Peterborough (a clay extraction site), has provided habitat for rare stoneworts and aquatic invertebrates. The reserve provides a complex of rich clean-water ponds within a mosaic of grassland, bare ground, scrub and reedbed.

Several ponds were created during the initial site restoration in 1996. Following colonisation by a huge diversity of invertebrates and the rare aquatic plant bearded stonewort (*Chara canescens*), an additional 12 ponds were created in 2010. And in 2011, 30 full-size ponds and 100 small 'one-bucket' ponds were added.

➤ This new pond at King's Dyke Nature Reserve supported great crested newts just 6 months after its creation. It is an excellent pond because:

- It has a *clean water* source
- It was left to *colonise naturally*
- It has broad *shallow water* zones

Fisheries

Sites destined for recreational fishing can be good places for wildlife ponds, though it's best to shield wildlife ponds from intensive fish stocking.

One option is to create dedicated wildlife ponds in undisturbed, 'wild' corners of the site, in places that have a clean water source (such as groundwater or clean surface run-off). The pond surrounds should be as 'natural' as possible, with no fertiliser, pesticide or other inputs, and should not suffer from undue disturbance from people (for example, duck feeding or the addition of fish). Such places might include little-used rank, scrubby or poorly drained areas.

Stocked fishing ponds can also be improved for wildlife. Think about creating small waterbodies in the margins of larger fishing lakes or ponds, which may be suitable as nursery grounds or foraging habitat for smaller fish, but which larger fish cannot access.

Low-intensity game fisheries, often have clear, clean water which can be very good for aquatic plant species including stoneworts (a threatened group of submerged plants that require very clean water and gravel, sand or clay substrates to thrive).

Game fishery (low intensity)
Coarse fishery (low intensity)
Coarse fishery (high intensity)
Stock ponds

Can be good for wildlife

Usually poor for wildlife

If possible, it is worth designing underwater features into ponds used for game fishing, particularly undulating underwater bars (see Figure 1) and shallow areas that extend beyond the tree overhang zone (see Figure 2).

Underwater bars and shallows that help stoneworts also help fish, and anglers! The stoneworts can form extensive beds of vegetation which, as well as oxygenating the water, provide excellent cover and foraging grounds for fish. Stoneworts, which smell of garlic, and are sometimes known to anglers as 'onion weeds', are said to be good feeding spots for fish.

See the species dossier *Creating ponds and lakes for stoneworts* for more information.

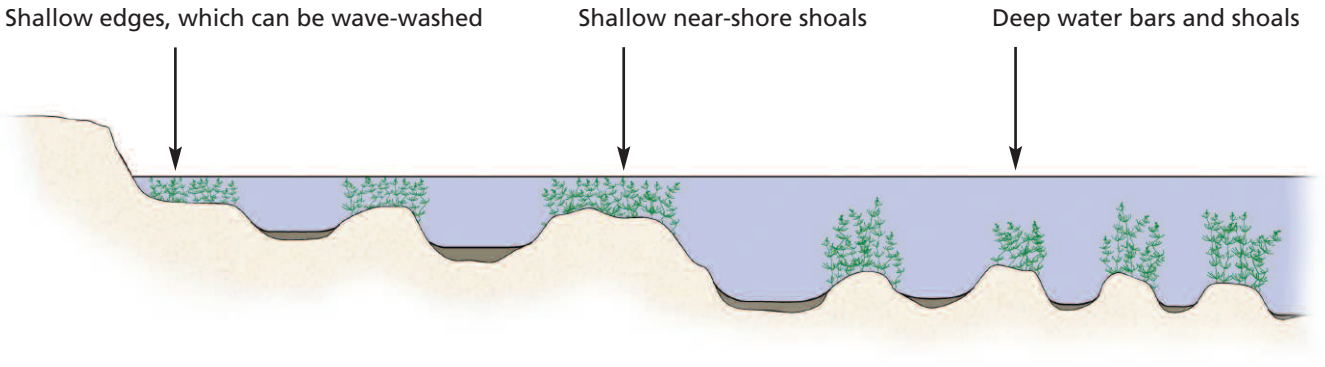

Figure 1. **Create underwater bars (at all depths) – wave wash keeps the bars free of organic sediment, helping maintain bare mineral substrates for stoneworts.**

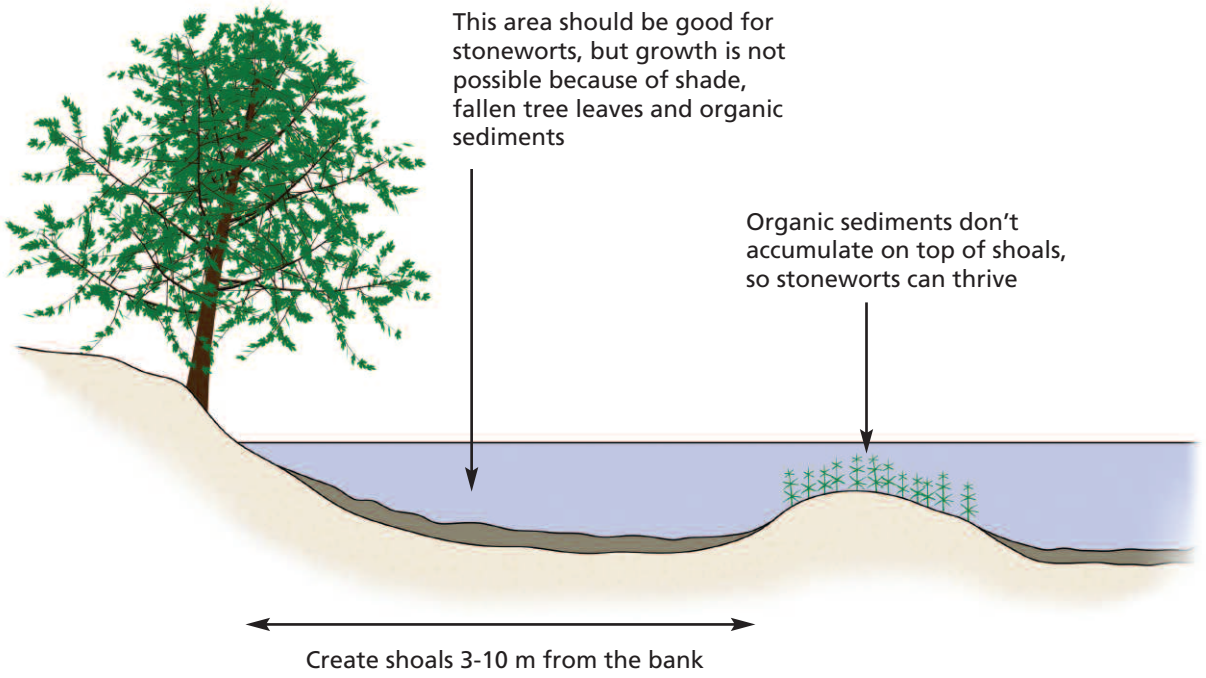

Figure 2. **Create shallows (less than 70 cm deep) beyond the tree overhang zone where stoneworts can grow.**

For more intensive fisheries, focus on improving the shallow water habitat and encourage dense vegetation growth around the pond margins.

Where the water is turbid, provide wide areas of VERY shallow water 0-10 cm deep to help light penetration and plant establishment.

Very intensive fisheries waterbodies, for example stock ponds where fish are kept at high densities are heavily impacted through addition of food and other additives. It is difficult to increase wildlife value at these sites. Instead focus on creating separate, dedicated clean water ponds for wildlife.

Leisure, amenity and public access

Areas designed for leisure, amenity and public access, such as country parks, campsites, sailing clubs and water sports centres can be good places to locate ponds, though thought needs to go into pond location, design and management.

In amenity or public access areas, it may be desirable to create ponds with different functions, for example, wildlife ponds, educational ponds or ornamental ponds, with the different pond types zoned in different areas of the site.

Where there is space, create dedicated wildlife ponds away from any intensively managed areas and away from areas with direct public access:

- **Find a clean water source and keep the water clean.** Surface water draining from a low-intensive catchment and ground water are both relatively clean sources of water. Ensure there are no pollutant inputs (such as fertiliser or pesticide). Don't link ponds to existing drainage ditches or streams, don't spread topsoil on or near the pond banks.
- **Let the pond colonise naturally, don't plant up.** Planting up is not required, as pond plants colonise rapidly. Planting up will often bring in unwanted alien invasive species which are difficult to control once established.

If ponds need to be located near to public paths, then consider erecting temporary fencing or allowing thorn scrub to grow up around ponds to discourage undue disturbance. This includes duck feeding and excessive disturbance from dogs, which will churn up the pond sediments. Ponds near paths also very commonly suffer from the addition of unwanted fish and garden pond plants (which may include alien invasive species).

See the *Aggregates Toolkit Sheet A2* for further information on locating clean water ponds and designing ponds for wildlife.

Where ponds are being created for ornamental, leisure or educational purposes (for example duck ponds or pond dipping ponds), it may be necessary to plant up the ponds. If this is the case, then wherever possible, use native species of local provenance from a reputable source. Depending on the density of people or animals (for example, ducks) that use the ponds, temporary fences or cages may need to be erected to give the vegetation a chance to become established.

Further information on designing ponds in areas with public access, including consideration of health and safety issues, can be found in the Supplementary Design Factsheet *Designing priority ponds in areas of public access*.

Wildlife pond creation at Witney Meadows and Lakes Country Park

Temporary ponds (often termed scrapes) were created in Witney Meadows, part of a country park restored from gravel extraction.

Small, shallow temporary ponds like this are very valuable for wildlife. The ponds are located within an area of floodplain grassland, maintained by cattle grazing, and attract foraging wading birds such as lapwing, and rare invertebrates and plants that specialise in this type of seasonally wet habitat.

The ponds are set away from the paths around the site and are too seasonal to support any introduced fish populations, so the pools' plant and invertebrate communities are not impacted by the many visitors to the park.

Agriculture

Ponds can be great additions to agricultural land, as long as they are created in a location with a clean water source:

- Make sure that polluted water running off arable land or intensive grassland fields doesn't drain into the pond.
- Ensure, where possible it has semi-natural surrounds (for example, grassland field edges, small woodlands or scrub).
- Don't link the pond to stream or ditch inflows – these bring in pollution. It's better to have a pond that dries up occasionally, than a polluted pond.

Ponds can be located in or next to arable fields, IF they don't receive run-off from that field. On most farmland, it's possible to find a poorly drained or awkwardly shaped area which could be made more biologically interesting and enjoyable to the eye, by adding a pond.

Grazed grassland pools are often particularly rich and varied wildlife habitats. Livestock keeps the vegetation short so that even tiny shallow pools persist for many years. The poaching and churning up of the wet ground by animal hooves usefully creates an extra level of habitat complexity at the pond edge. Nutrient inputs are less of an issue in grazed areas, because the trampling and poaching knocks back fast-growing dominant plants making space for less competitive species, enabling good levels of plant diversity.

Ideally ponds should be located where they won't 'get in the way' in future. For example, although it is great to locate ponds in the middle of pastoral fields, consider whether this would be appropriate in locations where machinery would need to manoeuvre round it (for example, during hay cutting).

Development

Ponds are often created as part of the construction of business parks, housing developments and golf courses, mainly for functional purposes (e.g. sustainable urban drainage ponds) and/or as ornamental features. Many of these ponds have some wildlife interest, particularly in their early years, however, their long-term value is usually compromised as the pollutant burden builds up in their water and sediments with time.

In many cases, it may be possible to create separate, dedicated wildlife ponds in 'wild' areas of a development site. Even small ponds (e.g. 5 m diameter) can be valuable for wildlife, and it may be possible to find out-of-the-way, undisturbed corners of a site to put clean water ponds.

Within a development context, put wildlife ponds where:

- There is semi-natural vegetation such as grassland, woodland, heathland, scrub or tall rank vegetation.
- The ponds will have a relatively clean water source (for example, groundwater, clean surface run-off or clean roof run-off).
- The ponds won't receive run-off from roads or car-parks, or from planted beds to which fertiliser has been added, or which are regularly weeded, disturbing the soil.
- The ponds won't be unduly disturbed by people (for example by duck feeding, adding fish or invasive pond plants from the garden) or their dogs.

For more information on finding clean water and designing ponds for wildlife, see *Aggregates Toolkit Sheet A2*.

Where it is not possible to create dedicated wildlife ponds, the value of ornamental or drainage ponds can often be improved:

- Sustainable urban drainage ponds inevitably receive silt, and polluted run off from urban surfaces. The pond habitat can be improved by including shallow (0-10 cm) water areas, where dense marginal vegetation can develop. In many cases it may also be possible to create small pools next to, but not linked to, drainage ponds.
- If it's necessary to plant up the ponds then ideally use native species of local provenance from a reputable source.
- See *Aggregates Toolkit Sheet A2* for guidance on design features to consider incorporating into ornamental or drainage ponds.

New wildlife pond at Lymm Golf Club in Cheshire. This pond has been created with a clean water source, away from the intensively managed greens, to benefit threatened wetland wildlife.

4. Integrating existing waterbodies into site restoration

During the quarrying process itself, valuable clean water pools are often created either incidentally (for example, silt ponds, groundwater monitoring ponds and gravel pit ponds) or accidentally (for example, small pools in clay spoil). These features can be good for wildlife because nutrient levels in the water are low (because topsoil and subsoil on the site has been stripped away), and have been allowed to colonise naturally.

These kinds of features are often destroyed during site re-grading and landscaping works, when they could easily be retained. So once quarrying has ceased, it can be worth identifying where they might be retained or extended and, where possible, incorporating these features into the site restoration plan. Even very small ponds or areas of seasonally wet ground can be valuable, and add to the small-scale habitat variety of the site, especially when they form part of a wider complex of wetland habitats (such as wet grassland, open water, reedbed and wet woodland). In sites that will be managed by grazing in particular, even very tiny pools will be maintained in the long term, and will add biodiversity value.

Silt ponds can be very good wildlife habitats in their own right and often don't even require tweaking, especially where they are shallow with gently sloping banks. Although many silt ponds gradually dry out as they age, or develop into wet woodlands, late successional and temporary waterbodies, and wet woodlands, are all valuable habitats, so this is not necessarily a process that requires intervention.

Priority Pond under the UK BAP: a silt pond in the Lower Windrush Valley, Oxfordshire, which supported a rich invertebrate community, including nationally scarce species of water beetles.

Silt pond at Nosterfield Nature Reserve, North Yorkshire, retained as part of the nature conservation afteruse. This pond has a clean, unpolluted water source from surface water draining from a clean catchment (low-input grassland) and supports 61 aquatic macroinvertebrate species – making it a priority pond under the UK BAP.

▲ ➤ Small pools on a sand extraction site in Dorset. Groundwater fed pools have formed on the quarry bottom (left), surface water fed pools have formed in clay spoil above the water table (right). These ponds are good because they've been left to colonise naturally, have a clean water source and gently sloping margins. They will eventually be lost without management (such as grazing), but will be valuable for wildlife at each stage of their development, and so are worth retaining as part of the restoration scheme.

◄ This small (250m^2) linear pond at Standlake Common Nature Reserve was originally constructed on a quarry site to monitor groundwater levels. It has quickly become exceptionally rich in invertebrates, qualifying as a priority pond under the UK BAP, and is now incorporated into the nature conservation afteruse for the site.

It shows the benefit of creating groundwater fed ponds sheltered by hedgerows in areas likely to be heavily impacted by large flocks of birds.

Deeper water habitats (up to about 2 m depth) created by extracting gravel can provide good habitat for submerged plant communities, such as native pondweeds and stoneworts, but only if the water source is clean, and kept clean.

After mineral extraction ends, the base and edge of gravel pit ponds (and also lakes) usually benefit greatly from modification.

- Whilst the pit is still pumped dry, create complex underwater topography on the bottom of the gravel pit to form submerged hummocks and bars.
- Create at least some broad areas of very shallow water at the pond edge, with very gently sloping margins of less than 1:10.
- Add complexity to the drawdown zone on the gently sloping margin (the area between the winter high water mark and the summer low water mark) by creating hummocks and hollows.
- Near shore islands can also be created to provide safe areas for waterfowl and wading birds.

See *Aggregates Toolkit Sheet A2* for more details on these design features to improve the value of waterbodies created through sand and gravel extraction.

◄ The margin of this gravel pit in Oxfordshire (Standlake Common Nature Reserve) has been modified to include a gently sloping margin, small pools, humps and hollows, and islands, to benefit wading birds.

5. Considering management in scheme design

Whatever afteruse is planned for a mineral extraction site, the landscape type and site management plans should influence the design of ponds; it is particularly important to consider how a pond or pond complex might develop 10 years or more after its creation.

For example, most sites not managed by grazing, mowing, or clearance, will rapidly develop into scrub and woodland. For these sites, include some larger (>30 m) ponds, which can be shallow, which will retain sun-lit centres (see Figure 3).

For ponds with open aspects, grazing is a particularly useful method to maintain waterbodies. In such landscapes, subtle damp and wet undulations created during restoration can be retained in the long term. This means that a variety of pond sizes can usefully be created, including very tiny pools.

For more information on considering management in design, see the *Pond Creation Toolkit Factsheet 4*.

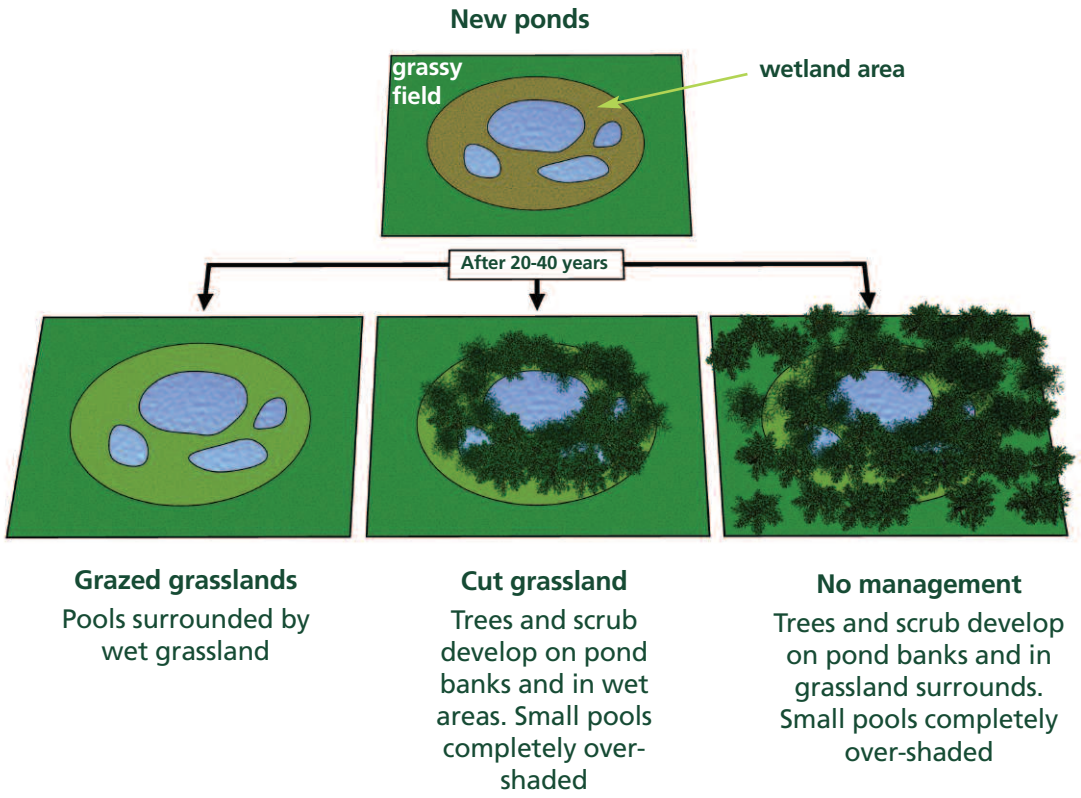

Figure 3. Ponds on grazed and ungrazed sites develop very differently over time.

For further information about the Million Ponds Project and to consult the other Factsheets from the Aggregates Toolkit, please visit *www.pondconservation.org.uk/millionponds* or email *info@pondconservation.org.uk*

mpa essential materials sustainable solutions

Pond Conservation *For life in fresh waters*

Natural England — Supported through Defra's Aggregates Levy Sustainability Fund

Supporting Britain's BAA Quarries

Lower Windrush Valley Project