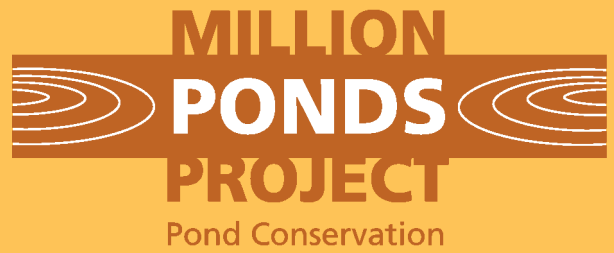


King's Dyke Nature Reserve: making space for new ponds in the Peterborough clay pits



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

1. The Peterborough clay pits

Background

The distinctive clay pits landscape around Peterborough has been formed through years of clay extraction for the brick-making industry. The resulting wetland and pond complexes across this area, with beautifully clean, unpolluted water, have become some of England's most important sites for threatened wetland wildlife.

The clay pits are internationally important for their communities of stoneworts (a group of complex macroalgae, many of which are now threatened), including the main English population of the highly endangered bearded stonewort.

The clay pits are also home to significant populations of great crested newts. Around 30,000 are estimated to live at Orton Pits Special Area of Conservation; the largest known population in the UK. The area also supports uncommon and abundant wetland invertebrate species, with diverse communities of water beetles, dragonflies and bugs, as well as important populations of the threatened mammal water vole, and many different bird species (including breeding marsh harrier, lapwing, little ringed plover and sand martins).

King's Dyke Nature Reserve is one of the most recently established areas for wildlife in the Peterborough clay pits, but has rapidly developed into a site of national importance for its stonewort and invertebrate assemblages, as well as its marine fossil assemblages. It is also of regional importance for its amphibian, reptile and bird populations.

Hanson and Philip Parker Associates, responsible for the management of King's Dyke Nature Reserve, have implemented a programme of pond creation and management to achieve the right mix of early, mid and late successional ponds on the site, to suit a variety of species.

Conservation

The stonewort communities, including the endangered bearded stonewort, as well as certain invertebrate species, are early successional pond colonisers that specialise in 'new pond' habitats.

As the waterbodies mature, the conditions in them change, with the bare clay substrate that bearded stonewort requires being lost as other vegetation colonises. Site management, including new pond creation and pond management, is required in order to reveal bare clay substrates and provide the conditions that early successional species need.

A case study to show how ongoing habitat creation and management at a restored mineral extraction site has had real benefits for threatened species



Bearded stonewort (above), needs new ponds in order to thrive. The great crested newt (below), fares best in mature ponds between 15 – 50 years old.

2. Establishing King's Dyke Nature Reserve

As part of the planned restoration to nature conservation, Hanson has established the King's Dyke Nature Reserve adjacent to a working pit near Whittlesey, an area that produces approximately 4 million bricks each week. The area that now forms the reserve was a disused area of the clay pit, dug for clay between the 1920s and 1950s.



King's Dyke Nature Reserve

Philip Parker Associates were instrumental in planning and undertaking a programme of habitat creation and management at the site. The initial restoration work, commencing in 1995 in the original 16 ha reserve, involved the creation of 6 ponds and an area of reedbed (beyond the far bank in the photograph to the left), which was developed by flooding an area of unworked clay to a shallow depth.

In addition, the existing clay pit waterbody was modified to include shallow margins for foraging waders and nesting islands for breeding wading birds (including lapwing, little ringed plover and redshank).

3. Extending the reserve and ongoing restoration work

The reserve has been continually extended over the past 5 years through the inclusion of reedbed, adjacent areas of former pasture and sand and gravel extraction, and an area of wet grassland alongside the Nene Washes (the latter is being managed for the benefit of corncrake and snipe, in conjunction with the RSPB). The reserve now covers over 60 ha of land and has developed into a valuable wildlife habitat and an important educational and recreational facility for the local community.

A restoration plan has been prepared for the whole of the future clay extraction areas, the majority of which will be restored for nature conservation use. It is proposed that over 300 ha of clay pit eventually be dedicated to nature conservation, with habitat management and creation proceeding alongside extraction.

Bradley Fen is a 70 ha site in the process of being restored. The main part of the restoration is a large lake with a chain of islands which will benefit an already significant population of wintering wildfowl (the lake providing open water when many other areas are frozen).

The water levels within the quarry will take a number of years to recover to their final level following the end of extraction, and so interim restoration and habitat creation measures have been incorporated. For example, the base of the pit is being profiled to allow the development of ephemeral ponds (to benefit invertebrates and stoneworts in the short term and to benefit fish in the long term) and the south facing banks will be used as trials for seeding nectar rich wildflowers (joint Buglife project) before being completely inundated. Higher levels, which will ultimately become a reedbed when water levels recover, will in the meantime be managed as an area of wet grassland.



4. Pond design and creation

The main pit at the reserve was formed from the original clay extraction, but numerous other ponds have been constructed on site from the initial establishment of the nature reserve to the present day:

- 5 ponds were created during the initial creation of the nature reserve (in area 2A – see Figure 1). These ponds were designed primarily for breeding birds (a dragonfly pond and four further ponds for the benefit of water voles and great crested newts which were known to inhabit the site).
- 6 former dried ponds were cleared in 2007 in the gravel area (area 2A) for the benefit of the great crested newt population.
- 10 ponds were created into the top of the unworked clay in January 2008 for the benefit of stoneworts (area 3A). These have also proved attractive to passage waders as the margins have developed.
- 12 new ponds were created within the gravel area (area 2A) in January 2010, again for the benefit of great crested newts and other amphibians. The spoil which was dug out of these was used to create a number of south facing banks for the benefit of invertebrates and also to provide hibernacula for the amphibians.
- A further 20 new ponds, targeted at multiple species (amphibians, invertebrates and plants), were created in January 2011 (area 5C – see Figure 2) as part of continued expansion of the reserve.
- Additionally, 20 + smaller ponds the size of a machine bucket ('one bucket ponds') were created in January 2011 in area 5C to create seasonal aquatic habitats for the benefit of invertebrates.

The result is that to date, approximately 70 ponds, all beautifully clean, unpolluted and rich in wildlife have been created at the reserve.

Further pond creation is planned as part of continued restoration work at the Whittlesey brick works. A pond complex designed to resemble the famous 'pingo ponds' of Norfolk, which are very important for aquatic plants, water beetles and dragonflies, will be created in summer 2011 in area 6C in Bradley Fen, part of a new extension to the reserve (see Figure 3).



New pond created in January 2010 at King's Dyke Nature Reserve, supported breeding great crested newts in spring 2010, with larvae present in the pond in June.



A new 'one bucket pond' created in January 2011 – only about 1m²!

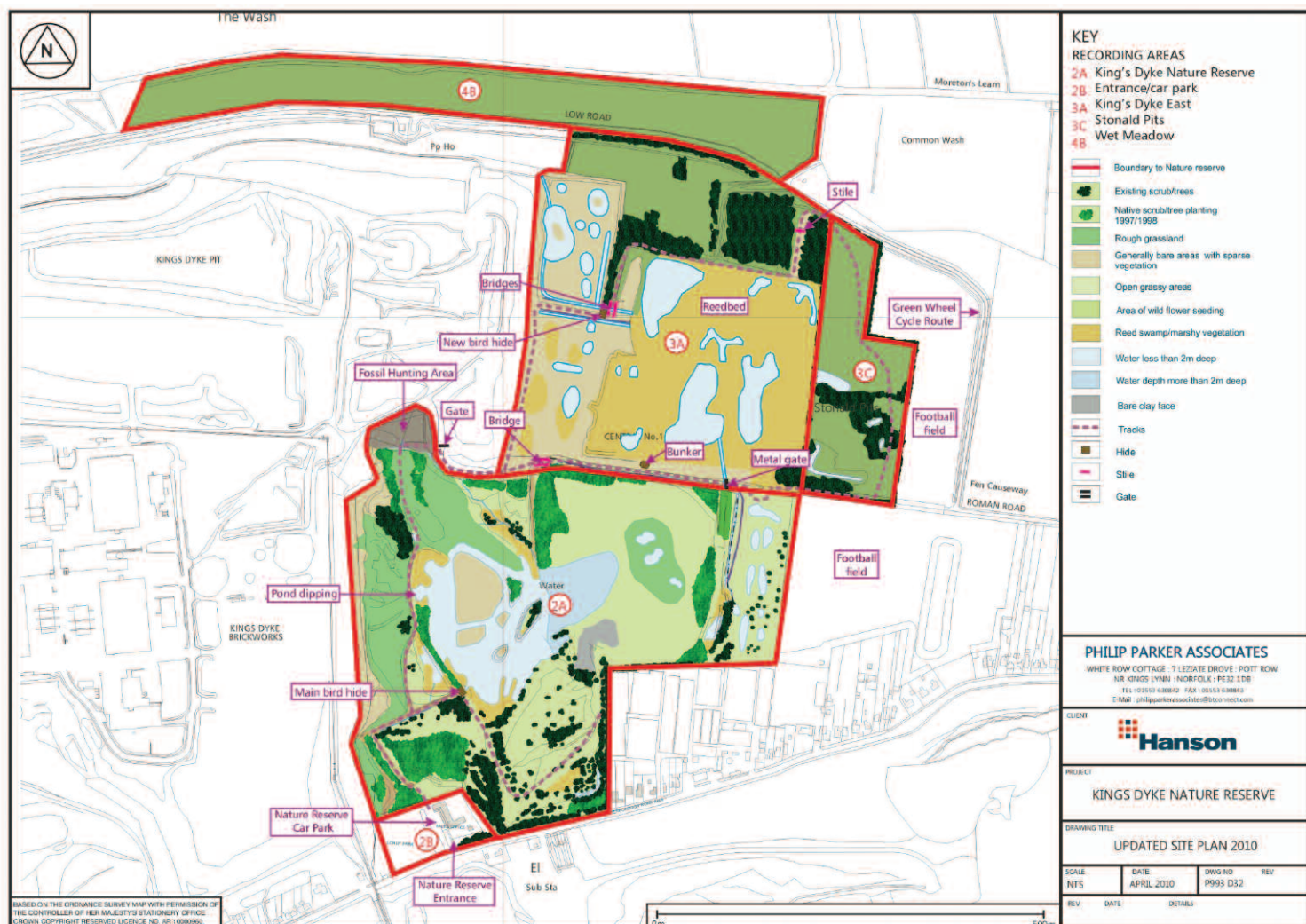


Figure 1. King's Dyke Nature Reserve. Since 1995, around 30 new ponds have been created in areas 2A and 3A.

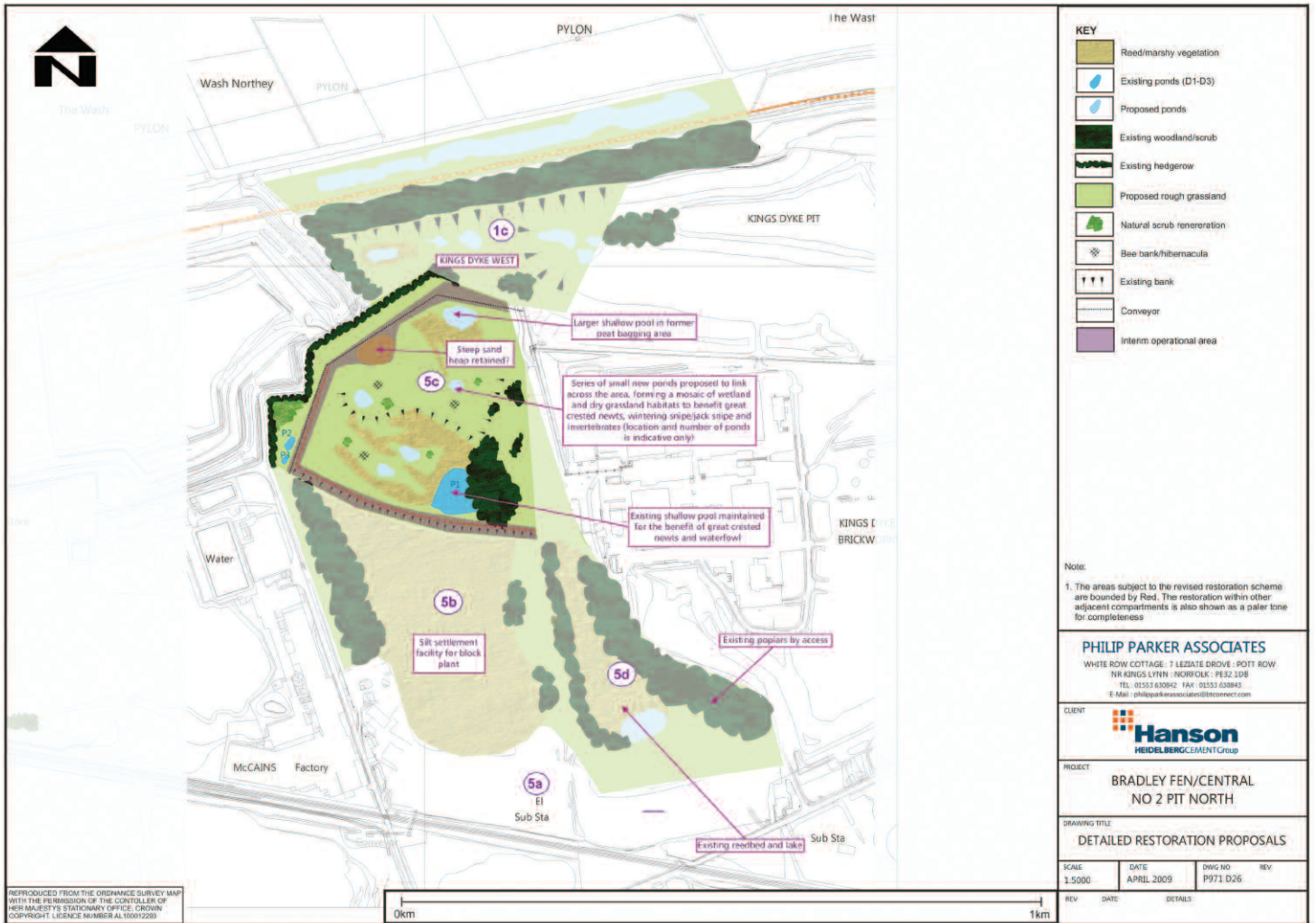


Figure 2. Bradley Fen extension to the Nature Reserve. Approximately 40 new ponds were created in area 5C in January 2011, including 20+ 'one bucket ponds'.

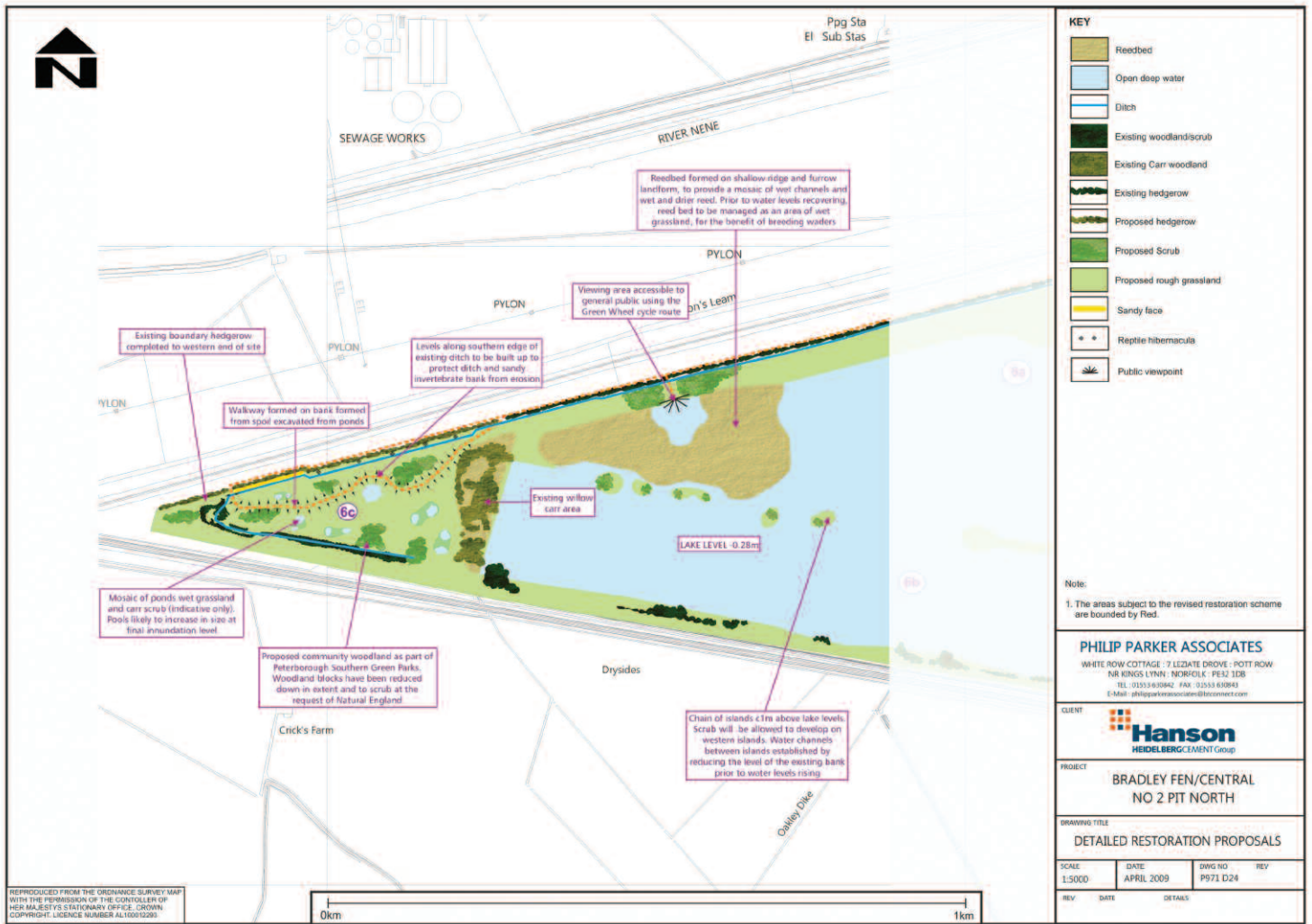


Figure 3. Bradley Fen extension to the Nature Reserve: the location of new 'pingo ponds', to be excavated in summer 2011.



Box 1: Special species at King's Dyke Nature Reserve

The ponds at King's Dyke Nature Reserve have been well monitored over the last 15 years by Philip Parker Associates and regular volunteers and species experts (particularly Peter Kirby, Sarah Lambert and George Walthew).

Important groups recorded at the site include:

- The stonewort flora: 10 species have been recorded, including the endangered bearded stonewort.
- 19 species of dragonfly recorded, including large numbers of the the uncommon variable damselfly (*Coenagrion pulchellum*) and more recently scarce chaser (*Libellula fulva*).
- Stable population of the threatened mammal water vole.
- Large population of great crested newt (peak counts in excess of 400 suggesting a population in the order of 4000).
- Wetland invertebrate species of national importance.

Peter Kirby, entomologist, describes the habits of a small selection of rare wetland invertebrate species recorded at King's Dyke Nature Reserve:

Haliphus mucronatus, a crawling water beetle (Nationally Scarce) which feeds on algae and is usually associated with stonewort beds. It occurs in small localised populations, sometimes in large deep pools, but more usually in small, often seasonally dry ponds. A mobile species, well-suited to make use of the brickpits, and exploiting minor or transitory features, or short-lived successional stages.

Bagous limosus, an aquatic weevil species (Nationally Scarce), which feeds on pondweeds and only found in places with good water quality and a sizeable permanent population of foodplants. It can cope with summer drying provided its foodplant can, and sometimes turns up in quite shallow seasonal pools. The larvae are permanently submerged, and the adults spend most of their lives underwater – a very unusual feature in the weevil family! At King's Dyke the weevil is associated with an important population of fen pondweed (*Potamogeton coloratus*), a Nationally Scarce aquatic plant.

Calligypona reyi, a planthopper almost entirely restricted to grey club-rush (*Schoenoplectus tabernaemontani*) as a foodplant. It is usually found where the plant grows as fairly dense emergents, and especially when growing on seasonally exposed sediments. Though a very local plant nationally, grey club-rush is very common indeed in the brickpits generally, and the Peterborough area provides possibly the greatest concentration of populations of this plant species nationally.

Erotesis baltica, a small caddisfly (Vulnerable). The species is strongly associated with old good-quality fenland, and at King's Dyke the larvae have been found in one of the more heavily vegetated pools, and adults light-trapped. The larvae seem to need permanently flooded fen. Unlike most caddis cases (which are a mess of twiggy bits, or are gradually added to in a never-ending neat spiral), the case of this species is of two half-cases of neat rows of plant fragments, roughly stitched together down the middle.

Thrypticus cuneatus, a true fly (Near Threatened). All members of this genus have larvae which mine the leaves or stems of plants in wetlands or water margins; and all are decidedly uncommon. *T. cuneatus* appears to be one of the rarest, with a very few rather widely scattered records. Two of the scattered recent records are from brickpits around Peterborough, making this, perhaps, the best area of the country in which to look for it. Which plant or plants it feeds on, and exactly what conditions this plant must be in, are unknown.

Designs for target species

The ponds provide a range of waterbody shapes, sizes and depths for the variety of wetland wildlife that make use of the site. The result has been the creation of a rich, varied wetland complex with a clean, unpolluted water source.

Particular target species include great crested newts, stoneworts, other uncommon plant species such as lesser water plantain and greater bladderwort, water voles and freshwater invertebrates (see *Box 1: Special species at King's Dyke Nature Reserve*). Stoneworts prefer a variety of pond sizes and depths, but the rarest species on the site, bearded stonewort, thrives in new ponds with bare clay substrates.

Great crested newts prefer a network of many small- to medium-sized ponds that dry out every few years (to remove predatory fish) surrounded by appropriate terrestrial habitat (in this case, a grassland and scrub mosaic).

The first great crested newt survey of the ponds created in January 2010, conducted in March 2010, counted around 150 adult great crested newts using the new ponds (in addition to a similar number using the existing ponds). Surprisingly, great crested newt larvae were observed in the new ponds in June, despite the ponds still being entirely bare of vegetation. Newts like some vegetation cover in ponds in order to lay eggs and hide from predators, but they seem to have managed without it here, probably laying eggs on dead fallen leaves or wind blown vegetation fragments).

Many of the scarce or uncommon invertebrate species found on the reserve benefit from the creation of waterbodies with very shallow margins and wide drawdown zones. The drawdown zone (between the winter high water level and the summer low water level) is especially good for water beetles, which thrive in the interface between land and water, amongst low-growing herbs and grasses.



Creation of a wader scrape in Bradley Fen, as part of ongoing habitat creation at King's Dyke Nature Reserve.



5. Pond management

Philip Parker Associates plan, budget and execute habitat management and creation measures, and Hanson provides the vast majority of the funding for the work required each year. Other funding has come from joint ventures, such as the Buglife project.

The aim of the pond management plan is to maintain a range of ponds at all stages of succession (early, mid and late) to provide habitat for a variety of plant and animal species that require different conditions.

- Management for Bearded stonewort involves ongoing pond creation and selected dredging of existing ponds, to reveal bare clay substrates that the plant needs to thrive.
- Ponds in mid- to late-successional stage are retained to provide optimal habitat for great crested newt. This species does well where there is good vegetation cover to provide egg-laying sites and protection for larvae and adults.

The new networks of ponds created in 2010 and 2011 have been located in areas with some vehicular access, to facilitate ease of future management if required. December/January was chosen as the month to carry out the pond digging works because this time period would limit the effect on protected species (e.g. newts in hibernation) and bird breeding had not commenced, limiting the chance of disturbance.

Natural regeneration of vegetation has been used extensively as a tool to create important wildlife habitats at this site. Both the freshwater and terrestrial habitats have been allowed to develop naturally. In the freshwater habitats, avoiding planting up of the ponds extends the period of time that bearded stonewort, and other species that require 'new pond' conditions, such as bare clay, can thrive.

The alien invasive plant species New Zealand pigmyweed (*Crassula helmsii*) is present in the main reserve lake and some of the ponds in its vicinity. It is managed by annual spraying at the margins, but it will not be possible to completely eradicate from King's Dyke. All new ponds are monitored for the presence of *Crassula helmsii* and measures are taken to both eradicate as soon as it is spotted in any other water body and prevent it from spreading in the first place.

The low nutrient status of the site (caused by the removal of the topsoil and subsoil layers during clay extraction) means that succession progresses slowly. This is good for the many rare early successional species found here, and also limits the amount of management required in these clean water ponds.

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

This case study has been prepared with Philip Parker (Philip Parker Associates) and Peter Kirby, Tim Darling (Land and Planning Manager, Hanson) and Paul FitzJohn (Works Manager, Hanson).

