NEPCOTE GREEN POND

POND SURVEY

A biological report for

Findon Parish Council

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1. Introduction

Small ponds play a crucial role in the environment by providing habitats for a wide range of species, including aquatic plants, amphibians, insects, and birds, contributing to the maintenance of local biodiversity (Williams 1997). Additionally, they provide essential functions such as water storage, flood management and are also vital for carbon sequestration, acting as temporary reservoirs for organic matter (Strayer 2003). There is now a growing recognition of the critical importance of protecting and managing small freshwater bodies to maintain biodiversity and a healthy ecosystem in any landscape (Hill *et al.* 2016).

The pond on the north-west corner of Nepcote Green has recently undergone conservation work including extensive deepening, and the insertion of an artificial liner which has improved its water holding qualities. Prior to this improvement, the pond had been dry with occasional seasonal inundations for a number of years. Previous surveys of this site had taken place in 2014 and again in 2020 when the pond only held water for a number of weeks or months and was very taxa impoverished as a result.

The pond was evaluated using the structure of PSYM (Predictive System for Multimetrics), the standard methodology for assessing the ecological quality of ponds (Environment Agency, 2002). Here the assessment was made using only the macro-invertebrate species. PSYM uses three invertebrate metrics representing important indicators of ecological quality.

The three invertebrate family-level metrics are:

• Average Score Per Taxon (ASPT, an estimation of biological water quality based on the sensitivity of different invertebrate families to organic enrichment)

• diversity of dragonfly, damselfly and alderfly families

• diversity of water beetle families

This survey was performed on 24th June 2025, based on a timed sample with effort divided equally between each meso-habitat present within the pond (e.g. submerged vegetation, open water, floating-leaved vegetation). PSYM requires identification of invertebrates to family level only, but in this survey specimens were identified to species level wherever possible.

Environmental data that was obtained for this pond included: surface area, altitude, grid reference, water pH, presence/absence of inflows, substrate composition, degree of shade, accessibility to livestock and cover of emergent vegetation.

The PSYM software compares the observed data with values predicted from a large reference dataset of undegraded ponds. PSYM predicts how a high quality pond with similar attributes should score for each metric, and compares the predictions with the survey.

The scores for individual metrics are combined to produce an Index of Biotic Integrity (IBI), which provides an overall indication of the ecological quality of the pond. Ponds can then be categorised as Very Poor, Poor, Medium and Good. PSYM results are provided in Appendix 2 and summarised briefly for the relevant ponds in section 4.4 below.

2. Details of Pond Surveyed

The Nepcote Green pond is an irregular circle in shape, approximately 18m in diameter. The profile is stepped with shallow marginal areas on one side and a deeper off-centre area approximately 1.6m deep. The water holding qualities have been enhanced with a thick plastic lining and this has now been covered with a deep sediment layer. Conservation took place during the summer of 2024, this resulted in significant disruption to the sediment layer. There is a single water inflow fed by runoff from surrounding fields, which passes through a water filter. The pond is part-shaded by overhanging sallows (15% to 20% surface area) and has an extensive surface coating of duckweed (Lemnoideae) which covered 95% to 98% of the surface at time of surveying, indicating a nutrient rich environment.

3. Method

Invertebrate sampling was carried out in line with the guidelines of the National Pond Survey Methodology (Biggs *et al.* 1998). Invertebrates were captured using a standard pond net with a

frame-size of 250mm x 250mm and a 1mm gauge mesh. The pond was sampled using six 30 second sweeps spread across different microenvironments within the pond. One sweep was made of pond margins in clear water, two sweeps from the pond centre on the surface and at depth. Two further sweeps were performed in and around any standing vegetation. The final sweep of the pond incorporated samples of sediment. All sweeps were aggregated into one holding container except for the final sediment sweep which was kept separate for detailed investigation to avoid clouding the remaining sample water. After all sweeps were complete a final review of the pond surface and shore was made to capture any larger or active surface invertebrates that may have been missed. All specimens were identified live and released at site, with the exception of one coleoptera specimen which was euthanised for later detailed identification. No amphibians were caught during the survey.

4. Results

4.1 Water Chemistry

Water samples taken before the invertebrate survey, were tested for O_2, pH and electrical conductivity (a measure of solute content) using a calibrated laboratory standard meter. Two water samples were taken from different points in the pond (margin and central).

As might be expected on chalk bedrock the water was moderately alkaline (pH 7.8 to 8.2, mean = 8.0). Conductivity levels were surprisingly low (36 µS/cm^{-1} for both samples). This conductivity reading is unusually for a pond in a semi-urban/agricultural landscape, where enrichment of pond catchments tends to elevate conductivity readings, often to levels >200 µS/cm.

Oxygenation levels were reasonably good (O_2 8.4 to 11.7 mg/L, mean 10.05 mg/L). Generally, oxygen concentrations above 5-6 mg/L are considered healthy for a diverse range of pond life, including invertebrates; this indicates a good balance of oxygenating plants are present.

4.2 Invertebrates

A total of 15 aquatic macro-invertebrate taxa were recorded (Appendix 1). Species were identified from all major aquatic invertebrate groups except for Trichoptera (caddis flies) and Oligochaeta (worms), where no individuals were present in the samples. All species captured were relatively common or widespread, and no rare or species of conservation concern were identified. Only one species of beetle was identified (*Hygrotus inaequalis*) which is unusually low for a pond of this size, although they were present in large numbers.

Odonata (Dragonflies/Damselflies) were represented by larvae of a single species (*Enallagma cyathigerum*), although adults of two additional species were observed feeding at the site during a preliminary visit on 17th June. (*Coenagrion puella* and *Anax imperator*)

Species of Hemiptera (water bugs) were well represented with Notonectidae (backswimmers), Corixidae (water boatmen) and Pleidae (lesser water boatmen) present in large numbers.

Diptera (true flies) were also well represented with three distinct taxa, including Chaorboridae (phantom midge) and two species of Chironimidae (plumed gnat)

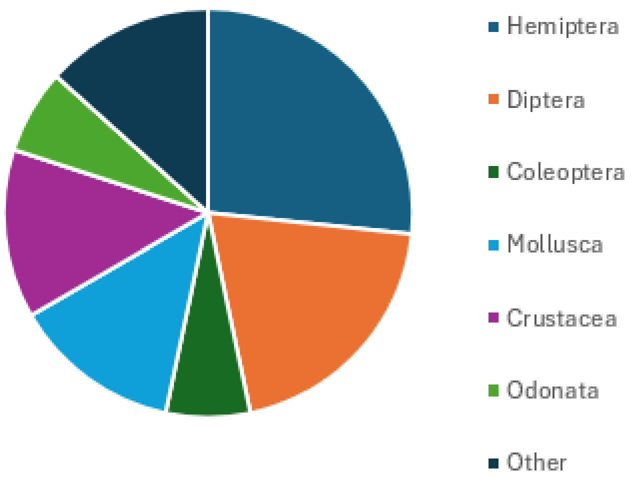

Figure 1: Taxonomic composition of the aquatic macro-invertebrate fauna in Nepcote Green pond sampled by hand-netting showing number of taxa identified.

When compared with the 2014 and 2020 surveys there has been a significant increase in the number of taxa (Figure 2). This reflects the greater environmental complexity and the increased period that the pond is currently inundated; providing an improved environment for species requiring longer durations for their young to develop.

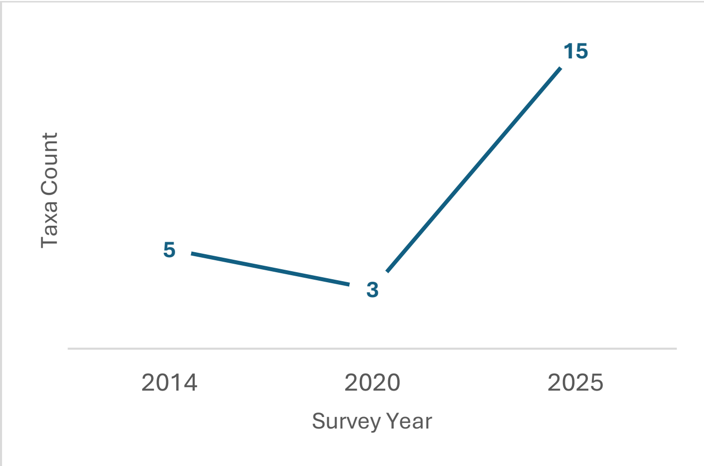

Figure 2: Comparison of taxonomic richness between three survey periods 2014 to the present (2025) for aquatic macro-invertebrate fauna in Nepcote Green pond.

4.3 Vertebrates

No amphibians were captured or observed during this survey period. As this pond has been dry for a number of years it is assumed frogs and newts will be attracted to it in future years and surveying in spring may be more productive.

No waterfowl were observed during the survey period.

No fish were captured during the survey period. For a pond of this size it is strongly recommended that fish are not introduced, as this will have a detrimental effect on the growing invertebrate populations.

4.4 PSYM Assessment

The IBI score (Index of Biological Integrity) for this pond was Poor at 44% although this is not unusual for a recently restored pond which has been subject to significant disruption in the last two years. The expectation is that this rating will increase in the next year and the IBI score will be uplifted to Moderate (IBI > 50%)

Similarly the diversity of water beetle and damselflies, dragonflies families was lower than expected at one family each.

Poorer than expected results for Odonata are probably due to a range of factors including the lack of marginal and emergent vegetation, this will again develop as the vegetative complexity increases.

5. Conservation Management Observations

Nepcote Green pond has been carefully conserved using good construction practices to ensure shallow border areas, filtration of inflowing water, planting of some marginal plants and inclusion of oxygenating macrophytes. The water quality appears to be good with acceptable levels of oxygen to promote wildlife, low conductivity levels, while the pH is unlikely to deter dispersing species. The levels of nitrates and phosphates were not assessed during this survey.

The level of duckweed (Lemnoideae) covering the water surface is problematic and indicates possible eutrophication of the water. A nutrient rich environment may result from the initial disturbance when the pond was first lined, or may result from nutrient rich runoff feeding into the pond. Testing the water and inflow for high nitrogen or phosphate levels may help inform future actions. Meanwhile physical removal of duckweed should be continued.

This pond is still at an early stage of development and maturing well. The conservation work has improved the water holding qualities so that the pond is inundated all year round. Pond permanence has a recognised positive correlation with the richness of invertebrate taxa (Wiliams 1997), and this can clearly be seen here, where the number of taxa has trebled since the work was completed on the pond.

The number of taxa at 15 is average for a pond of this size and it is hoped that this will increase over the next few years to approximately 20+ as the pond matures. The number of predatory species including Dytiscidae (diving beetles), Coenagridae (damselflies) and Notonectidae (backswimmers) is high, indicating a good source of prey species and a developing ecosystem. The amount of duckweed may be deterring some dispersing species and surface hunters such as Gerridae (pond skaters) and it is expected that these species may increase as the duckweed comes under control.

The key metrics from PSYM are not very high at present with the Average Score Per Taxon relatively low at 4.1 with few rare or highly scoring BMWP taxa (Biological Monitoring Working Party score). Similarly, the number of Odonata and Coleoptera species was comparatively low at one taxa each. However, it should be noted that this is a relatively isolated pond recently conserved, and it should be expected that these numbers will grow over the following years.

Certainly it would be expected that the number of beetles will increase as the vegetative complexity of the pond develops as there is a recognised relationship between vegetative complexity and coleoptera diversity (Hill *et al*. 2023).

The installed netting dog barrier should be maintained at regular intervals to avoid incursion from dogs as Nepcote Green is frequently used for dog exercise. Apart from the physical disturbance from dogs entering the water, water-soluble insecticide flea treatments are known to have a detrimental impact on aquatic biological systems (Perkins *et al.* 2021).

Fish species should not be introduced to a pond of this size, as they are likely to have a significant negative impact on invertebrate populations.

While waterfowl are likely to visit the pond they should probably not be encouraged by providing permanent roosting areas or duck houses in a pond of this size. While they do consume duckweed they are unlikely to consume it fast enough to act as an effective control measure, and their droppings will increase the nutrient levels in the water and may make the problem worse.

Overall, the trajectory for Nepcote Green pond is promising. Continued monitoring and adaptive management will be essential to support ecological succession, allowing both flora and fauna to establish more robust communities. Encouraging a diversity of native macrophytes and maintaining a mosaic of open water and vegetated areas should facilitate further colonisation by invertebrates and amphibians. Regular assessment of nutrient levels may help to monitor future eutrophication and avoid an associated decline in water quality.

As the pond matures, community involvement in ongoing maintenance and citizen science monitoring could enrich understanding of the pond's dynamics and foster stewardship. Over time, these efforts will not only nurture biodiversity within the pond but also enhance its value as a local ecological asset and educational resource.

6. References

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Appendix 1 – List of taxa identified during pond survey in Nepcote Green pond on 24th June 2025

Family	**Taxa**
Notonectidae	*Notonecta glauca*
Corixidae	*Corixa punctata*
Corixidae	*Corixa panzerii*
Chaorboridae	*Chaoborus spp.*
Baetidae	*Cloeon dipterum*
Physidae	*Physa hypnorum*
Planorbidae	*Planorbis corneus*
Pleidae	*Plea minutisima*
Dytiscidae	*Hygrotus inaequalis*
Chironimidae	*Tanypodinae spp.*
Chironimidae	*Ortocladinae spp.*
Asellidae	*Ascellus aquaticus*
Hydrachnidae	*Arrenurus spp.*
Coenagrionidae	*Enallagma cyathigerum*
Sididae	

Appendix 2 – Predictive System for Multimetrics (PSYM) results for Nepcote Green pond

Results	
ASPT	
Predicted (ASPT)	5
Actual (ASPT)	4
EQI (ASPT)	1
IBI (ASPT)	2
Odonata + Megaloptera (OM) families	
Predicted (OM)	3
Actual (OM)	1
EQI (OM)	0
IBI (OM)	1
Coleoptera families	
Predicted (CO)	4
Actual (CO)	1
EQI (CO)	0
IBI (CO)	1
Sum of Individual Metrics	4
Index of Biotic Integrity (%)	**44%**