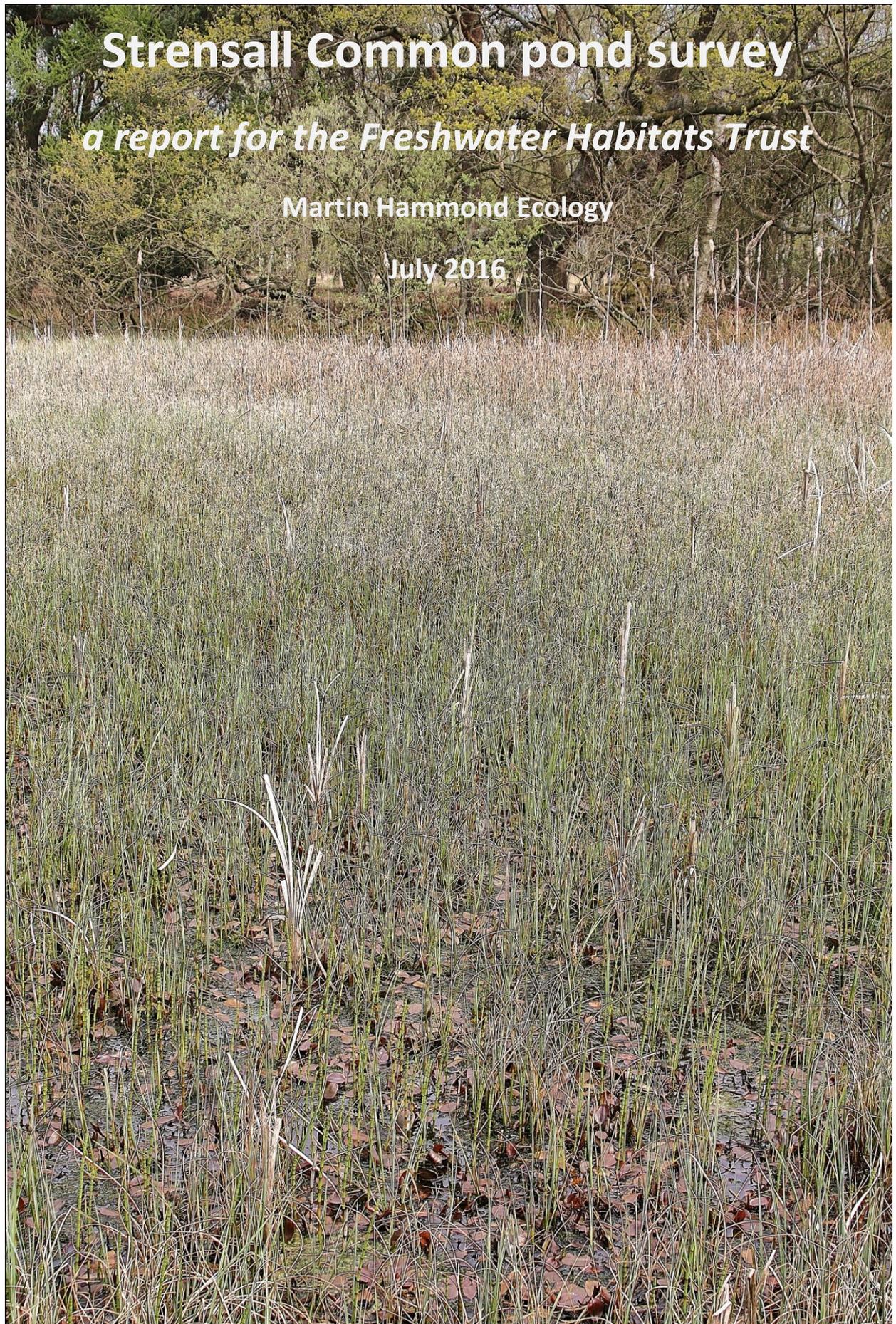


Strensall Common pond survey

a report for the Freshwater Habitats Trust

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1. Introduction

Strensall Common has been identified as a Flagship Pond site by the Freshwater Habitats Trust due to its exceptional importance for freshwater biodiversity. The Common is a 579 hectare Site of Special Scientific Interest (SSSI) in the Vale of York, designated as an extensive example of lowland heathland. It is also notified as a Special Area of Conservation (SAC) for its wet and dry heath features. There are numerous ponds and pools on the Common, the oldest probably originating as peat cuttings and clay pits. Others have been created during the period of military occupation from the 1880s onwards, including several excavated in recent years for conservation purposes. Ecological information on these ponds is limited.

This survey focussed on three ponds: Kidney Pond, Pillwort Scrape and Crossley's Pond. Kidney Pond and Pillwort Scrape were sampled in spring to obtain a representative list of aquatic macro-invertebrates since many 'fen' species are most readily collected in spring. All meso-habitats within each pond were sampled using a long-handled net until no further taxa could be recognised in the net. All three ponds were then surveyed in early summer using PSYM, the standard methodology for assessing the ecological quality of ponds (Environment Agency, 2002).

PSYM (**P**redictive **S**ystem for **M**ultimetrics) uses six 'metrics' (measurements) representing important indicators of ecological quality. The three botanical metrics are:

- diversity of emergent and submerged plant species
- the number of uncommon species
- Trophic Ranking Score (TRS, an indication of nutrient status based on selected plant species)

The three invertebrate family-level metrics are:

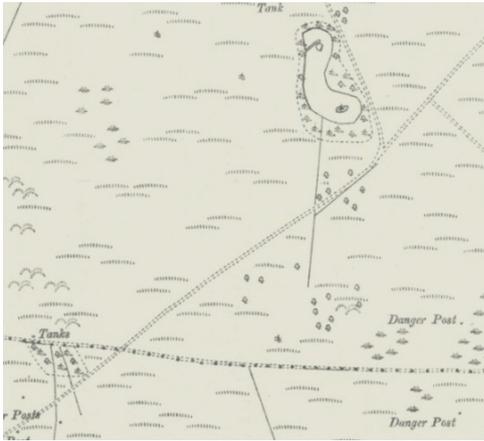
- Average Score Per Taxon (ASPT, an estimation of biological water quality based on the sensitivity of different invertebrate families to organic enrichment)
- diversity of dragonfly, damselfly and alderfly families
- diversity of water beetle families

Environmental data obtained for each pond include: 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 results. 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 1 and summarised briefly for the relevant ponds in section 2 below.

2. The ponds surveyed

Kidney Pond (SE 650 597)



Kidney Pond is located near the centre of the Common. Its origins are uncertain: the earliest OS 6" map indicates a large pond in an area called Swizzen Carr but its position is slightly different from the present-day pond. The 1909 revision (extract opposite) shows the pond in its present form. The 1930 6" map (revised 1928) indicates half the pond was by then 'marsh'.

While a crescent-shaped area of open water has been maintained or reinstated at its south-eastern end, this only constitutes about 5% of the pond area. Broad-leaved Pondweed *Potamogeton natans* grows in the open water with pools in the margins supporting Common Duckweed *Lemna minor*, Least Duckweed *L. minuta*, Floating Crystalwort *Riccia fluitans* and, locally, Translucent Stonewort *Nitella translucens*. These pools are situated within stands of mixed emergent vegetation including rushes, Gipsywort *Lycopus europaeus*, Water Mint *Mentha aquatica*, Water Forget-me-not *Myosotis scorpioides* and Tubular Water-dropwort *Oenanthe fistulosa*. Marsh Stitchwort *Stellaria palustris* is occasional.

The majority of the basin is occupied by a quaking raft of Bottle Sedge *Carex rostrata* – Spiky Bog-moss *Sphagnum squarrosum* mire. Within this matrix there are pools supporting Delicate Stonewort *Chara virgata*, Greater Bladderwort *Utricularia vulgaris* and Bog Pondweed *Potamogeton polygonifolius*. Marsh Cinquefoil *Potentilla palustris*, Grey Club-rush *Schoenoplectus tabernaemontani* and Greater Reedmace *Typha latifolia* are locally frequent within the raft while Bogbean *Menyanthes trifoliata* occurs near the northern end of the pond. In a few places, acidic hummocks occur with Flat-topped Bog-moss *Sphagnum fallax*, Fringed Bog-moss *S. fimbriatum*, Bog Bead-moss *Aulacomnium palustre* and Common Haircap Moss *Polytrichum commune*. There are also more basiphilous bryophytes at the edges of the raft such as Heart-leaved Spear-moss *Calliergon cordifolium* and Kneiff's Hook-moss *Drepanocladus aduncus*.

Table 1 shows physico-chemical readings obtained during the present survey. These show variations of 0.84 pH point and 110 $\mu\text{S}/\text{cm}^{-1}$ conductivity within the pond on the same date. Mean pH from the six readings was 6.42 and mean conductivity was 133 $\mu\text{S}/\text{cm}^{-1}$. The data show that Kidney Pond has slightly acidic water with low solute content but both pH and conductivity are considerably higher than would be expected in an acidic bog-pool system. No nitrate or soluble reactive phosphate could be detected using a simple semi-quantitative test kit on 6th May.

| Date/location | water pH | electrical conductivity ($\mu\text{S}/\text{cm}$) |
|--|----------|---|
| 22/4/16 | 6.52 | 140 |
| 6/5/16 (pool with <i>Chara virgata</i> , north-centre of pond) | 6.61 | 150 |
| 6/5/16 (<i>Sphagnum</i> hummocks, N end of pond) | 6.19 | 100 |
| 6/5/16 (floating mat with <i>Sphagnum squarrosum</i> & <i>Carex rostrata</i>) | 6.09 | 80 |
| 6/5/16 (pool near E edge of floating mat) | 6.95 | 190 |
| 24/6/16 | 6.22 | 140 |

Table 1: physico-chemical data for Kidney Pond

Aquatic invertebrates were sampled on 21st April, 6th May and 24th June with 79 taxa recorded in total (67 in the PSYM sample collected on the last date). Species of conservation concern included Mud Snail *Ompshicola glabra*, the burrowing water beetle *Noterus crassicornis*, the diving beetle *Hygrotus decoratus*, the scavenger water beetles *Helophorus strigifrons* and *Helochares punctatus*, the moss beetle *Limnebius aluta* and the caddis fly *Trichostegia minor*.

PSYM assessment produced an Index of Biotic Integrity of 89% for Kidney Pond, placing it within the top (**Good**) category of ecological quality. It scored highly for five of the six metrics but poorly for representation of damselfly, dragonfly and alderfly families. Given the densely-vegetated nature of the pond, and the difficulty in sampling the open water habitat at the southern end, the poor representation of Odonata is to be expected.

Pillwort Scrape (SE 650 594)



Located close to Kidney Pond, the Pillwort Scrape is an open, shallow pond excavated in 2012. It has non-acidic water of low solute content: a water sample collected on 22nd April produced a pH reading of 7.08 with electrical conductivity of 100 $\mu\text{S}/\text{cm}^{-1}$. A second sample collected on 24th

June gave a pH of 7.63 with conductivity of 150 $\mu\text{S}/\text{cm}^{-1}$.

The wide draw-down zone around the pond supports patchy, open vegetation with locally-abundant Pillwort *Pilularia globulifera* and Floating Club-rush *Eleogiton fluitans*. Associated species include Bulbous Rush *Juncus bulbosus*, Common Yellow Sedge *Carex demissa*, Bog Pimpernel *Anagallis tenella*, Lesser Spearwort *Ranunculus flammula* and, very locally, Lesser Water-plantain *Baldellia ranunculoides*. More patchy stands of taller vegetation feature Sharp-flowered Rush *Juncus acutiflorus*, Common Marsh Bedstraw *Galium palustre*, Marsh Speedwell *Veronica scutellata* and Marsh Stitchwort *Stellaria palustris*. At the south-west end of the scrape, there are signs of base-enrichment with flush-like vegetation featuring Carnation Sedge *Carex panicea*, Flea Sedge *C. pulicaris*, Fen Bedstraw *Galium uliginosum* and Marsh Valerian *Valeriana dioica*. Open water contains patches of Bog Pondweed and Small Pondweed *Potamogeton berchtoldii*.

Invertebrates were collected on 21st April with the PSYM sample collected in 4th June. Sixty seven taxa were recorded in total (52 in the PSYM sample). Species of conservation concern included Mud Snail, the burrowing water beetle *Noterus crassicornis*, the diving beetle *Hygrotus nigrolineatus* and the scavenger water beetle *Helochaers punctatus*.

PSYM assessment gave Pillwort Scrape an Index of Biotic Integrity of 94%, placing it within the top category for ecological quality. It scored highly for all metrics apart from diversity of damselfly, dragonfly and alderfly families, which was moderate.

Crossley's Pond (SE 659 607)



This pond is situated in the north-east of the SSSI. It is a rare example of an apparently natural pond occupying a hollow in the topography of the Common. It shows no obvious features of being a man-made feature such as a clay-pit, stock-watering pond or a product of military activities though an old peat-cutting cannot be ruled out. As with several other water

bodies on Strensall Common, it supports a well-developed 'bog pool' flora and fauna characteristic of acidic and nutrient-poor conditions but also supports species typical of more fen-like conditions. This perhaps reflects the influence of underlying clay.

Crossley's Pond has ill-defined boundaries, almost complete vegetation cover and very little visible surface water. It could be considered a mire rather than a pond but it remains permanently water-filled, distinguishing it from surrounding wet heath. In terms of plant communities, there are extensive areas of Bottle Sedge – Flat-topped Bog-moss mire (*Carex rostrata* – *Sphagnum fallax* mire, coded M4 in the National Vegetation Classification: Rodwell, 1992); Bottle Sedge – Spiky Bog-moss mire (*Carex rostrata* – *Sphagnum squarrosum* mire, NVC M5), including stands of Common Sedge *Carex nigra*; and Bottle

Sedge swamp with Marsh Cinquefoil, sparse shoots of Water Horsetail *Equisetum fluviatile* and patches of Bog Pondweed (probably representing a species-poor form of S27 *Carex rostrata* – *Comarum palustre* tall-herb fen). There are also drier mounds dominated by Sphagna and Bog Bead-moss, and areas in which Common Reed *Phragmites australis* and Greater Pond-sedge *Carex riparia* are abundant. Noteworthy plants occurring in small amounts include Bogbean, Creeping Willow *Salix repens* and a bladderwort *Utricularia* species. Purple Moor-grass *Molinia caerulea*, Sharp-flowered Rush and Cross-leaved Heath *Erica tetralix* occur at the edges of the hollow.

Two water samples collected on 3rd June produced pH readings of 4.41 and 5.55, showing considerable variation within the pond! Both samples, however, gave conductivity measurements of just 50 $\mu\text{S}/\text{cm}^{-1}$, suggesting very oligotrophic conditions.

Aquatic invertebrates and plants were recorded on 3rd June for the PSYM survey. Forty aquatic invertebrate taxa were collected. The invertebrate fauna is characterised by bog-pool species such as Black Darter dragonfly *Sympetrum danae*; the Sphagnum Bug *Hebrus ruficeps*; the diving beetles *Agabus affinis*, *Ilybius aenescens* and *Hydroporus obscurus*; the scavenger water beetles *Hydrobius subrotundus*, *Enochrus affinis* and *Helochares punctatus*; and the reed-beetle *Plateumaris discolor*. There are, however, several species characteristic of more mesotrophic conditions including two species of conservation concern: the Mud Snail *Omphiscola glabra* and the long-toed water beetle *Dryops auriculatus*. A single specimen of the semi-subterranean diving beetle *Hydroporus ferrugineus* was difficult to account for.

PSYM assessment gave Crossley's Pond an Index of Biotic Integrity of 89%, placing it within the top (**Good**) category for ecological quality. It scored highly for wetland plant diversity and Trophic Ranking Score but poorly for representation of uncommon plants. It scored well for all three invertebrate metrics. In fact Crossley's Pond supports an excellent suite of local or uncommon wetland plants for a site in the eastern lowlands of England but most of these are relatively widespread in the north and west.

3. Results

3.1 Invertebrates

A total of 117 aquatic macro-invertebrate taxa were recorded during this survey (Appendix 2). Raw data have been provided in spreadsheet format. As is typical for shallow lowland ponds, water beetles (Coleoptera) made up well over half the taxa recorded (59%) (Figure 2). The next largest group were water bugs, making up 14% of the total.

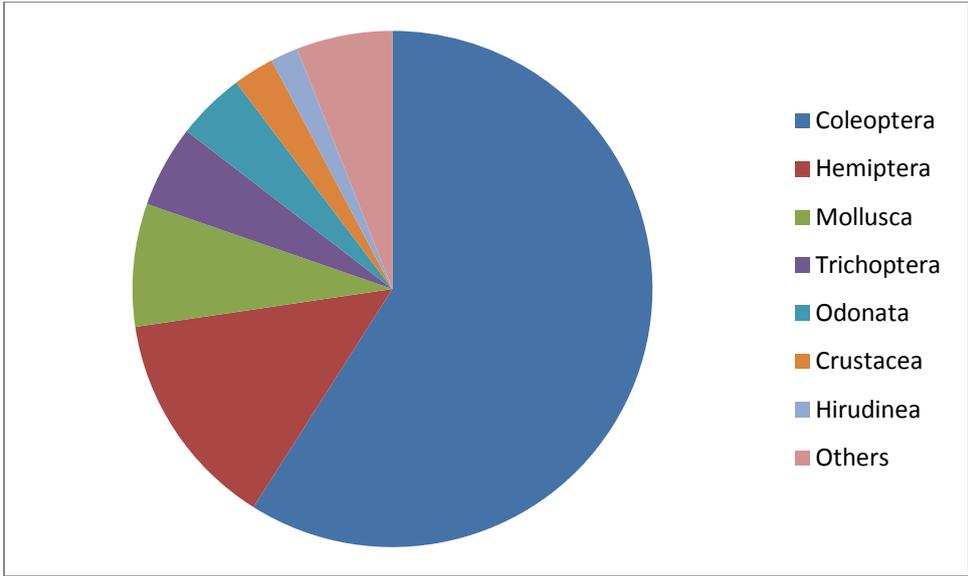


Figure 2: species diversity of aquatic-macroinvertebrate groups recorded during the survey

3.2 Vertebrates

Kidney Pond produced single adult Common Toad and Common Frog on 6th May along with three adult Smooth Newts and several Smooth/Palmate Newt tadpoles. Common Frog tadpoles were abundant, as were emerging froglets in early June. Small numbers of Nine-spined Sticklebacks were also netted. Common Lizards were observed running over the *Sphagnum* raft on 6th May and 24th June.

On 21st April, three adult Smooth Newts and hundreds of Common Frog tadpoles were found in Pillwort Scrape. Both Three-spined and Nine-spined Sticklebacks were present. Single adult female Smooth and Palmate Newts were caught during sampling of Crossley’s Pond on 3rd June.

3.3 Wetland plants

A total of 92 wetland plant species were recorded during this survey (i.e. species listed on the PSYM/NPS recording sheet plus wetland bryophytes) (Appendix 3).



Bog Pimpernel

3.4 Priority Pond Status

Priority Ponds are defined as the best ca. 20% of ponds in England and Wales based on a range of criteria. These were originally developed for the UK Biodiversity Action Plan but Priority Ponds are recognised as a Habitat of Principal Importance for conservation under Section 41 of the Natural Environment & Rural Communities Act. All three of the ponds surveyed meet multiple criteria for Priority Pond status (Table 2).

| Pond | Kidney Pond | Pillwort Scrape | Crossley's Pond |
|--|--|---|--|
| PSYM Good ecological quality | ✓ | ✓ | ✓ |
| UKBAP species/Species of Principal Importance | Mud Snail Tubular Water Dropwort, Marsh Stitchwort | Mud Snail, Pillwort, Marsh Stitchwort | Mud Snail |
| EU Habitats Directive feature | Quaking Bog | | |
| 3 or more Nationally Scarce invertebrate species | Mud Snail, <i>Noterus crassicornis</i> , <i>Hygrotus decoratus</i> , <i>Helophorus strigifrons</i> , <i>Helochaeres punctatus</i> , <i>Limnebius aluta</i> , <i>Trichostegia minor</i> | Mud Snail, <i>Noterus crassicornis</i> , <i>Hygrotus nigrolineatus</i> , <i>Helochaeres punctatus</i> , | Mud Snail, <i>Hydroporus ferrugineus</i> , <i>Helochaeres punctatus</i> , <i>Dryops auriculatus</i> ¹ |
| 1 or more Nationally Scarce wetland plants | | Pillwort | |
| 30 or more wetland plant species | 61 species | 51 species | |
| 50 or more aquatic invertebrate species | 79 taxa during this survey | 67 taxa during this survey | |

Table 2: Application of Priority Pond criteria to the three ponds

4. Species of conservation concern

4.1 Invertebrates

MOLLUSCA

Omphiscola glabra (Lymnaeidae), Mud Snail

GB status: Nationally Scarce; NERC Act Section 41 Species of Principal Importance

A distinctively elongate pond snail, closely associated with pools and pond margins in agriculturally-unimproved habitats, typically on historic Commons. This species has declined greatly, though significant populations persist in a few regions such as the New Forest and Humberhead Levels/Vale of York. There are post-1999 records from 47 hectads in Great Britain (Seddon *et al.*, 2014).

¹ The water beetles *Limnebius aluta* (Kidney Pond) and *Dryops auriculatus* (Crossley's Pond) have the status of Near Threatened, a higher conservation category than Nationally Scarce but one which was not widely used when the Priority Pond criteria were published.

² **Red List** species are those categorised as Regionally Extinct, Critically Endangered, Endangered or Vulnerable



Its remnant distribution implies that Mud Snail is much more sedentary than most of the Lymnaeidae. It avoids water bodies supporting a rich variety of aquatic molluscs, preferring those which dry out in summer or are poor in nutrients (e.g. Kerney, 1999) though the oft-repeated claim that this is a calcifuge species is misleading. A single specimen was collected from a shaded side-pool at the western edge of Kidney Pond, though it has previously been

found in good numbers in the adjoining fen. Modest numbers were found in Pillwort Scrape on two dates and eight were amongst the PSYM sample from Crossley's Pond on 3rd June.

COLEOPTERA

Noterus crassicornis (Noteridae), a burrowing water beetle

GB status: Nationally Scarce

This small, brown, bullet-shaped beetle inhabits richly-vegetated permanent water. It is well-established on Strensall Common, where it was recorded from Kidney Pond and Pillwort Scrape during the present survey. It can also be found in ponds and ditches on Towthorpe Common. Elsewhere in Yorkshire, *N. crassicornis* is known from clusters of borrow pits and better-quality drains on the Humberhead Levels, and lake-edge reedbed at Hornsea Mere. Nationally, it has a patchy distribution with centres in the Humberhead Levels/Trent Valley, the Cheshire Plain, East Anglia, the grazing marshes of south-east England and the Anglesey fens. This is a flightless species, closely associated with historic wetlands though many of its habitats are man-made water bodies on drained fenland.

Hydroporus ferrugineus (Dytiscidae), a diving beetle

GB status: Nationally Scarce



This is one of a small group of semi-subterranean dytiscids usually found in emerging groundwater in springs and headwaters; elsewhere in the country it has been collected from underground streams in cave systems and from wells. Most Yorkshire records are from the Pennines and North York Moors. A single specimen collected from Crossley's Pond on 3rd June was an unexpected find, and apparently the first for the Vale of York. Whether this was a wanderer or whether

a population might be associated with shallow groundwater nearby is open to speculation, though there are no obvious springs on the Common.

Hygrotus decoratus (Dytiscidae), a diving beetle

GB status: Nationally Scarce

This tiny but attractively-marked diving beetle is very local amongst fen vegetation in the shallow margins of ponds, peat cuttings or ditches. Its main centres in Yorkshire are Strensall and Skipwith Commons and parts of Thorne Moors. Outside our region, it occurs mainly in south-east England, East Anglia and Cheshire (Foster & Friday, 2011). During this survey, *H. decoratus* was recorded from Kidney Pond in April.

Hygrotus nigrolineatus (Dytiscidae), a diving beetle

GB status: Nationally Scarce

This striped diving beetle is a 'fugitive' species, usually found in newly-excavated permanent ponds or sand/gravel pits. It was first recorded in Britain in Kent in 1983, reached South Yorkshire by 1995, and has since been found north to Glasgow. This species is typically associated with other pioneer insects such as the dytiscids *Hygrotus confluens* and *Agabus nebulosus* and various Corixid bugs. Occupancy of specific sites is often short. Two individuals were collected from the open water of Pillwort Scrape on 4th June.

Helophorus strigifrons (Helophoridae), a scavenger water beetle

GB status: Nationally Scarce



Helophorus strigifrons is widespread but very local in fens and floodplain swamps which dry up in summer. It is not usually found in very acidic habitats. Other sites in the City of York include Heslington Tillmire, Askham Bog and the Ings at Middlethorpe, Fulford and Water Fulford. Two were collected from the edge of Kidney Pond on 21st April, when several more were found in adjoining fen; another was collected from Kidney Pond on 6th May.

Helochares punctatus (Hydrophilidae), a scavenger water beetle

GB status: Nationally Scarce

Although listed as Nationally Scarce by Foster (2010), *H. punctatus* is a localised rather than rare beetle, mostly associated with acidic bog-pools at low to moderate elevations but sometimes occurring in base-rich waters. During this survey, it was found in all three ponds.

Limnebius aluta (Hydraenidae), a moss beetle

GB status: Near Threatened

At just over a millimetre in length, *L. aluta* is one of Britain's smallest water beetles. It is associated with silty water margins in fens, usually on relict sites with a very long history of wetland conditions. Kidney Pond on Strensall Common appears to be its only surviving station in northern England: previously, single specimens have been collected there in June 1998 (M. Hammond) and June 2008 (R. Merritt); another was collected from a shaded, silty pool at the eastern edge of the pond on 21st April 2016.

Limnebius aluta was previously known from Askham Bog (a small valley fen on the western outskirts of York) in 1880-1906. Nationally, other modern records are from East Anglia, the Somerset Levels and Anglesey. Early Holocene to medieval fossil records of *L. aluta* have been reported from at least six locations in Yorkshire, indicating that it was more widely distributed in the distant past.

Dryops auriculatus (Dryopidae), a long-toed water beetle

GB status: Near Threatened

Dryops are mid-sized, very hairy, dark brown amphibious beetles. Although difficult to identify, the British species have been rather well-studied and show distinctive patterns of distribution (Foster, 1995). Only two of the seven British *Dryops* are at all widespread, the others being rare or scarce habitat-specialists. *Dryops auriculatus* is a beetle of heath and fen pools found from North Yorkshire southwards. It is, according to Foster (2010), "largely confined to natural habitats". A male specimen was collected from Crossley's Pond on 3rd June. There was a previous record from the pond in 2000 (M. Hammond det G.N. Foster), and this appears to be the only place on Strensall Common where it can be found. The only other site in Yorkshire for *D. auriculatus* is Skipwith Common, although there is an historic record from Askham Bog.

TRICHOPTERA

Trichostegia minor (Phryganeidae), a caddis-fly

GB status: Nationally Scarce

A local caddis of pools rich in leaf litter which dry out in summer. It has been recorded from 98 ten km squares in Britain since 1980 (Wallace, in prep), so only narrowly qualifies for Nationally Scarce status. Three larvae were collected from Kidney Pond on 6th May.

4.2 Plants

Species considered here include: vascular plants meriting Red List² or Near Threatened status in England (Stroh *et al.*, 2014³). Pillwort, Tubular Water Dropwort and Marsh Stitchwort are also identified as Species of Principal Importance for conservation under Section 41 of the Natural Environment & Rural Communities Act. No mosses, liverworts or stoneworts of conservation concern were recorded during the survey although Translucent Stonewort is rare in Yorkshire.

***Baldellia raunculoides*, Lesser Water-plantain**

English status: Vulnerable (GB status: Near Threatened)

This small water-plantain occurs in small amounts in the draw-down zone of Pillwort Scrape. It also grows in clay-bottomed ditches on Towthorpe Common. Lesser Water-plantain underwent a decline in distribution of 43% in England during the latter half of the 20th century (Stroh *et al.*, 2014).

***Carex echinata*, Star Sedge**

English status: Near Threatened

This small sedge remains frequent in flushes of varying trophic status in the uplands but has undergone a protracted decline in the lowlands (Preston *et al.*, 2002). It is found locally around the edge of Kidney Pond.

***Carex pulicaris*, Flea Sedge**



English status: Near Threatened

This delicate sedge is an uncompetitive species of nutrient-poor but base-enriched mires. It occurs in flush vegetation at the south-west end of Pillwort Scrape. Flea Sedge is very scarce in the Vale of York, Heslington Tillmire perhaps being its only other station.

² **Red List** species are those categorised as Regionally Extinct, Critically Endangered, Endangered or Vulnerable in relevant inventories. **Near Threatened** plants are mainly those undergoing significant declines in distribution which are not yet at risk but are liable to become so if present trends continue.

³ The recently-published vascular plant Red List for England provides a more relevant basis for conservation assessment than previous inventories covering the whole of Great Britain as many species which have stable populations in Scotland are threatened in lowland England.

***Eriophorum angustifolium*, Common Cotton-grass**

English status: Vulnerable

Common Cotton-grass is a classic example of a plant which remains locally-abundant in the uplands of northern and western Britain but has declined seriously in the agricultural lowlands: it underwent a 33% decline in its English distribution during the second half of the 20th century (Stroh *et al.*, 2014). Cotton-grass occurs sparsely on Kidney Pond and Crossley's Pond with a very small amount in the margin of Pillwort Scrape.

***Hydrocotyle vulgaris*, Marsh Pennywort**

English status: Near Threatened

A humble plant of short vegetation in water margins and wet fens which, like many species of less fertile wetlands, is undergoing a long-term decline in distribution in England. It can be found in all three ponds.

***Hypericum elodes*, Marsh St John's Wort**

English status: Near Threatened

This distinctive bog plant has been known on Strensall Common since at least 1846. Patches can be found in several places at the margins of Pillwort Scrape; it also occurs very locally on Kidney Pond. Marsh St John's Wort underwent a 24% decline in distribution in England during the latter half of the last century (Stroh *et al.*, 2014). This species is threatened by the drainage and deterioration of peatland habitats.

***Oenanthe fistulosa*, Tubular Water-dropwort**

English status: Vulnerable; NERC Act Species of Principal Importance

This perennial umbellifer grows in open waterside vegetation on circumneutral soils. Its range in England contracted by 35% during the latter half of the last century (Stroh *et al.*, 2014) due to land drainage and agricultural improvement. Tubular Water-dropwort occurs locally at the south-eastern end of Kidney Pond.



***Pilularia globulifera*, Pillwort**

English status: Vulnerable (Near Threatened in Great Britain as a whole); NERC Act Species of Principal Importance

This delicate fern-relative is poor at competing with more vigorous vegetation and its English range declined by 42% during the

second half of the 20th century (Stroh *et al.*, 2014). A large and important population occurs around the edge of Pillwort Scrape. Pillwort was first recorded on Strensall Common in 1881 (Watson & Ali, 2014).

***Potentilla erecta*, Tormentil**

English status: Near Threatened

Another common upland species which is restricted to a diminishing number of unimproved grasslands, heaths and fens in the lowlands. Recorded from drier habitats at the margins of all three ponds.

***Ranunculus flammula*, Lesser Spearwort**

English status: Vulnerable

Although still widespread and locally frequent, Lesser Spearwort underwent a 32% decline in distribution in England during the latter half of the last century (Stroh *et al.*, 2014). It was recorded as occasional at Kidney Pond and frequent in the margins of Pillwort Scrape.



***Stellaria palustris*, Marsh Stitchwort**

English status: Vulnerable; NERC Act Species of Principal Importance

The English range of this delicate fen herb has declined by over 30% (Stroh *et al.*, 2014). Plants of Marsh Stitchwort are scattered around the margins of Kidney Pond with a few also on the floating fen. It grows in several places around the edges of Pillwort Scrape.

***Valeriana dioica*, Marsh Valerian**

English status: Near Threatened

This small herb is associated with fen-meadows and seepages on base-enriched soils. Its English range has been reduced by around 25% (Stroh *et al.*, 2014). Marsh Valerian occurs in flush-like vegetation at the south-west end of Pillwort Scrape, with Flea Sedge, Carnation Sedge *Carex panicea* and Fen Bedstraw *Galium uliginosum*.

***Veronica scutellata*, Marsh Speedwell**

English status: Near Threatened

A moderately declining species of water-margins on poorer soils, Marsh Speedwell is occasional at Kidney Pond and Pillwort Scrape.

5. Implications for conservation management

Kidney Pond arguably supports the best and most extensive example of Bottle Sedge – Spiky Bog-moss mire in lowland Yorkshire. This conforms well to the ‘transition mires and quaking bogs’ habitat listed in Annex I of the EU Habitats Directive and it is unfortunate that this feature is not mentioned in the SAC citation for Strensall Common.

The ontogeny and future development of the floating fen on Kidney Pond is uncertain. Theoretically, floating mires provide a ‘short cut’ to development of raised bog, where a dome of *Sphagnum* mosses develops above the level of the water table and becomes fed primarily by rainfall. However, the ‘bog building’ *Sphagna* such as Imbricate Bog-moss *S. imbricatum* are no longer present in lowland England so we don’t really know how quaking mires will develop in future. It seems likely that mounds of Flat-topped Bog-moss *Sphagnum fallax*, topped by Fringed Bog-moss *S. fimbriatum* and Bog Bead-moss *Aulacomnium palustre* will continue to expand slowly. These may eventually become colonised by vascular plants such as Cranberry *Vaccinium oxycoccus*, Round-leaved Sundew *Drosera rotundifolia* and Hare’s-tail Cotton-grass *Eriophorum vaginatum*.

Providing the Kidney Pond basin remains wet enough, the priority should be to maintain the quaking mire in favourable condition. This should allow for the development of raised mounds provided these do not completely occlude more aquatic features such as stonewort pools within the fen matrix. Removal of any encroaching scrub should be ongoing, though shaded pools at the edges of the basin provide a distinct habitat supporting several species of conservation concern not found on the floating fen (e.g. Mud Snail and the water beetles *Helophorus strigifrons* and *Limnebius aluta*).

The creation of open pools within the *Sphagnum* raft has sometimes been mooted as a way of maintaining a range of successional stages. While this would not necessarily be harmful on a very small scale, it is questionable whether removal of a nationally rare habitat (floating fen) to create a common one (open water) can be justified. It might be more appropriate to create pools or small ponds within the increasing dry fen adjoining Kidney Pond. However, careful removal of vegetation and sediment from the existing open-water habitat at the south-eastern end of Kidney Pond is unlikely to do harm if this is considered a priority.

While there is little indication of changing water levels within the pond, the fen to the west and south-west has become noticeably dehydrated in recent years. Previously, much of this was tall Common Reed *Phragmites australis* swamp with standing water for much of the year. It supported breeding Water Rails, Reed Warblers and a large Water Vole population as well as a flora including Marsh Stitchwort, Purple Small-reed *Calamagrostis canescens* and, very locally, Slender Sedge *Carex lasiocarpa*. Reed growth is now stunted and the habitat is surface-dry much of the time. This follows the excavation of a ditch draining in a southerly direction (Figure 3, below) in 1999 or 2000. As this could affect the hydrological

integrity of Kidney Pond itself, Defence Estates and Natural England should be encouraged to investigate.



Figure 3: ditch removing water from Kidney Pond fen

The **Pillwort Scrape** is in excellent condition at present. Grazing and trampling of the extensive draw-down zone is essential to maintain suitable conditions for Pillwort and associated species. Dense growth of tall rushes, sedges or grasses around a large part of the pond margin would be detrimental: an 'acceptable limit' (e.g. 50%) should be defined and intervention triggered if this is exceeded. Cattle grazing is likely to be a more sustainable means of maintaining short, patchy vegetation than sheep grazing alone. If grazing alone is insufficient to maintain favourable conditions, it may be necessary to consider rotational clearance of 'pie slices' of the draw down zone using a digger bucket or bulldozer blade.

Crossley's Pond is likely to be self-maintaining providing scrub cover is not allowed to increase significantly.

6. References

Environment Agency (2002). *A guide to monitoring the ecological quality of ponds and canals using PSYM*. Version 2. Environment Agency Midlands Region: Solihull.

Foster, G. N. (1995). Atlas of British water beetles: preliminary edition - Part 7. *Latissimus* (Supplement), **5**: 1-11.

Foster, G.N. (2010). *A review of the scarce and threatened Coleoptera of Great Britain, Part 3: water beetles of Great Britain*. Joint Nature Conservation Committee: Peterborough.

Foster, G.N., Bilton, D.T. & Friday, L.E. (2014). *Keys to adults of the water beetles of Britain and Ireland (Part 2)*. Handbooks for the Identification of British Insects, **4** (5b). Royal Entomological Society: London.

Foster, G.N. & Friday, L.E. (2011). *Keys to adults of the water beetles of Britain and Ireland (Part 1)*. Handbooks for the Identification of British Insects, **4** (5). Royal Entomological Society: London.

Kerney, M. (1999). *Atlas of the land and freshwater molluscs of Britain and Ireland*. Harley Books: Colchester.

Preston, C.D., Pearman, D.A. & Dines, T.D. (eds) (2002). *New atlas of the British and Irish Flora*. Oxford University Press: Oxford.

Rodwell, J.S. (ed) (1992). *British plant communities, 2: mires and heaths*. Cambridge University Press: Cambridge.

Seddon, M.B., Killeen, I.J. & Fowles, A.P. (2014). *A review of the non-marine Mollusca of Great Britain*. Species Status No. 17. NRW Evidence Report 14. Natural Resources Wales: Bangor.

Stroh, P.A., Leach, S.J., August, T.A., Walker, K.J., Pearman, D.A., Rumsey, F.J., Harrower, C.A., Fay, M.F., Martin, J.P., Pankhurst, T., Preston, C.D. & Taylor, I. (2014). *A vascular plant Red List for England*. Botanical Society of Britain and Ireland: Bristol.

Wallace, I.D. (in prep.) *A review of the status of the caddis flies (Trichoptera) of Great Britain*. Species Status Review for Natural England (draft version, September 2015).

Watson, P. & Ali, M. (2014). *The herbarium of William Whitwell*. Birmingham Museums: Birmingham.

APPENDIX 1: PSYM DATA

| Pond | Pillwort Scrape | Kidney Pond | Crossley's Pond |
|---|-----------------|-------------|-----------------|
| Date | 24-Jun-16 | 24-Jun-16 | 03-Jun-16 |
| Grid ref | SE650594 | SE650597 | SE658607 |
| Plant metrics | | | |
| No. of submerged + marginal plant species (not including floating leaved) | 44 | 47 | 22 |
| Number of uncommon plant species | 12 | 12 | 1 |
| TRS | 6.61111111 | 6.41 | 5.40833333 |
| Invertebrate metrics | | | |
| ASPT | 4.7894737 | 4.4666667 | 4.4 |
| Odonata + Megaloptera | 2 | 1 | 2 |
| Coleoptera | 5 | 3 | 3 |
| Environmental variables | | | |
| Altitude | 18 | 18 | 21 |
| Shade (%) | 0 | 7 | 7 |
| Inflow (0/1) | 0 | 0 | 0 |
| Grazing (%) | 100 | 0 | 100 |
| Water pH | 7.35 | 6.22 | 4.98 |
| Emergent plant cover (%) | 20 | 85 | 95 |
| Base: silt/clay (1-3) | 3 | 3 | 1 |
| Base: sand/gravel (1-3) | 1 | 1 | 1 |
| Base: peat (1-3) | 1 | 1 | 3 |
| Base: rock (1-3) | 1 | 1 | 1 |
| Area (m ²) | 3000 | 10378 | 6676 |
| RESULTS | | | |
| Submerged + marginal plants | | | |
| Predicted | 21.8 | 18.8 | 17.5 |
| Actual | 44 | 47 | 22 |
| EQI | 2.02 | 2.50 | 1.26 |
| IBI | 3 | 3 | 3 |
| Uncommon plants | | | |
| Predicted | 4.0 | 3.9 | 3.1 |
| Actual | 12 | 12 | 1 |
| EQI | 2.98 | 3.05 | 0.32 |
| IBI | 3 | 3 | 1 |
| TRS | | | |
| Predicted | 7.63 | 6.45 | 5.45 |
| Actual | 6.61 | 6.41 | 5.41 |
| EQI | 0.87 | 0.99 | 0.99 |
| IBI | 3 | 3 | 3 |
| ASPT | | | |
| Predicted | 5.12 | 5.16 | 4.89 |
| Actual | 4.79 | 4.47 | 4.40 |
| EQI | 0.94 | 0.87 | 0.90 |

| | | | |
|--|------|------|------|
| IBI | 3 | 3 | 3 |
| OM families | | | |
| Predicted | 3.15 | 3.27 | 1.40 |
| Actual | 2 | 1 | 2 |
| EQI | 0.64 | 0.31 | 1.43 |
| IBI | 2 | 1 | 3 |
| Coleoptera families | | | |
| Predicted | 3.77 | 3.82 | 3.38 |
| Actual | 5 | 3 | 3 |
| EQI | 1.32 | 0.79 | 0.89 |
| IBI | 3 | 3 | 3 |
| | | | |
| Sum of Individual Metrics | 17 | 16 | 16 |
| | | | |
| Index of Biotic Integrity (%) | 94% | 89% | 89% |
| | | | |
| PSYM quality category (IBI >75%=Good, 51-75%= Moderate, 25-50%=Poor, <25%=V Poor) | Good | Good | Good |
| | | | |
| Priority Pond? (Good ecological quality) | Yes | Yes | Yes |

APPENDIX 2: AQUATIC MACRO-INVERTEBRATE TAXA RECORDED DURING THIS SURVEY

| TAXON | ENGLISH NAME | FAMILY | ORDER |
|--|-----------------------------|----------------|------------|
| <i>Crangonyx pseudogracilis</i> | an amphipod shrimp | Crangonyctidae | Amphipoda |
| <i>Pisidium</i> sp. | a pea-mussel | Sphaeriidae | Bivalvia |
| <i>Sphaerium corneum</i> | an orb mussel | Sphaeriidae | Bivalvia |
| <i>Donacia vulgaris</i> | a reed beetle | Chrysomelidae | Coleoptera |
| <i>Plateumaris discolour</i> | a reed beetle | Chrysomelidae | Coleoptera |
| <i>Dryops auriculatus</i> | a long-toed water beetle | Dryopidae | Coleoptera |
| <i>Dryops luridus</i> | a long-toed water beetle | Dryopidae | Coleoptera |
| <i>Agabus affinis</i> | a diving beetle | Dytiscidae | Coleoptera |
| <i>Agabus bipustulatus</i> | a diving beetle | Dytiscidae | Coleoptera |
| <i>Agabus nebulosus</i> | a diving beetle | Dytiscidae | Coleoptera |
| <i>Agabus sturmii</i> | a diving beetle | Dytiscidae | Coleoptera |
| <i>Agabus unguicularis</i> | a diving beetle | Dytiscidae | Coleoptera |
| <i>Dytiscus semisulcatus</i> | a great diving beetle | Dytiscidae | Coleoptera |
| <i>Dytiscus</i> sp. (not <i>semisulcatus</i>) | a great diving beetle larva | Dytiscidae | Coleoptera |
| <i>Hydroglyphus pusillus</i> | a diving beetle | Dytiscidae | Coleoptera |
| <i>Hydroporus angustatus</i> | a diving beetle | Dytiscidae | Coleoptera |
| <i>Hydroporus erythrocephalus</i> | a diving beetle | Dytiscidae | Coleoptera |
| <i>Hydroporus ferrugineus</i> | a diving beetle | Dytiscidae | Coleoptera |
| <i>Hydroporus gyllenhalii</i> | a diving beetle | Dytiscidae | Coleoptera |
| <i>Hydroporus incognitus</i> | a diving beetle | Dytiscidae | Coleoptera |
| <i>Hydroporus obscurus</i> | a diving beetle | Dytiscidae | Coleoptera |
| <i>Hydroporus palustris</i> | a diving beetle | Dytiscidae | Coleoptera |
| <i>Hydroporus planus</i> | a diving beetle | Dytiscidae | Coleoptera |
| <i>Hydroporus pubescens</i> | a diving beetle | Dytiscidae | Coleoptera |
| <i>Hydroporus striola</i> | a diving beetle | Dytiscidae | Coleoptera |
| <i>Hydroporus tristis</i> | a diving beetle | Dytiscidae | Coleoptera |
| <i>Hydroporus umbrosus</i> | a diving beetle | Dytiscidae | Coleoptera |
| <i>Hygrotus confluens</i> | a diving beetle | Dytiscidae | Coleoptera |
| <i>Hygrotus decoratus</i> | a diving beetle | Dytiscidae | Coleoptera |
| <i>Hygrotus impressopunctatus</i> | a diving beetle | Dytiscidae | Coleoptera |
| <i>Hygrotus inaequalis</i> | a diving beetle | Dytiscidae | Coleoptera |
| <i>Hygrotus nigrolineatus</i> | a diving beetle | Dytiscidae | Coleoptera |
| <i>Ilybius aenescens</i> | a diving beetle | Dytiscidae | Coleoptera |
| <i>Ilybius ater</i> | a diving beetle | Dytiscidae | Coleoptera |
| <i>Ilybius guttiger</i> | a diving beetle | Dytiscidae | Coleoptera |
| <i>Ilybius montanus</i> | a diving beetle | Dytiscidae | Coleoptera |
| <i>Ilybius quadriguttatus</i> | a diving beetle | Dytiscidae | Coleoptera |
| <i>Laccophilus minutus</i> | a diving beetle | Dytiscidae | Coleoptera |
| <i>Liopterus haemorrhoidalis</i> | a diving beetle | Dytiscidae | Coleoptera |
| <i>Rhantus grapii</i> | a diving beetle | Dytiscidae | Coleoptera |
| <i>Rhantus suturellus</i> | a diving beetle | Dytiscidae | Coleoptera |
| <i>Gyrinus substriatus</i> | Common Whirligig | Gyrinidae | Coleoptera |

| | | | |
|----------------------------------|-----------------------------|---------------|---------------|
| <i>Haliphus confinis</i> | an algivorous water beetle | Haliplidae | Coleoptera |
| <i>Haliphus flavicollis</i> | an algivorous water beetle | Haliplidae | Coleoptera |
| <i>Haliphus fulvus</i> | an algivorous water beetle | Haliplidae | Coleoptera |
| <i>Haliphus ruficollis</i> | an algivorous water beetle | Haliplidae | Coleoptera |
| <i>Helophorus brevipalpis</i> | a scavenger water beetle | Helophoridae | Coleoptera |
| <i>Helophorus flavipes</i> | a scavenger water beetle | Helophoridae | Coleoptera |
| <i>Helophorus grandis</i> | a scavenger water beetle | Helophoridae | Coleoptera |
| <i>Helophorus minutus</i> | a scavenger water beetle | Helophoridae | Coleoptera |
| <i>Helophorus strigifrons</i> | a scavenger water beetle | Helophoridae | Coleoptera |
| <i>Hydraena testacea</i> | a moss beetle | Hydraenidae | Coleoptera |
| <i>Limnebius aluta</i> | a moss beetle | Hydraenidae | Coleoptera |
| <i>Anacaena limbata</i> | a scavenger water beetle | Hydrophilidae | Coleoptera |
| <i>Anacaena lutescens</i> | a scavenger water beetle | Hydrophilidae | Coleoptera |
| <i>Coelostoma orbiculare</i> | a scavenger water beetle | Hydrophilidae | Coleoptera |
| <i>Enochrus affinis</i> | a scavenger water beetle | Hydrophilidae | Coleoptera |
| <i>Enochrus coarctatus</i> | a scavenger water beetle | Hydrophilidae | Coleoptera |
| <i>Enochrus ochropterus</i> | a scavenger water beetle | Hydrophilidae | Coleoptera |
| <i>Enochrus testaceus</i> | a scavenger water beetle | Hydrophilidae | Coleoptera |
| <i>Helochares lividus</i> | a scavenger water beetle | Hydrophilidae | Coleoptera |
| <i>Helochares punctatus</i> | a scavenger water beetle | Hydrophilidae | Coleoptera |
| <i>Hydrobius fuscipes</i> | a scavenger water beetle | Hydrophilidae | Coleoptera |
| <i>Hydrobius subrotundus</i> | a scavenger water beetle | Hydrophilidae | Coleoptera |
| <i>Laccobius bipunctatus</i> | a scavenger water beetle | Hydrophilidae | Coleoptera |
| <i>Laccobius minutus</i> | a scavenger water beetle | Hydrophilidae | Coleoptera |
| <i>Noterus clavicornis</i> | a burrowing water beetle | Noteridae | Coleoptera |
| <i>Noterus crassicornis</i> | a burrowing water beetle | Noteridae | Coleoptera |
| <i>Contacyphon hilaris</i> | a marsh beetle | Scirtidae | Coleoptera |
| <i>Contacyphon padi</i> | a marsh beetle | Scirtidae | Coleoptera |
| <i>Contacyphon variabilis</i> | a marsh beetle | Scirtidae | Coleoptera |
| <i>Scirtes hemisphaericus</i> | a marsh beetle | Scirtidae | Coleoptera |
| Chironomidae indet | a non-biting midge larva | Chironomidae | Diptera |
| Culicidae indet | mosquito larvae & pupae | Culicidae | Diptera |
| Dixidae | meniscus midge larvae | Dixidae | Diptera |
| <i>Cloeon dipterum</i> | Pond Olive mayfly | Baetidae | Ephemeroptera |
| <i>Galba truncatula</i> | Dwarf Pond Snail | Lymnaeidae | Gastropoda |
| <i>Lymnaea stagnalis</i> | Greater Pond Snail | Lymnaeidae | Gastropoda |
| <i>Omphiscola glabra</i> | Mud Snail | Lymnaeidae | Gastropoda |
| <i>Stagnicola palustris</i> agg. | Marsh Pond Snail | Lymnaeidae | Gastropoda |
| <i>Anisus leucostoma</i> | White-lipped Ramshorn snail | Planorbidae | Gastropoda |
| <i>Planorbarius corneus</i> | Greater Ramshorn Snail | Planorbidae | Gastropoda |
| <i>Planorbis planorbis</i> | Margined Ramshorn snail | Planorbidae | Gastropoda |
| <i>Corixa punctata</i> | a lesser water-boatman | Corixidae | Hemiptera |
| <i>Hesperocorixa castanea</i> | a lesser water-boatman | Corixidae | Hemiptera |
| <i>Hesperocorixa sahlbergi</i> | a lesser water-boatman | Corixidae | Hemiptera |

| | | | |
|--------------------------------|---------------------------|----------------|-------------|
| <i>Sigara distinct</i> | a lesser water-boatman | Corixidae | Hemiptera |
| <i>Sigara dorsalis</i> | a lesser water-boatman | Corixidae | Hemiptera |
| <i>Sigara lateralis</i> | a lesser water-boatman | Corixidae | Hemiptera |
| <i>Sigara nigrolineata</i> | a lesser water-boatman | Corixidae | Hemiptera |
| <i>Sigara scotti</i> | a lesser water-boatman | Corixidae | Hemiptera |
| <i>Gerris lateralis</i> | a pond-skater | Gerridae | Hemiptera |
| <i>Gerris odontogaster</i> | Toothed Pond-skater | Gerridae | Hemiptera |
| <i>Hebrus ruficeps</i> | a sphagnum bug | Hebridae | Hemiptera |
| <i>Ilyocoris cimicoides</i> | Saucer Bug | Naucoridae | Hemiptera |
| <i>Nepa cinerea</i> | Water Scorpion | Nepidae | Hemiptera |
| <i>Notonecta glauca</i> | Common Backswimmer | Notonectidae | Hemiptera |
| <i>Plea minutissima</i> | Pygmy Backswimmer | Pleidae | Hemiptera |
| <i>Microvelia reticulata</i> | a pygmy water-cricket | Veliidae | Hemiptera |
| <i>Erpobdella testacea</i> | a leech | Erpobdellidae | Hirudinea |
| <i>Haemopsis sanguisuga</i> | Horse Leech | Haemopidae | Hirudinea |
| <i>Asellus aquaticus</i> | Water Hoglouse | Asellidae | Isopoda |
| <i>Proasellus meridianus</i> | a water hoglouse | Asellidae | Isopoda |
| <i>Aeshna cyanea</i> | Southern Hawker dragonfly | Aeshnidae | Odonata |
| <i>Ischnura elegans</i> | Blue-tailed Damselfly | Coenagrionidae | Odonata |
| <i>Pyrrhosoma nymphula</i> | Large Red Damselfly | Coenagrionidae | Odonata |
| <i>Sympetrum danae</i> | Black Darter | Libellulidae | Odonata |
| <i>Sympetrum striolatum</i> | Common Darter (larvae) | Libellulidae | Odonata |
| <i>Oligochaeta</i> | a worm | Oligochaeta | Oligochaeta |
| <i>Nemoura cinerea</i> | a stonefly | Nemouridae | Plecoptera |
| ? <i>Anabolia brevipennis</i> | a caddis-fly | Limnephilidae | Trichoptera |
| <i>Limnephilus ?marmoratus</i> | a caddis-fly | Limnephilidae | Trichoptera |
| <i>Limnephilus ?vittatus</i> | a caddis-fly | Limnephilidae | Trichoptera |
| <i>Limnephilus flavicornis</i> | a caddis-fly | Limnephilidae | Trichoptera |
| <i>Limnephilus stigma</i> | a caddis-fly | Limnephilidae | Trichoptera |
| <i>Trichostegia minor</i> | a caddis-fly | Phryganeidae | Trichoptera |
| Tricladida | a flatworm | Tricladida | Tricladida |

APPENDIX 3: WETLAND PLANT SPECIES RECORDED DURING THE SURVEY

| SPECIES | ENGLISH NAME |
|--|---------------------------|
| <i>Agrostis canina</i> | Velvet Bent |
| <i>Agrostis stolonifera</i> | Creeping Bent |
| <i>Alopecurus geniculatus</i> | Marsh Foxtail |
| <i>Anagallis tenella</i> | Bog Pimpernel |
| <i>Aulacomnium palustre</i> | Bog Bead-moss |
| <i>Baldellia ranunculoides</i> | Lesser Water-plantain |
| <i>Brachythecium salebrosum</i> | Smooth-stalk Feather-moss |
| <i>Bryum pseudotriquetrum</i> var. <i>pseudotriquetrum</i> | Marsh Bryum |
| <i>Calamagrostis canescens</i> | Purple Small-reed |
| <i>Calliergon cordifolium</i> | Heart-leaved Spear-moss |
| <i>Calliergonella cuspidate</i> | Pointed Spear-moss |
| <i>Callitriche platycarpa</i> | Water-starwort |
| <i>Cardamine pratensis</i> | Lady's Smock |
| <i>Carex demissa</i> | Common Yellow Sedge |
| <i>Carex echinata</i> | Star Sedge |
| <i>Carex nigra</i> | Common Sedge |
| <i>Carex ovalis</i> | Oval Sedge |
| <i>Carex panicea</i> | Carnation Sedge |
| <i>Carex pulicaris</i> | Flea Sedge |
| <i>Carex riparia</i> | Greater Pond Sedge |
| <i>Carex rostrata</i> | Bottle Sedge |
| <i>Chara virgata</i> | Delicate Stonewort |
| <i>Cirsium palustre</i> | Marsh Thistle |
| <i>Comarum palustre</i> | Marsh Cinquefoil |
| <i>Dactylorhiza maculate</i> | Heath Spotted Orchid |
| <i>Deschampsia cespitosa</i> | Tufted Hair-grass |
| <i>Drepanocladus aduncus</i> | Kneiff's Hook-moss |
| <i>Eleocharis palustris</i> | Common Spike-rush |
| <i>Eleogiton fluitans</i> | Floating Club-rush |
| <i>Epilobium palustre</i> | Marsh Willowherb |
| <i>Epilobium tetragonum</i> | Square-stalked Willowherb |
| <i>Equisetum fluviatile</i> | Water Horsetail |
| <i>Equisetum palustre</i> | Marsh Horsetail |
| <i>Erica tetralix</i> | Cross-leaved Heath |
| <i>Eriophorum angustifolium</i> | Common Cotton-grass |
| <i>Galium palustre</i> ssp. <i>elongatum</i> | Greater Marsh Bedstraw |
| <i>Galium palustre</i> ssp. <i>palustre</i> | Common Marsh Bedstraw |
| <i>Galium uliginosum</i> | Fen Bedstraw |
| <i>Glyceria fluitans</i> | Flote-grass |
| <i>Glyceria notate</i> | Small Sweet-grass |
| <i>Hydrocotyle vulgaris</i> | Marsh Pennywort |
| <i>Hypericum elodes</i> | Marsh St John's wort |

| | |
|--|-----------------------------|
| <i>Juncus acutiflorus</i> | Sharp-flowered Rush |
| <i>Juncus articulatus</i> | Jointed Rush |
| <i>Juncus bulbosus</i> | Bulbous Rush |
| <i>Juncus conglomeratus</i> | Compact Rush |
| <i>Juncus effusus</i> | Soft Rush |
| <i>Juncus inflexus</i> | Hard Rush |
| <i>Lemna minor</i> | Common Duckweed |
| <i>Lemna minuta</i> | Least Duckweed |
| <i>Lemna triscula</i> | Ivy-leaved Duckweed |
| <i>Leptodictyum riparium</i> | Kneiff's Feather-moss |
| <i>Lotus pedunculatus</i> | Greater Bird's-foot Trefoil |
| <i>Lycopus europaeus</i> | Gipsywort |
| <i>Mentha aquatica</i> | Water Mint |
| <i>Menyanthes trifoliata</i> | Bogbean |
| <i>Molinia caerulea</i> | Purple Moor-grass |
| <i>Myosotis laxa</i> ssp. <i>caespitosa</i> | Tufted Forget-me-not |
| <i>Myosotis scorpioides</i> | Water Forget-me-not |
| <i>Nitella translucens</i> | Translucent Stonewort |
| <i>Oenanthe fistulosa</i> | Tubular Water-dropwort |
| <i>Pellia</i> sp. | a liverwort |
| <i>Phragmites australis</i> | Common Reed |
| <i>Pilularia globulifera</i> | Pillwort |
| <i>Plagiomnium ellipticum</i> | Marsh Thyme-moss |
| <i>Polytrichum commune</i> var. <i>commune</i> | Common Haircap Moss |
| <i>Potamogeton berchtoldii</i> | Small Pondweed |
| <i>Potamogeton natans</i> | Broad-leaved Pondweed |
| <i>Potamogeton polygonifolius</i> | Bog Pondweed |
| <i>Potentilla erecta</i> | Tormentil |
| <i>Ranunculus flammula</i> | Lesser Spearwort |
| <i>Riccia fluitans</i> | Floating Crystalwort |
| <i>Salix repens</i> | Creeping Willow |
| <i>Schoenoplectus tabernaemontani</i> | Grey Club-rush |
| <i>Senecio aquaticus</i> | Marsh Ragwort |
| <i>Solanum dulcamara</i> | Woody Nightshade |
| <i>Sparganium erectum</i> | Branched Bur-reed |
| <i>Sphagnum cuspidatum</i> | Feathery Bog-moss |
| <i>Sphagnum fallax</i> | Flat-topped Bog-moss |
| <i>Sphagnum fimbriatum</i> | Fringed Bog-moss |
| <i>Sphagnum squarrosum</i> | Spiky Bog-moss |
| <i>Stellaria alsine</i> | Bog Stitchwort |
| <i>Stellaria palustris</i> | Marsh Stitchwort |
| <i>Straminergon stramineum</i> | Straw Spear-moss |
| <i>Typha latifolia</i> | Greater Reedmace |
| <i>Utricularia vulgaris</i> | Greater Bladderwort |

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| <i>Valeriana dioica</i> | Marsh Valerian |
| <i>Veronica scutellata</i> | Marsh Speedwell |