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Kemerton Lake Nature Reserve
Aquatic Habitat Creation & Restoration Project Report
21st February 2025

Project Background

Kemerton Lake Nature Reserve (KLNR) is Kemerton Conservation Trust's flagship reserve. It is a 46.5 acre (18.8 ha) wetland complex created out of a former gravel working, situated between the villages of Bredon, Westmancote, Kemerton and Kinsham. The reserve is a designated Local Wildlife Site, and has a diverse range of habitats including a 16 acre (6.5 ha) lake, pools, seasonal wet scrapes, reed beds, grassland, and land specially cultivated for arable plants. The reserve is surrounded by 111 acres (45 ha) of native woodland and arboretum which are not part of the reserve, but which make an important contribution to the habitat mosaic.

KCT manages the reserve under a long lease and the majority of habitat management on site is carried out by the Trust's volunteer Warden John Threadingham, and the Trust's volunteer work party group, with contractors brought in for specific tasks as needed and when funds allow.

The waterbody is a key habitat on the reserve. Many species rely on the water for all or part of their lifecycle. These include:

- invertebrates and mollusc such as Mayflies, Caddis Flies, Dragonflies and Damselflies (many of which form a key part of the diet of animals higher up the food chain); KLNR is home to thousands of Swan Mussels and is an 'Ark' site for the endangered native White-clawed Crayfish;
- birds such as Great Crested Grebe, Teal, Kingfisher, Cuckoo, Reed Bunting and Lapwing;
- mammals including Otter, Noctule Bat and Daubenton's Bat;
- fish including Roach and Rudd (fish form a key part of the diet of animals further up the food chain);
- amphibians and reptiles such as Common Frog, Common Toad, Palmate Newt and Grass Snake;
- aquatic plants including Amphibious bistort, Fennel Pondweed and Nuttall's Waterweed (a non-native invasive).

Kemerton Lake was chosen as an 'Ark' site for White-clawed Crayfish in 2010 and 100 crayfish were translocated under licence in a joint project with Buglife and the Environment Agency in November 2010. KCT created crayfish habitat including adding brash bundles

and stone to the lake bed, and the crayfish were monitored under licence for 5 years after the translocation (in years 2, 3 and 5). Buglife advised that future monitoring every 5 years would be desirable, and that additional brash bundles would be needed in time. Since the project and associated monitoring finished in 2015, the lake has become a popular fishing spot for Otter, and there are concerns about how that may have affected the crayfish population. As crayfish trapping is a licensed activity, we have been unable to do any further monitoring. However, eDNA testing has become an extremely useful tool in recent years, and one that allows detailed monitoring without needing a licence, as all it requires are water samples from the site, which volunteers can collect. eDNA testing has proved extremely helpful in monitoring crayfish populations in the Wyre Forest, and many organisations use it instead of field surveys now (e.g. Freshwater Habitats Trust has used it to monitor Great Crested Newt populations for 10 years).

In addition to needing more information on our crayfish population, we wanted to confirm fish species and numbers present in the lake currently. In the early years, Roach and Rudd were introduced to provide food for fish-eating birds. Since then, several other species are likely to have arrived naturally (perhaps as eggs stuck to weed on birds' feet and feathers). Other species, such as common goldfish, are likely to have been released illegally by members of the public. Ad-hoc observations and bird surveys have demonstrated that fish are present in the lake. Birds such as Cormorant, Heron and Great Crested Grebe are to be found fishing year-round, while Otters visit regularly and have been photographed with fresh kills. However, we lacked data on what species and how many are there. In 2022, the Trust had a detailed electro-fishing survey carried out at the lake, which confirmed the presence of Brown Goldfish (non-native) and 3-Spined Stickleback. No other fish were found during the survey, but it was hampered by the quantity of invasive Nuttall's Waterweed in the lake, and a sonar scan of the waterbody showed that there were additional fish in the deeper areas of the lake that the electro-fishing method could not capture. The fish survey highlighted a lack of fish in the lake, which has major implications for the many species that depend on the fish further up the food chain, however photographic evidence since then suggests there are more fish in the lake than the survey found. It was imperative that we got a more accurate picture, as if the fish stocks are as low as the initial electro-fishing survey found, we will need to restock, which is a complicated and expensive undertaking. Using eDNA testing would allow us to gain a more accurate picture, as the tests can confirm species' presence from the tiniest amount of shed DNA. We could then make an informed decision on whether to restock or not. We also wanted to find out what amphibians are in the lake, especially newt species, and whether Mink are still onsite (they were recorded on trail camera 10 year ago but have not been seen since).

To support the crayfish and fish fry in the lake, we wanted to add new brash bundles to replace those added in 2010 which would have broken down over time.

Alongside the need for eDNA testing and creation of new crayfish habitat, there were urgent habitat management restoration works needed on site. The water pipe that carries water from the Lagoon into the main lake had stopped working properly in 2022 and, as a result, flooding was occurring on a key section of grassland that contained large numbers of Common Spotted and Southern Marsh Orchids. The flooding was damaging the grassland and affecting the Trust's ability to carry out normal management tasks in that area, as it was under water for months at a time. Attempts to find and repair the existing waterpipe had proved futile in 2023, and we were advised to install a new waterpipe to solve the problem.

Erosion was becoming an issue for the islands on the main lake, which are important sites for some of the birds that breed or overwinter at the reserve. Wave action has eroded the islands over the last 25 years, and without prompt action, several will likely be lost completely in the next few years. Action was needed to prevent that. Following advice, it was decided to trial coir rolls along the most affected section of the western island, whilst on the eastern island, which is wooded, the decision was made to pollard the large willows on rotation to prevent damage to the island when the trees inevitably blow over as they age and grow.

The Trust therefore applied to the UK Shared Prosperity Fund through the Natural Networks programme delivered on behalf of Wychavon District Council for a grant to pay for a significant programme of habitat restoration and habitat creation at KLNR to be carried out by contractors, supported by our warden and volunteers. We successfully bid for £7904.11, which represented 70% of the total project cost. The project began in August 2024 and was completed in February 2025. The balance of funds came from KCT's own financial reserves, including £2500 from The Benefact Group's Movement for Good Award which we received in 2023.

Project Aims

The main aims of the project were to improve our understanding of vertebrate species within the lake, restore grassland habitat through installation of a new waterpipe, trial coir rolls to prevent erosion of the western island, pollard willows on the eastern island to prevent future damage, and use the brash from the pollarding to create new habitat for crayfish and fish fry in the lake. Advice was taken from Worcestershire Wildlife Trust, Aquatic Solutions (regarding the water pipe) and Nature Metrics (regarding eDNA tests) while designing the project.

The project focussed on the following.

1. Carrying out eDNA tests using water samples from the lake, to test for White-clawed Crayfish and Vertebrates (samples to be collected by volunteers, tests to be done by Nature Metrics).
2. Installing a new water pipe between the Lagoon and the main lake (KCT Warden and contractors to carry out scrub clearance along bund before installation, pipe installation to be completed by contractors).
3. Installing pre-planted coir rolls along the eastern edge of the western island to control erosion (contractors to install coir rolls).
4. Pollarding up to 50% of willows on the eastern island (contractors to carry out pollarding).
5. Creating brash bundles for crayfish and adding them to deepwater areas (volunteers to create brash bundles from willow cuttings, contractors to add the bundles to the lake).
6. Using eDNA data to make decision on whether to restock lake with silver fish such as Roach and Rudd.

Overview of Works

Project works commenced in August 2024 and the final works were completed in January 2025 (see Appendix A – Photo Montage).

In early August Project Manager Kate Aubury ordered the coir rolls and eDNA tests and booked the water pipe installation works. She also wrote an eDNA testing protocol with input from Nature Metrics, supplier of the tests, and organised volunteers to carry out the sampling. Kate also publicised the project on Facebook.

On 24th August Project Manager Kate Aubury supervised the eDNA sample collection at the lake. Chairman of the Governors Matthew Darby and 10 KCT volunteers joined her to collect samples from 5 areas of the lake (north shore, south shore, east shore, west edge by boat & open water/islands by boat), with up to 2.5 litres of water collected from multiple points in each area. After collection, each sample was filtered and the sediment captured labelled and sent off to Nature Metrics. Kate publicised the eDNA sample work on Facebook.

In September, Project Manager Kate Aubury liaised with Landowner Kemerton Estate and contractors CRC Ecology over the logistics of the coir roll installation at the lake, specifically moving the heavy rolls from the delivery point to the north shore. Kemerton Estate kindly agreed to take delivery at the farmyard and use a farm tractor to move the coir rolls into position. The coir rolls arrived on 27th September, were moved to the north shore, and our contractors then carried them into the shallows of the lake to keep them wet until installation could start the following week. On the same day, our contractors did some scrub clearance along the Lagoon bund to prepare for the water pipe installation.

In early October, the coir rolls were installed along the eastern edge of the Western Island by our contractors. Project Manager Kate Aubury marked up the location of the new water pipe on the bund, with input from Chairman Matthew Darby, and the height of the new pipe was agreed after checking the water levels data our volunteers had gathered earlier in the year. Warden John Threadingham also carried out some final scrub clearance on the exact line of the new pipe ahead of the installation.

On 16th October, Aquatic Solutions carried out the installation of the new water pipe, including cutting a splay in the reedbed in the Lagoon to create a clear area around the pipe inflow. The cut reeds were piled up neatly on a selected spot to create a habitat pile. Before the installation began, Project Manager Kate Aubury photographed the flooded section of limestone grassland, which had remained boggy throughout the summer and was, after recent rainfall, again in full flood. A week after the new pipe was installed, the area had drained and dried up and monitoring throughout the winter has confirmed that the new pipe is working well, and the area has remained dry despite the wet weather.

Our eDNA reports arrived at the end of October (see Appendix B – eDNA Test Results for a summary). The tests confirmed the presence of Roach (which was not picked up on the electro-fishing in 2022) but White-Clawed Crayfish was not detected, which was disappointing. It was noted that the sampling had been done at the very end of the preferred test window, which may have affected the results. No amphibians were detected either, but again, doing the tests earlier in the year might have increased the likelihood of a positive. Nature Metrics notes that '*Not detecting a species does not always mean that the species was absent. Different species shed DNA at different rates; although eDNA can be detected at very low concentrations, organisms that shed large amounts of DNA are more likely to be detected than organisms that shed very small amounts of DNA. eDNA from different species also breaks down at different rates, meaning some species can be detected for longer periods than others after they were physically present. Furthermore, eDNA breakdown can be accelerated by environmental factors (e.g., temperature, pH, salinity), and eDNA can be diluted and transported in turbulent water systems or remain highly localised in still water systems'*. All samples included Three-spined Stickleback, which based on both the electro-fishing data and eDNA test results, confirms it is our most numerous fish in the lake. Coot was detected in all 5 samples too, which given their high numbers was not a surprise. One unexpected result was the detection of Grey Squirrel in the south shore sample.

In December, CRC Ecology began pollarding 40% of the Willow on the Eastern Island. The works took a week, with the larger logs moved by boat to the shore and stacked for later use, the brash stacked on the island ready for making bundles, and the remaining trimmings burned in-situ.

On 4th January, KCT volunteers, supervised by Project Manager Kate Aubury, rowed out to the Eastern Island and made brash bundles using twine and the cut brash. A large stone was added to the middle of each bundle (Cotswold stone donated by Kemerton Estate). Twenty bundles were created and stacked neatly on the island.

On 14th January, CRC Ecology returned to move the brash bundles from the island to deep water, to create habitat for the crayfish and fish fry. Unfortunately, after a cold spell the lake was still frozen over, but the hardworking team used an axe to cut a channel for the boat out to the island and then to the deep water. When the first bundles were added to the lake it was discovered that the stones were not heavy enough and they floated instead of sinking. Project Manager Kate Aubury quickly sourced some larger stones (from again by Kemerton Estate), and the contractors added them to the bundles before dropping them into the water. With the additional heavier stone, the bundles sank as intended.

In late January, an article about the project was included in KCT's Kemerton Clippings newsletter.

In February, the completion of the project was publicised on Facebook.

Project Results

Our project was completed on time and on budget.

The eDNA tests were carried out successfully and the reports have been used to consider whether to restock the lake or not. Based on the data, as well as our field observations and informal discussions with the Environmental Agency, the Trust feels that there are adequate fish stocks and that adding additional fish at this stage would be costly and risky to the existing ecosystem.

The new water pipe was installed successfully and within one week the flooded areas had dried up. The pipe has been running well all winter, and the previously flooded grassland has remained dry despite heavy deluges.

The coir rolls were installed successfully on the eastern margin of the western island but as water levels in the main lake reached their highest point over the winter, the rolls became almost entirely submerged, which unfortunately limits their effectiveness in preventing wave action erosion. It is likely that some of the aquatic plants pre-planted within the rolls will not survive the immersion either.

Forty percent of the willows on the eastern island were pollarded successfully to a height of 5 foot in autumn/winter 2024. The larger logs were moved to the shore by boat and stacked ready for collection later. The brash created was used for the brash bundles, and the remaining trimmings were burnt in-situ.

Twenty brash bundles were created using the trimmings from the willow pollarding and successfully dropped into deep water in the lake to create additional habitat for the crayfish and fish fry.

Our volunteers were involved throughout the project and those who took part in the eDNA sample collection thoroughly enjoyed it and learnt new skills in the process.

The Future

As part of the project, we updated our existing management plan for the site to include management of the new waterpipe and continuing the eastern island pollarding (the remaining willow will be pollarded in two more tranches in winter 2025 and winter 2026).

The reedbeds on either side of the new waterpipe inflow will be cut back annually if necessary to ensure a clear area around the mouth of the pipe, which should prevent the pipe from getting blocked up.

We will continue to monitor the fish situation in the lake and take steps to restock if the data suggests fish stocks have become unsustainable.

We plan to carry out further crayfish eDNA tests over the next 2-3 years, at a more optimal test time, to gather more data on their presence/absence. If additional tests confirm the population has been lost, we will look at options to relocate more crayfish to the lake. If their presence is confirmed, we will continue adding more brash bundles/other crayfish habitat to the lake over time to support the population.

We will monitor the effectiveness of the coir roll erosion control, including whether the plants included in the rolls survive and flourish, over the next 12 months before making a decision on whether to use them on the other islands or consider a different method such as nico-span.

Acknowledgements

Kemerton Conservation Trust would like to thank the UK Shared Prosperity Fund through the Natural Networks programme delivered on behalf of Wychavon District Council for generously supporting this project and making it possible. We would also like to thank Movement For Good from The Benefact Group for their generous award to the Trust in 2023, half of which was put towards this project.

We would also like to thank all those who assisted in the delivery of the project, including our Warden John Threadingham, our hardworking work party volunteers, and Kemerton Estate for donating both staff time and equipment to deliver the coir rolls and the Cotswold stone for our brash bundles. Finally, we would like to thank our contractors; Aquatic Solutions who installed the new waterpipe, and CRC Ecology who carried out all other habitat management works, and to a high standard.

Funded by
UK Government