New Life on the Old West Project-
a survey of vegetation and aquatic Coleoptera

2nd draft Report, Jonathan Graham & Martin Hammond (10th September 2025)

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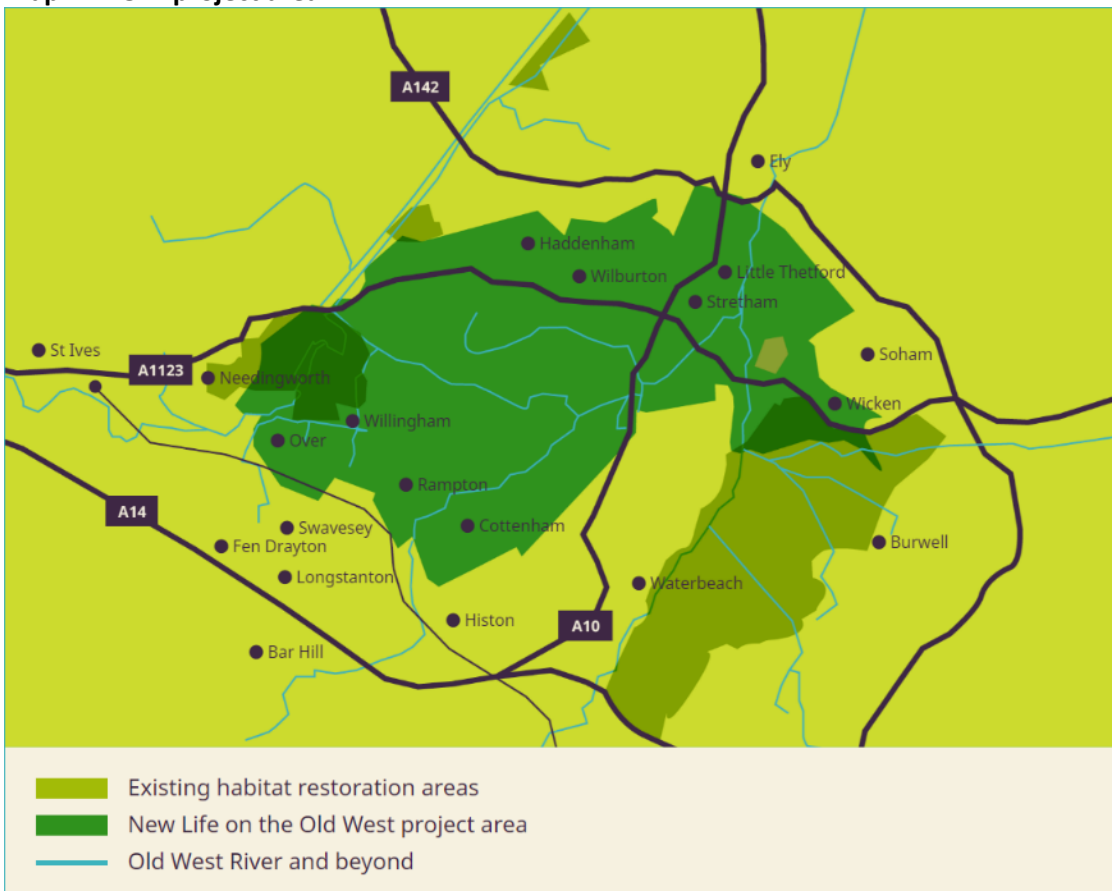
Vegetation and Aquatic Coleoptera Survey Report

New Life on the Old West Project

Executive Summary

An ecological survey of drainage ditches and ponds within the New Life on the Old West (NLOW) project area was undertaken in 16th - 20th June 2025. The project focusses on the area around the Old West River, between the Ouse Washes and Wicken Fen in the Cambridgeshire Fens (Map 1). A total of 43 water bodies, comprising 21 that had previously been surveyed and 22 new sites were sampled using wetland plants and aquatic Coleoptera as indicators of ecological quality. Eight of the previously surveyed sites had wildlife enhancement works undertaken allowing direct compassion of species recorded and therefore a judgement on the success of these enhancement measures.

Map 1 NLOW project area



The survey generated 97 drain or pond plants, 84 bank plants and 310 records of water beetles from 31 sites (two sites at Cam Washes SSSI held water but yielded no beetles; one dried-up pond produced only galls of Pink Water-speedwell Weevil). Seventy-nine distinct water beetle taxa were recorded.

Five water beetles have the status of Near Threatened in Great Britain: the diving beetles *Agabus undulatus* and *Laccornis oblongus*; the scavenger water beetles *Hydrochus crenatus* and *Enochrus nigritus*; and the small water beetle *Limnebius papposus.* In addition, four water beetles are listed as Nationally Scarce: the burrowing water beetle *Noterus crassicornis*, the diving beetle *Scarodytes halensis*, the scavenger water beetle *Enochrus quadripunctatus* and

the riffle beetle *Oulimnius major/O. rivularis.* Two weevils, Pink Water-speedwell Weevil *Gymnetron villosulum* and *Phytobius leucogaster* are formally still listed as Nationally Scarce, although they probably no longer warrant this status.

In contrast to an earlier surveys within the NLOW project area (2001), no Red List plants were recorded perhaps due to the drought conditions and smaller sample size of this survey. However, the following six plants are considered local in a Fenland context: Clustered Stonewort *Tolypella glomerata*, Orange Foxtail *Alopecurus aequalis*, River Water-dropwort *Oenanthe fluviatilis*, Hairlike Pondweed *Potamogeton trichoides*, Common Water-crowfoot *Ranunculus aquatilis* and Golden Dock *Rumex maritimus*. In addition, terrestrial plants of Water-violet *Hottonia palustris* (Vulnerable in England) were recorded from a dry pond close to the two sampled as part of the Hainey Farm pond complex.

The survey produced new site records of several water beetle species of conservation concern and provides evidence that habitat improvements to drainage dykes and pond creation both benefit such species. Three key findings are:

(I) Creation of berms (shelves just below summer water level in the banks of trapezoidal drains) shows highly positive results in promoting a richer water beetle fauna compared to pre-enhancement baseline surveys. This is reflected in marked improvements in three metrics (Number of Species, Species Quality Score and Species Quality Index) as well as increased representation of species of conservation concern. At Queenholme Drain, the number of species recorded more than quadrupled and Species Quality Index almost trebled; two Near Threatened water beetles were newly recorded. At Smithey Fen Engine Drain, two sections of berm showed large increases in species-richness and one section yielded two Near Threatened and two Nationally Scarce species. Queenholme and Smithey Fen Engine Drain (II) produced the highest and second highest Species Quality Score of 110 drains sampled during the two NLOW surveys, and were among the best ten out of 299 Fenland drains surveyed by the authors. However, results from an ill-defined berm at New Cut were disappointing, indicating that creation of berms needs to be clearly specified and supervised.

(II) Creation of new clean-water ponds close to existing wetlands has the potential to expand the distribution of rare beetles usually restricted to ancient fens. During the present survey this was shown by the occurrence of the diving beetle *Laccornis oblongus* in a new pond one kilometre north of Wicken Fen SSSI; similarly, the small water beetle *Limnebius aluta* was recorded from another man-made pond 2 km north-west Wicken Fen in 2021. An additional record of another Near Threatened fen specialist, the scavenger water beetle Enochrus nigritus, from a high-quality farmland pond at Norlands, provides further corroboration.

(III) Recently-created clay-bedded ponds in more isolated locations held water despite drought conditions in spring/summer 2025, in contrast to scrapes and ponds on more porous soils. These were characterised by more typical ‘pioneer’ water beetle assemblages but provided rich habitats for a wide range of aquatic invertebrates and stoneworts.

1 Introduction

1.1 The New Life on the Old West (NLOW) project covers an area of around 11,000 hectares encompassing a corridor of land either side of the Old West River between its confluence with the River Cam to where it meets the Ouse Washes at Earith. The project aims to create new wildlife habitat as well as enhancing existing green spaces and surrounding countryside linking the internationally known nature reserves at Wicken Fen in the east and the Ouse Washes in the west.

1.2 The project area focuses on nine parishes (Cottenham, Haddenham, Little Thetford, Over, Rampton, Stretham, Wicken, Willingham and Wilburton).

1.3 The *Fens Biodiversity Audit* (Mossman *et al.* 2012) highlighted sites such as Wicken Fen and the Ouse Washes as extreme hotspots of both biodiversity and recording effort. However, the *Audit* also emphasised that the value of the wider landscape, and farmland in particular, is poorly understood.

1.4 To address this concern, the NLOW commissioned surveys of ditches and pond within this iconic but under-recorded landscape feature of the Fens (Graham & Hammond, 2014 and 2021) finding many new local plant and water beetle records, confirming the importance of the region.

1.5 Following these surveys, the NLOW project undertook wildlife enhancement measures at some of the survey sites including creation of berms on ditch banks, enhancements to some exiting ponds as well as creation of new ponds.

1.6 To investigate the success of wildlife enhancement works, Graham and Hammond were commissioned to survey a selection of sites (with and without enhancements) following the same methodology as for previous surveys.

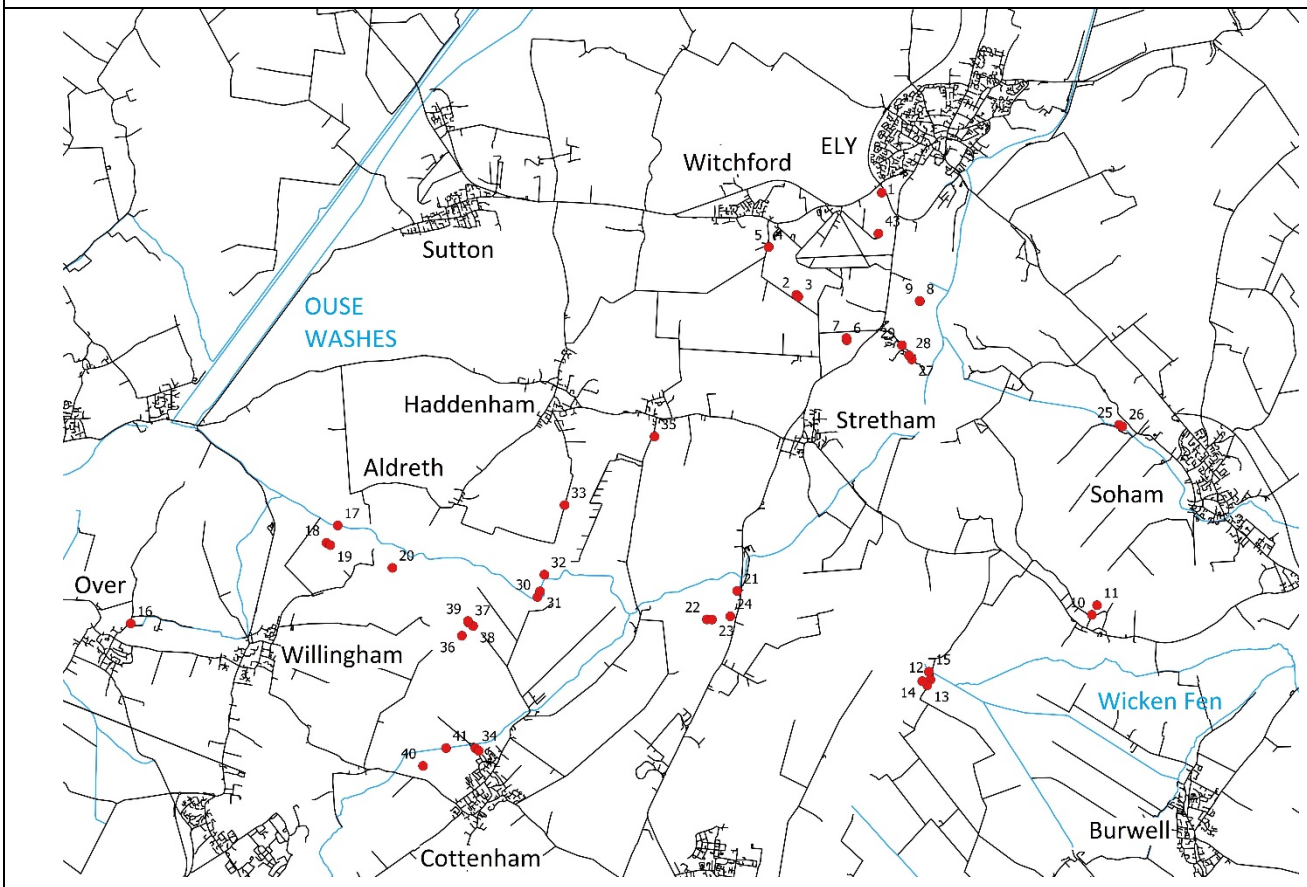
1.7 A total of 43 sites were surveyed comprising 21 that had previously been surveyed and 22 new sites. Eight of the previously surveyed sites had wildlife enhancement works undertaken allowing direct compassion of species recorded and therefore a judgement on the success of these enhancement measures. Full details for all 43 sites are included in Appendix, their locations in Map 2 (below) and a digital photo of each site is provided in Appendix 2.

1.8 Vascular plants, bryophytes and macro-algae are of obvious importance in any assessment of wetland biodiversity because many species are sensitive to environmental conditions and the conservation status and distribution of individual species is well known. Moreover, plants also provide much of the habitat structure upon which fauna depends. In still and slow-moving waters, aquatic Coleoptera are by far the most speciose group of aquatic macro-invertebrates which can be sampled

readily using a pond-net (Pond Conservation, 2003), making them particularly useful in ecological assessment.

1.9 Jonathan Graham (plants) and Martin Hammond (water beetles) were commissioned to undertake surveys in May and June 2021.

Map 2 General location of 43 sample points in relation to the Old West River, Ouse Washes and Wicken Fen



2 Methodology

2.1 General

2.1.1 Survey work was undertaken on 16th – 20th June 2025, during mainly fine weather but within a period of significant drought. As a result, many of the selected sites, especially new ponds) were dry allowing no assessment of water beetles. Where sites were found to be dry, bank, emergent and terrestrial aquatic plants were recorded while a second site (the closest with at least 1 cm depth of water) was selected for assessment of water beetles. This strategy resulted in many more sites being surveyed than originally intended. An 8-figure grid reference was obtained for each sample point using a hand-held GPS unit accurate to within five metres and then ten metres either side of this point (i.e. a 20m sample stretch) was surveyed using measured paces for ditches and larger ponds while the entirety of smaller ponds was surveyed.

2.1.6 In addition to basic data recording such as date, grid reference etc., a number of other parameters were recorded including drain type, width of water in drain, water depth and bed substrate.

2.1.7 In addition to plants and water beetles, other species of interest were noted including smaller fish, Odonata and amphibians.

2.1.8 Nomenclature adopted follows Stace (2019) for flowering plants; Atherton, Bosanquet & Lawley (2010) for bryophytes; John, Whitton and Brook (2002) for Charophytes and Foster *et al* (2020) for aquatic Coleoptera.

2.2 Methodology - plants

2.2.1 All macrophytes (including charophytes, bryophytes and macroscopic filamentous algae as well as vascular plants) were surveyed by sight and by use of a grapnel. Netting for water beetles also proved useful in locating some plants, especially floating liverworts. Percentage cover estimated for each species. Critical species (such as certain pondweed *Potamogeton* species, charophytes and filamentous algae) were collected and stored in small plastic bags before being checked later with a microscope.

2.2.2 Sampling plants in drainage channels and assessing cover levels can be difficult as aquatic plants occur in more than one stratum (i.e. submerged plants, plants with floating leaves and plants with emergent leaves). In addition, traditional terms for drain plants (such as emergent, submerged, floating or aquatic) can be misleading as

drain plants are notoriously plastic and can sometimes fall within more than one of these categories. Consequently, a simpler approach was adopted for fenland drain terminology following Redding (2013) with plants being recorded in two distinct categories. “Pond or drain” species are defined as species occupying the water column or at its edge (such as traditionally-named emergents) whilst “bank” species are defined as species occurring above the water column (away from the water’s edge) up to the level top of the bank.

2.2.5 A number of critical plant taxa have been included in this survey. White-flowered *Nasturtium* (water-cress) species have only been recorded to species level where mature fruit was present (the character of flower size is considered unreliable in separating the two species, *Nasturtium officinale sensu stricto* and *N. microphyllum). Callitriche* (water-starwort) species have been named on the basis of microscopic examination of pollen (Lansdown, 2008) and/or the presence of semi-mature or mature fruits while a small number of infertile plants were recorded as the aggregate *Callitriche* sp. All records of Lesser Pondweed *Potamogeton pusillus*, Hair-like Pondweed *Potamogeton trichoides* and Small Pondweed *Potamogeton berchtoldii* are based on microscopic examination of stipules following Preston (1995).

2.3 Methodology - Coleoptera

2.3.1 Water beetles are not a unitary group of closely-related insects with a common evolutionary origin, but comprise members of diverse families which have adapted to life in water. For this reason, there is no strict definition of what constitutes a water beetle. Therefore, the range of taxa recorded during this survey includes marsh beetles (Scirtidae), reed beetles (members of the subfamily Donaciinae) and weevils (Erirhindae and Curculionidae) associated with submerged or emergent plants as well as the more ‘traditional’ families[1]. This expanded set of taxa has been referred to collectively as “water beetles” or “aquatic Coleoptera” in this report.

2.3.2 In ditches, sampling of water beetles took place within the same 20 metre transect used for plant recording. For ponds, each mesohabitat (e.g. marginal vegetation, floating-leaved vegetation, open water) was sampled. Sampling was exhaustive (rather than timed), continuing until no further species could be recognised in the net.

2.3.3 At each site, submerged and marginal vegetation was trawled vigorously using a standard long-handled pond net with a one mm mesh bag. Shallow-flooded marginal vegetation was trampled gently before netting. At suitable locations, submerged

[1] These comprise the families Gyrinidae (whirligig beetles), Haliplidae (algivorous water beetles), Noteridae (burrowing water beetles), Hygrobiidae (screech beetles), Dytiscidae (diving beetles), Hydrophiloidea (scavenger water beetles), Hydraenidae (small water beetles), Elmidae (riffle beetles) and Dryopidae (long-toed water beetle)

vegetation was gathered up using the net or a grapnel and left to drain in a tray. Binoculars were used to scan floating vegetation such as water-lilies in the middle of the channel for reed-beetles.

2.3.4 Water beetles were either identified in the field (for distinctive, widespread species) or preserved in tubes containing industrial de-natured alcohol. Beetles were usually obtained by emptying the contents of the net into a white polythene tray, but sometimes by picking them directly from the net bag. It was considered that bankside sorting was efficacious and preservation of bulk samples of invertebrates (as in Environment Agency biological monitoring) would probably result in relatively few additional records of water beetles but would greatly increase the time and cost of sorting in the laboratory.

2.3.5 Aquatic and emergent plants could be recorded by visual observation and use of a grapnel, allowing the vast majority of species present at each location to be recorded. By contrast, accessibility imposed considerable constraints on whether a representative water beetle list could be obtained for each site.

2.3.6 Some water bodies allowed excellent access, especially shallow drains and ponds with gentle banks. At these sites it was possible to obtain a representative sample of the beetles present. However, such sites were a minority and, more frequently, arable drains had very steep banks with little foothold at the base of the bank. Often there was then a vertical drop into deep water, so considerable caution was needed and sometimes samples could only be obtained from a few square metres of water margin.

2.3.7 For these reasons, it would be misleading to claim that a comprehensive sample of aquatic Coleoptera was obtained at many locations, and any interpretation of the data is subject to this caveat.

2.3.8 Agricultural drains in the Cambridgeshire Fens are generally difficult to access to sample aquatic invertebrates and pose significant safety hazards. In addition to the steepness of banks and sometimes precipitous drops into deep water below, bankside vegetation such as hemlock, nettles and brambles frequently makes sampling uncomfortable and difficult. **Lone-working to sample aquatic invertebrates in these water bodies is intrinsically hazardous and cannot be recommended**.

2.3.9 It is difficult to recommend an optimal seasonal period for recording water beetles in Fenland drains. In semi-natural fens with seasonal pool systems, late March to early May is the prime time as this coincides with the peak period of adult activity. In permanent, still or slow-moving water, early summer is generally considered to be the optimal period since water beetles are difficult to find in these habitats before vegetation has emerged. Moreover, for practical and safety reasons, we needed to

time our fieldwork to allow botanical and invertebrate surveys to be conducted on a single visit to each site.

Martin Hammond sampling the steep-sided reed-filled drain, Smithey Fen Engine (CO3) in Cottenham parish (19th June).

3 Results

3.1 Plants

3.1.1 Nighty seven pond or drain plants and 84 bank plants were recorded during the survey. These are listed in Tables 1 and 2 along with their conservation status in England as listed in *A Vascular Plant Red List for England* (Stroh *et al*, 2014). Taxa listed as 'Least Concern' are those that do not qualify as Critically Endangered, Endangered, Vulnerable or Near Threatened but this does not necessarily mean that they are widespread or common[2].

Table 1: Pond or drain plant species recorded from sample points

SPECIES	English name	Status in England
Chlorophyta	Green algae	
Chara globularis	Fragile Stonewort	n/a
Chara vulgaris	Common Stonewort	n/a
Cladophora	A macro green alga	n/a
Spirogyra	A macro green alga	n/a
Tolypella glomerata	Clustered Stonewort	n/a
Ulva	A macro green alga	n/a
Xanthophyta	Yellow-green algae	
Vaucheria	A macro yellow-green alga	n/a
Bryophyta	Mosses, liverworts & hornworts	
Drepanocladus aduncus	Knieff's Hook-moss	n/a
Leptodictyum riparium	Knieff's Feather-moss	n/a
Oxyrrhynchium speciosum	Showy Feather-moss	n/a
Calamophytes	Horsetails	
Equisetum palustre	Marsh Horsetail	Least Concern
Angiosperms	Flowering plants	
Agrostis stolonifera	Creeping Bent	Least Concern
Alisma plantago-aquatica	Water-plantain	Least Concern
Alopecurus aequalis	Orange Foxtail	Least Concern
Berula erecta	Lesser Water-parsnip	Least Concern
Bidens tripartita	Trifid Bur-marigold	Least Concern
Butomus umbellatus	Flowering Rush	Least Concern
Callitriche obtusangula	Blunt-fruited Water-starwort	Least Concern
Callitriche platycarpa	Various-leaved Water-starwort	Least Concern
Caltha palustris	Marsh Marigold	Least Concern
Calystegia sepium	Hedge Bindweed	Least Concern
Carex hirta	Hairy Sedge	Least Concern
Carex otrubae	False Fox-sedge	Least Concern
Carex pseudocyperus	Cyperus Sedge	Least Concern
Carex riparia	Greater Pond-sedge	Least Concern
Ceratophyllum demersum	Ridged Hornwort	Least Concern
Crassula helmsii	New Zealand Pigmyweed	Non-native
Deschampsia cespitosa	Tufted Hair-grass	Least Concern
Eleocharis palustris	Common Spike-rush	Least Concern

[2] For explanations of these statuses, please see Stroh *et al* (2014)

Elodea canadensis	Canadian Waterweed	Non-native
Elodea nuttallii	Nuttall's Waterweed	Non-native
Epilobium hirsutum	Great Willowherb	Least Concern
Epilobium parviflorum	Hoary Willowherb	Least Concern
Epilobium tetragonum	Square-stalked Willowherb	Least Concern
Filipendula ulmaria	Meadow-sweet	Least Concern
Galium palustre	Marsh Bedstraw	Least Concern
Glyceria fluitans	Floating Sweet-grass	Least Concern
Glyceria maxima	Reed Sweet-grass	Least Concern
Gnaphalium uliginosum	Marsh Cudweed	Least Concern
Helosciadium nodiflorum	Fool's Water-cress	Least Concern
Hippuris vulgaris	Mare's-tail	Least Concern
Hydrocotyle ranunculoides	Floating Pennywort	Non-native
Iris pseudacorus	Yellow Iris	Least Concern
Juncus articulatus	Jointed Rush	Least Concern
Juncus bufonius	Toad Rush	Least Concern
Juncus effusus	Soft Rush	Least Concern
Juncus inflexus	Hard Rush	Least Concern
Juncus subnodulosus	Blunt-flowered Rush	Least Concern
Lemna gibba	Fat Duckweed	Least Concern
Lemna minor	Common Duckweed	Least Concern
Lemna minuta	Least Duckweed	Invasive non-native
Lemna trisulca	Ivy-leaved Duckweed	Least Concern
Lycopus europaeus	Gypsywort	Least Concern
Lysimachia nummularia	Creeping Jenny	Least Concern
Lythrum salicaria	Purple Loosestrife	Least Concern
Mentha aquatica	Water Mint	Least Concern
Myosotis laxa	Tufted Forget-me-not	Least Concern
Myosotis scorpioides	Water Forget-me-not	Least Concern
Myriophyllum spicatum	Spiked Water-milfoil	Least Concern
Nasturtium officinale s.l.	Water-cress	Least Concern
Nuphar lutea	Yellow Water-lily	Least Concern
Oenanthe fluviatilis	River Water-dropwort	Least Concern
Oxybasis rubra	Red Goosefoot	Least Concern
Persicaria amphibia (aquatic form)	Amphibious Bistort	Least Concern
Phalaris arundinacea	Reed Canary-grass	Least Concern
Phragmites australis	Common Reed	Least Concern
Potamogeton berchtoldii	Small Pondweed	Least Concern
Potamogeton crispus	Curled Pondweed	Least Concern
Potamogeton lucens	Shining Pondweed	Least Concern
Potamogeton natans	Broad-leaved Pondweed	Least Concern
Potamogeton perfoliatus	Perfoliate Pondweed	Least Concern
Potamogeton trichoides	Hair-like Pondweed	Least Concern
Ranunculus aquatilis	Common Water-crowfoot	Least Concern
Ranunculus circinatus	Fan-leaved Water-crowfoot	Least Concern
Ranunculus sceleratus	Celery-leaved Buttercup	Least Concern
Ranunculus trichophyllus	Thread-leaved Water-crowfoot	Least Concern
Rorippa sylvestris	Creeping Yellow-cress	Least Concern
Rumex conglomeratus	Clustered Dock	Least Concern
Rumex maritimus	Golden Dock	Least Concern
Sagittaria sagittifolia	Arrowhead	Least Concern
Samolus valerandi	Brookweed	Least Concern
Schoenoplectus lacustris	Common Club-rush	Least Concern

Schoenoplectus tabernaemontani	Grey Club-rush	Least Concern
Scrophularia auriculata	Water Figwort	Least Concern
Solanum dulcamara	Woody Nightshade	Least Concern
Sparganium emersum	Unbranched Bur-reed	Least Concern
Sparganium erectum	Branched Bur-reed	Least Concern
Spirodela polyrhiza	Greater Duckweed	Least Concern
Stellaria aquatica	Water Chickweed	Least Concern
Stuckenia pectinata	Fennel Pondweed	Least Concern
Symphytum officinale	Comfrey	Least Concern
Typha angustifolia	Lesser Reedmace	Least Concern
Typha latifolia	Greater Reedmace	Least Concern
Veronica anagallis-aquatica	Blue Water-speedwell	Least Concern
Veronica beccabunga	Brooklime	Least Concern
Veronica catenata	Pink Water-speedwell	Least Concern
Zannichellia palustris	Horned Pondweed	Least Concern

Table 2: Bank plant species recorded from sample points

SPECIES	**English name**	**Status in England**
Calamophytes	Horsetails	
Equisetum arvense	Field Horsetail	Least Concern
Angiosperms	Flowering plants	Least Concern
Achillea millefolium	Yarrow	Least Concern
Alnus glutinosa	Alder	Least Concern
Alopecurus pratensis	Meadow Foxtail	Least Concern
Anisantha steralis	Barren Brome	Least Concern
Anthriscus sylvestris	Cow Parsley	Least Concern
Arctium lappa	Greater Burdock	Least Concern
Arctium minus	Lesser Burdock	Least Concern
Arrhenatherum elatius	False-oat Grass	Least Concern
Artemisia vulgaris	Mugwort	Least Concern
Ballota nigra subsp. meridionalis	Black Horehound	Least Concern
Bellis perennis	Daisy	Least Concern
Bromus hordeaceous ssp. hordeaceus	Soft Brome	Least Concern
Carduus crispus	Welted Thistle	Least Concern
Centaurea nigra	Common Knapweed	Least Concern
Cirsium arvense	Creeping Thistle	Least Concern
Cirsium vulgare	Spear Thistle	Least Concern
Conium maculatum	Hemlock	Least Concern
Convolvulus arvensis	Field Bindweed	Least Concern
Crataegus monogyna	Hawthorn	Least Concern
Crepis capillaris	Smooth Hawk's-beard	Least Concern
Crepis vesicaria subsp. taraxacifolia	Rough Hawk's-beard	Least Concern
Cupressus x leylandii	Leyland Cypress	Least Concern
Dactylis glomerata	Cock's-foot	Least Concern
Dipsacus fullonum	Teasel	Least Concern
Elymus repens	Couch	Least Concern
Ervum tretrasperma	Smooth Tare	Least Concern
Festuca rubra	Red Fescue	Least Concern
Fraxinus excelsior	Ash	Least Concern

Galium aparine	Cleavers	Least Concern
Geranium dissectum	Cut-leaved Crane's-bill	Least Concern
Glechoma hederacea	Ground Ivy	Least Concern
Hedera helix	Ivy	Least Concern
Helminthotheca echioides	Bristly Oxtongue	Least Concern
Heracleum sphondylium	Hogweed	Least Concern
Holcus lanatus	Yorkshire Fog	Least Concern
Hordeum murinum	Wall Barley	Least Concern
Hordeum secalinum	Meadow Barley	Least Concern
Hypericum perforatum	Perforate St John's-wort	Least Concern
Jacobaea erucifolia	Hoary Ragwort	Least Concern
Jacobaea vulgaris	Common Ragwort	Least Concern
Lactuca serriola	Prickly Lettuce	Least Concern
Lactuca virosa	Great Lettuce	Least Concern
Lapsana communis	Nipplewort	Least Concern
Leucanthemum vulgare	Ox-eye Daisy	Least Concern
Lipandra polysperma	Many-seeded Goosefoot	Least Concern
Lolium perenne	Perennial Rye-grass	Least Concern
Lotus corniculatus	Bird's-foot Trefoil	Least Concern
Malva moschata	Musk Mallow	Least Concern
Malva sylvestris	Common Mallow	Least Concern
Medicago lupulina	Black Medick	Least Concern
Papaver rhoeas	Field Poppy	Least Concern
Pentaglottis sempervirens	Green Alkanet	Garden Escape
Persicaria amphibia	Amphibious Bistort	Least Concern
Persicaria lapathifolia	Pale Persicaria	Least Concern
Plantago lanceolata	Ribwort Plantain	Least Concern
Plantago major	Greater Plantain	Least Concern
Poa trivialis	Rough Meadow-grass	Least Concern
Populus tremula	Aspen	Least Concern
Populus x canescens	Grey poplar	Least Concern
Potentilla anserina	Silverweed	Least Concern
Prunella vulgaris	Self-Heal	Least Concern
Prunus spinosa	Blackthorn	Least Concern
Pulicaria dysenterica	Common Fleabane	Least Concern
Ranunculus repens	Creeping Buttercup	Least Concern
Rosa canina agg.	Dog Rose	Least Concern
Rubus fruticosus agg.	Brambles	Least Concern
Salix sp. (weeping)	Weeping Willow	Least Concern
Salix alba	White Willow	Least Concern
Salix cinerea ssp. cinerea	Grey Sallow	Least Concern
Salix x fragilis	Crack Willow	Least Concern
Sambucus nigra	Elder	Least Concern
Schedonorus arundinaceus	Tall Fescue	Least Concern
Senecio vulgaris	Groundsel	Least Concern
Silene latifolia	White Campion	Least Concern
Sinapis arvensis	Charlock	Least Concern
Sison amomum	Stone Parsley	Least Concern
Sisymbrium officinale	Hedge Mustard	Least Concern
Sonchus asper	Prickly Sowthistle	Least Concern
Symphytum x uplandicum	Russian Comfrey	Least Concern
Torilis japonica	Upright Hedge-parsley	Least Concern
Tragopogon pratense	Goat's-beard	Least Concern

Trifolium dubius	Lesser Trefoil	Least Concern
Trifolium repens	White Clover	Least Concern
Tussilago farfara	Colt's-foot	Least Concern
Urtica dioica	Stinging Nettle	Least Concern
Vicia sativa ssp. *segetalis*	Common Vetch	Least Concern

3.1.2 Figures 1 and 2 shows frequency of occurrence of both "pond or drain" and "bank" plant species occurring above 5% within the 43 sample points

3.1.3 The "pond and drain" flora is dominated by Clustered Dock *Rumex conglomeratus* (59% of sample points), Branched Bur-reed *Sparganium erectum* (44%), Reed Canary-grass *Phalaris arundinacea* and False Fox-sedge *Carex otrubae* (41%), Great Willowherb *Epilobium hirsutum* and Reed Sweet-grass *Glyceria maxima* (38%), Bulrush Typha latifolia (31%) and Frequent submerged aquatics included Common Stonewort *Chara vulgaris* (34%), Various-leaved Water-Starwort *Callitriche platycarpa* and Nuttall's Water-weed *Elodea nuttallii* (22%), Fennel Pondweed *Stuckenia pectinata* and Ivy-leaved Duckweed *Lemna trisulca* (16%) and Horned Pondweed *Zannichellia palustris* (13%). The macro alga *Cladophora* occurred in 34% of sample points.

3.1.5 In contrast to 'pond or drain' species, 'bank' plants which were frequent also tended to be abundant. Most notably, False Oat-grass *Arrhenatherum elatius* was not only the most ubiquitous species in terms of bank cover but also occurred in 94% of sample points. Other prominent species include Nettle *Urtica dioica* (75% of sample points), Cock's-foot *Dactylis glomerata* (59%), Rough-leaved Meadow-grass *Poa trivialis* and Bristly Ox-tongue *Helminthotheca echioides* (47%), Couch *Elymus repens* and Creeping Thistle *Cirsium arvense* (44%), Cleavers *Galium aparine* and *Bramble Rubus fruticosus agg.* (38%) and Charlock Sinapis arvensis (31%). The rather local species Stone-parsley *Sison amomum* was recorded from 9% of sample points.

3.1.6 Non-native "pond or drain" species were not generally widespread within the survey area. Nuttall's Waterweed *Elodea nuttallii* was most frequent (22% of sites) along with Least Duckweed *Lemna minuta* (6%). New Zealand Pigmyweed *Crassula helmsii* was refound in local abundance in the Cottenham recreation area pond (sample point 42) and Floating Pennywort *Hydrocotyle ranunculoides* was recorded from a single new liner pond at Holt Fen Recreation area, Little Thetford (sample point 27) where it is presumed to have been planted in error for the native Marsh Pennywort *H. vulgaris.*

Figure 1 Occurrence of "pond or drain" plant species within the 43 sample points

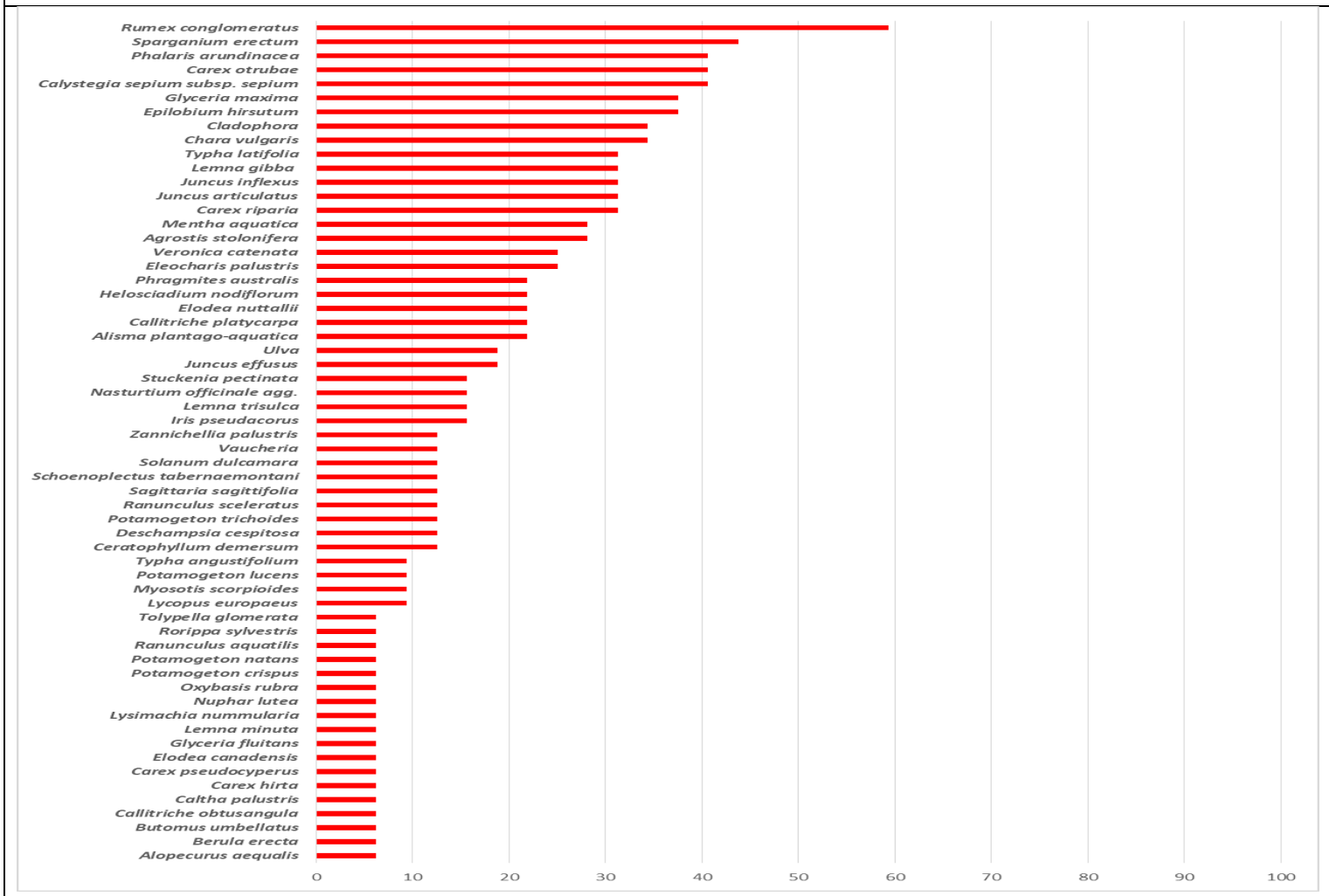
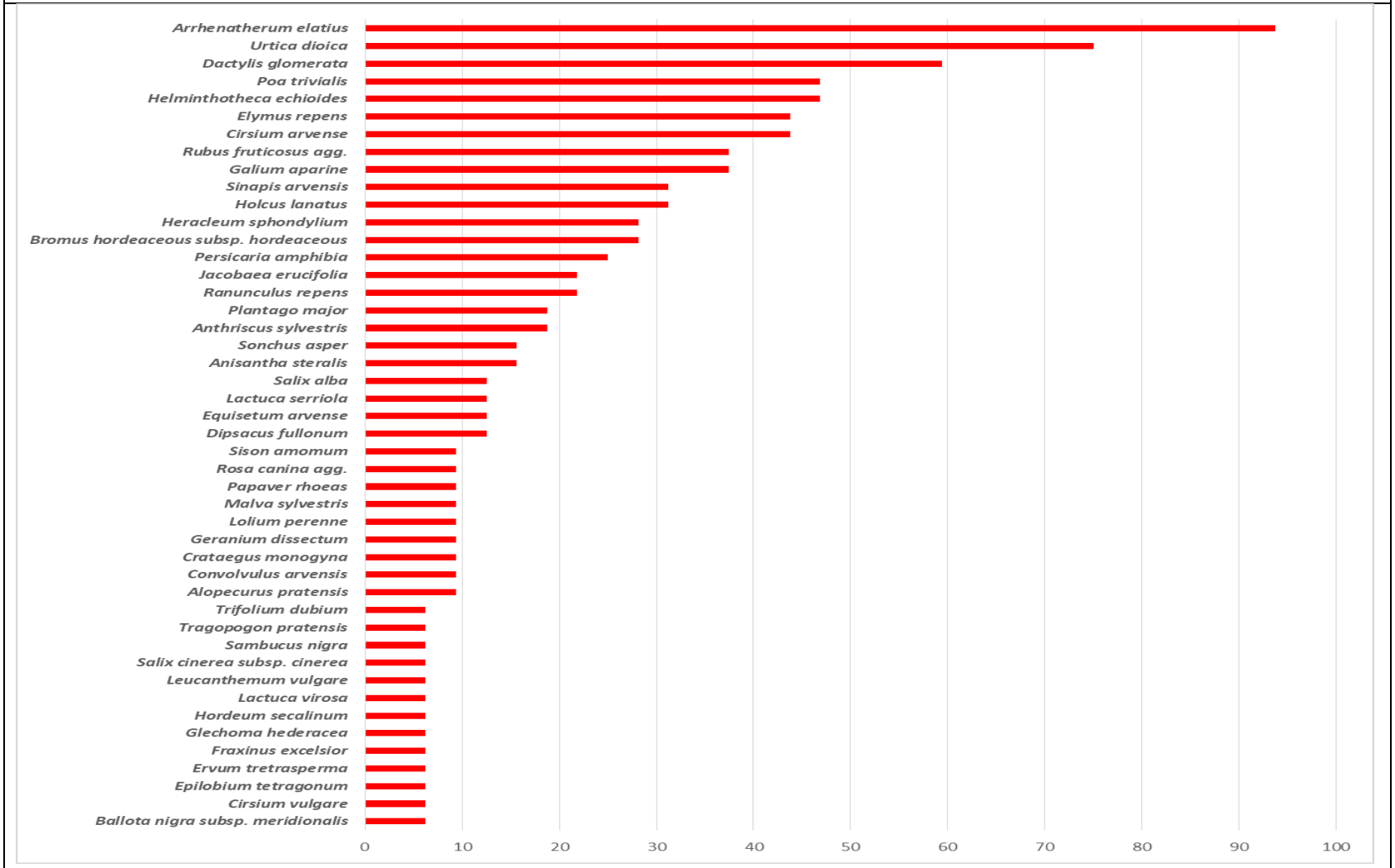


Figure 2 Occurrence of "bank" plant species within the 43 sample points



3.2 Aquatic Coleoptera

3.2.1 The survey generated 310 records of water beetles from 31 sites (two sites at Cam Washes SSSI held water but yielded no beetles; one dried-up pond produced only galls of Pink Water-speedwell Weevil *Gymnetron villosulum*). Seventy-nine distinct taxa were recorded and these are listed in Table 3.

3.2.2 Five of these have the status of Near Threatened in Great Britain: the diving beetles *Agabus undulatus* and *Laccornis oblongus*; the scavenger water beetles *Hydrochus crenatus* and *Enochrus nigritus*; and the small water beetle *Limnebius papposus*. In addition, four water beetles are listed as Nationally Scarce: the burrowing water beetle *Noterus crassicornis*, the diving beetle *Scarodytes halensis*, the scavenger water beetle *Enochrus quadripunctatus* and the riffle beetle *Oulimnius major/O. rivularis*. Two weevils, Pink Water-speedwell Weevil and *Phytobius leucogaster* are formally still listed as Nationally Scarce, although they probably no longer warrant this status.

Table 3: Aquatic Coleoptera species recorded during the survey

SPECIES	English name	GB status
GYRINIDAE	whirligig beetles	
Gyrinus substriatus Stephens, 1828	Common Whirligig	Widespread
HALIPLIDAE	algivorous water beetles	
Haliplus obliquus (Fabricius, 1787)		Widespread
Haliplus immaculatus Gerhardt, 1877		Widespread
Haliplus lineolatus Mannerheim, 1844		Local
Haliplus ruficollis (De Geer, 1774)		Widespread
Haliplus flavicollis Sturm, 1834		Widespread
Haliplus mucronatus Stephens, 1828		Nationally Scarce
Haliplus lineatocollis (Marsham, 1802)		Widespread
NOTERIDAE	burrowing water beetles	
Noterus clavicornis (De Geer, 1774)		Widespread
Noterus crassicornis (O.F. Müller, 1776)		Nationally Scarce
HYGROBIIDAE	screech beetles	
Hygrobia hermanni (Fabricius, 1775)	Screech Beetle	Widespread
DYTISCIDAE	diving beetles	
Agabus bipustulatus (Linnaeus, 1767)		Widespread
Agabus didymus (Olivier, 1795)		Widespread
Agabus nebulosus (Forster, 1771)		Widespread
Agabus paludosus (Fabricius, 1801)		Local
Agabus sturmii (Gyllenhal, 1808)		Widespread
Agabus undulatus (Schrank, 1776)		Near Threatened
Ilybius chalconatus (Panzer, 1796)		Local
Ilybius fenestratus (Fabricius, 1781)		Local
Ilybius fuliginosus (Fabricius, 1792)		Widespread
Ilybius quadriguttatus (Lacordaire, 1835)		Widespread
Colymbetes fuscus (Linnaeus, 1758)		Widespread
Rhantus suturalis (Macleay, 1825)		Local
Liopterus haemorrhoidalis (Fabricius, 1787)		Widespread
Acilius sulcatus (Linnaeus, 1758)		Near Threatened
Dytiscus marginalis Linnaeus, 1758	Great Diving Beetle	Widespread
Hydroglyphus geminus (Fabricius, 1792)		Nationally Scarce

Nebrioporus assimilis (Paykull, 1798)		Local
Graptodytes pictus (Fabricius, 1787)		Widespread
Hydroporus discretus Fairmaire & Brisout de Barneville, 1859		Widespread
Hydroporus incognitus Sharp, 1869		Widespread
Hydroporus memnonius Nicolai, 1822		Widespread
Hydroporus palustris (Linnaeus, 1761)		Widespread
Hydroporus planus (Fabricius, 1782)		Widespread
Hydroporus striola (Gyllenhal, 1826)		Local
Hydroporus tessellatus (Drapiez, 1819)		Widespread
Scarodytes halensis (Fabricius, 1787)		Nationally Scarce
Hygrotus confluens (Fabricius, 1787)		Widespread
Hygrotus inaequalis (Fabricius, 1777)		Widespread
Hygrotus versicolor (Schaller, 1783)		Local
Hygrotus impressopunctatus (Schaller, 1783)		Widespread
Laccornis oblongus		Near Threatened
Hyphydrus ovatus (Linnaeus, 1761)		Widespread
Laccophilus hyalinus (De Geer, 1774)		Widespread
HELOPHORIDAE		
Helophorus brevipalpis Bedel		Widespread
Helophorus grandis Illiger, 1798		Widespread
Helophorus griseus Herbst, 1793		Local
Helophorus minutus Fabricius, 1775		Widespread
Helophorus obscurus Mulsant, 1844		Widespread
HYDROCHIDAE		
Hydrochus crenatus (Fabricius, 1792)		Near Threatened
HYDROPHILIDAE	scavenger water beetles	
Anacaena bipustulata (Marsham, 1802)		Local
Anacaena globulus (Paykull, 1798)		Widespread
Anacaena limbata (Fabricius, 1792)		Widespread
Berosus affinis Brullé, 1835		Local
Cymbiodyta marginellus (Fabricius, 1792)		Widespread
Enochrus quadripunctatus (Herbst, 1797)		Nationally Scarce
Enochrus nigritus (Sharp, 1873)		Near Threatened
Enochrus testaceus (Fabricius, 1801)		Widespread
Helochares lividus (Forster, 1771)		Local
Hydrobius fuscipes (Linnaeus, 1758)		Widespread
Hydrobius subrotundus (Stephens, 1829)		Local
Hydrobius c.f. *rottenbergii* (Gerhardt, 1872)		Local
Laccobius bipunctatus (Fabricius, 1775)		Widespread
Laccobius sinuatus Motschulsky, 1849		Local
Cercyon convexiusculus Stephens, 1829		Local
Cercyon marinus Thomson, C.G., 1853		Widespread
Cercyon sternalis (Sharp, 1918)		Local
HYDRAENIDAE	small water beetles	
Hydraena testacea Curtis, 1830		Local
Limnebius papposus Mulsant, 1844		Near Threatened
Ochthebius bicolon Germar, 1824		Local
Ochthebius dilatatus Stephens, 1829		Widespread
Ochthebius minimus (Fabricius, 1792)		Widespread
DRYOPIDAE	long-toed water beetles	
Dryops luridus (Erichson, 1847)		Widespread
ELMIDAE	riffle beetles	
Oulimnius major / *rivularis*		Nationally Scarce

SCIRTIDAE	marsh beetles	
Contacyphon laevipennis (Tournier, 1868)		Local
CHRYSOMELIDAE: DONACIINAE	reed beetles	
Donacia semicuprea Panzer, 1796		Local
Donacia simplex Fabricius, 1775		Widespread
ERIRHINIDAE	weevils	
Tanysphyrus lemnae (Paykull, 1792)	Duckweed Weevil	Local
CURCULIONIDAE	weevils	
Gymnetron villosulum (Gyllenhal, 1838)	Pink Water-speedwell Weevil	Nationally Scarce
Phytobius leucogaster (Marsham, 1802)		Nationally Scarce

4 Noteworthy Species

4.1 Plants

No England Red List plants (Stroh et. al, 2014) were recorded from sample points though the following are considered notable in a regional (Fenland) context (Graham & Mountford, in prep.). These are either uncommon species in Fenland as a whole, species thought to be declining regionally or represented by significant populations within individual sample points. These include Clustered Stonewort *Tolypella glomerata*, Orange Foxtail *Alopecurus aequalis*, River Water-dropwort *Oenanthe fluviatilis*, Hairlike Pondweed *Potamogeton trichoides*, Common Water-crowfoot *Ranunculus aquatilis* and Golden Dock *Rumex maritimus*. In addition, terrestrial plants of Water-violet *Hottonia palustris* (Vulnerable in England) were recorded from a dry pond close to the two sampled as part of the Hainey Farm pond complex.

Clustered Stonewort *Tolypella glomerata* collected from the New Cut Drain, Willow Grange Farm.

4.2 Aquatic Coleoptera

Haliplus mucronatus, an algivorous water beetle (Haliplidae)

GB status: Nationally Scarce

Haliplus mucronatus has a very restricted British distribution concentrated in eastern England from Kent to the Humber, with a small number of outlying records in the Gwent and Somerset Levels. In 2013-14, it was found in a single drain (out of 175 surveyed) in the farmland surrounding the Ouse Washes. During the previous NLOW survey, it was found in two man-made ponds at Kingfishers Bridge NR.

In the present survey, a single specimen of *H. mucronatus* was found in a shallow pool dominated by stonewort at Hainey Farm, Soham (Site 26). This continues to be a rare and sporadic beetle in Fenland.

Noterus crassicornis, a burrowing water beetle (Noteridae)

GB status: Nationally Scarce

This small, brown, bullet-shaped beetle has a very patchy, 'semi-relict' distribution associated with lowland fenland areas. Its principal centres are the coastal grazing levels of south-east England; East Anglia; the Trent Valley and Humberhead Levels; the Cheshire Plain and Anglesey. *Noterus crassicornis* is flightless, having markedly reduced wings, and is probably a good indicator of historic (though often highly modified) wetland landscapes. This species occurs both in primary wetlands (such as natural meres and pingos) and in secondary habitats such as ditches and borrow-pits on drained fenland.

During the 2021 NLOW survey, *N. crassicornis* was found in ten locations. In June 2025, it was found in just two (21 & 33), both of which produced the species previously.

Agabus undulatus, a diving beetle (Dytiscidae)

GB status: Near Threatened

This distinctive, mid-sized diving beetle occurs principally in the counties around the Wash with records extending from Wicken Fen in the south to the Donnington area of south Lincolnshire in the north; Cambridgeshire represents its national stronghold, though it occurs also in Breckland. This species has disappeared from most outlying locations and survives precariously at single stations near York and in Herefordshire.

Agabus undulatus was found in nine drains (out of 175) during the Ouse Washes Fringes survey but only one (Shoalmill Drain) during the 2021 NLOW study. It was therefore reassuring to find

A. undulatus at four sites in June 2025: Queenholme Drain (Site 20), the embayment on New Cut at Willow Grange Farm (Chittering) (Site 22) and both locations on Smithey Fen Engine Drain at Fen End Farm (Sites 36 and 39). Interestingly, all these locations were habitat enhancement sites on larger IDB drains and none had produced *A. undulatus* previously. These records confirm the NLOW project area as an important stronghold for this nationally rare species, and suggest that it benefits from creation of varied shallow-water habitats in trapezoidal drains.

Laccornis oblongus, a diving beetle (Dytiscidae)

GB status: Near Threatened

This small diving beetle is associated with relict fens of natural origin, with clusters of records in the Brecks, Broadland, the Somerset Levels and Scottish Border Mires. It is of scattered and extremely localised occurrence elsewhere. *Laccornis oblongus* has long been known from Wicken Fen, most recently from Adventurer's Fen in 2013. Other records from the Fens are vague or poorly localised.

It was remarkable, then, to collect a single specimen from the recently-created small pond at Wicken Recreation Ground (Site 11). The underside photo shows the flattened and rounded prosternal process, one of the features separating *Laccornis* from other members of the subfamily Hydroporinae. Photos have been confirmed by Professor G.N. Foster.

This record must relate to a wanderer from Wicken Fen, the new pond being about one kilometre away. It gives credence to the comment by Foster *et al* (2016) that "the distribution of this species indicates that specimens capable of flight must occur". In conjunction with the 2021 record of another relict-fen rarity, *Limnebius aluta*, from a modern pond at Kingfisher Bridge NR, the discovery of *Laccornis* at Wicken Recreation Ground indicates that well-designed new ponds can potentially enable such species to expand beyond their ancestral population centres.

Hydrochus crenatus, a scavenger water beetle (Hydrochidae)

GB status: Near Threatened

A small scavenger water beetle associated with reedy or mossy water margins in lowland fenland areas. *Hydrochus crenatus* has a very limited British distribution centred on Breckland and Fenland with very few outlying records (Foster *et al*, 2018). Although often associated with remnant fens, this beetle was recorded from eight drains in the Ouse Washes Fringes survey, with an important stronghold in the Sutton & Mepal IDB district. During the 2021 NLOW survey, it was collected from a man-made pond at Kingfishers Bridge.

During the present survey, *Hydrochus crenatus* was found widely, including in sites where it was not detected previously. It was recorded from Duce's Pond at Over (Site 16), the scrape by the Old West (Site 17), the two gravel-pit ponds at Norlands (Sites 18 & 19), Queenholme Drain (Site 20), Willow Grange Farm North Pond at Chittering (Site 21), Haddenham Engine Drain (Site 33) and on Smithy Fen Engine Drain at Fen End Farm (Site 39). These records confirm that the NLOW project area is also a stronghold for *H. crenatus*.

Enochrus nigritus, a scavenger water beetle (Hydrophilidae)

GB status: Near Threatened

This beetle is a speciality of richly-vegetated lowland fen pools, occurring mainly in East Anglia with outlying populations in Herefordshire, the New Forest and a few isolated locations elsewhere. While largely confined to relic habitats (Foster *et al*, 2018), *E. nigritus* is capable of flight (Hammond, 2019) and can potentially colonise new sites. It was not detected in the Ouse Washes Fringes ditch surveys but the 2021 NLOW survey produced records from Crowlands Moat and a recently-created pond on Swaffham Prior Fen.

During the present survey, a male specimen of *E. nigritus* was collected from the Norlands Pond (Site 18). This demonstrates the exceptional quality of the pond, which has varied vegetation structure including extensive mossy margins as well as clean, clear water. The record also provides further evidence that high-quality ponds can be colonised by scarce and specialised fenland insects.

Enochrus quadripunctatus, a scavenger water beetle (Hydrophilidae)

GB status: Nationally Scarce

A mid-sized, brownish scavenger water beetle associated with clayey or silty water margins. Although older records are confused by taxonomic changes, the true *E. quadripunctatus* has a restricted British distribution strongly centred on the east of England; it appears to have extended its range in recent years (Foster *et al*, 2014).

In 2021, this species was recorded from the SUDS pond at Cottenham, two ponds at Kingfishers Bridge NR and, in abundance, from the pond at Swaffham Prior Fen in the Wicken Fen Vision area. Previous surveys suggest *Enochrus quadripunctatus* has a significant population centre around the Ouse Washes. In June 2025, specimens were collected from Grunty Fen Catchwater at Hall Fen (Site 9), the new pond at Wicken Recreation Area (Site 11), The Norlands pond (Site 18), Willow Grange Farm north pond (Site 21), Smithey Fen Engine Drain (II) (Site 39).

Limnebius papposus, a small water beetle (Hydraenidae)

GB status: Near Threatened

The distribution of this small beetle has contracted markedly, leaving the Fens around the Wash as its core stronghold (map in Foster *et al*, 2020). It lives among plant litter in ditches and pond margins.

Limnebius papposus was not detected in surveys of 175 ditches in the farmland surrounding the Ouse Washes in 2013-14. The only record from the 2021 NLOW survey came from a semi-shaded, linear pool at Wicken Recreation Area, where four specimens were collected[3]. It was, however, found in good numbers in ditches at Wicken Fen itself in September 2023 (Hammond, 2023).

During the present survey*, L. papposus* was found at four locations: Grunty Fen Catchwater (Site 3), the new pond at Wicken Recreation Area (Site 11), Willow Grange Farm north pond (Site 21) and Hainey Farm pond 1 (Site 25).

Oulimnius major/rivularis, riffle beetles (Elmidae)

GB status: Nationally Scarce

Oulimnius are riffle-beetles, a family mostly associated with highly-oxygenated, fast-flowing water. Less typically, both *Oulimnius major* and *O. rivularis* are characteristic of slow-flowing, often canalised lowland watercourses and have very restricted British distributions. *Oulimnius major* extends from southern England north to the Lower Derwent Valley in East Yorkshire but with a strong concentration of records in the Fens. Once thought extinct in Britain, *O. rivularis* was rediscovered in Cambridgeshire in 1986 in the Sixteen-Foot Drain (Foster & Bratton, 1986). There have been numerous records since then from the Fens, with more northerly populations around the New River Ancholme in north Lincolnshire and in a section of the

[3] This site was re-visited in 2025 but was dry.

Chesterfield Canal in Nottinghamshire (Merritt, 2006). Otherwise there appear to be just two outlying records from south-east England, one very old.

A single female *O. major*/*rivularis* was collected from Haddenham Engine Drain at Hoghill Drove but unfortunately could not be determined with confidence to species.

Gymnetron villosulum, Pink Water-speedwell Weevil (Curculionidae)

GB status: Nationally Scarce

The larvae of this weevil develop in the seed pods of *Veronica catenata* (Pink Water Speedwell). It has a localised distribution north to County Durham but its distinctive galls (photo, left) seem to be frequent in many places where its host plant abounds, so it is unlikely to really merit a national conservation status. Pink Water-speedwell Weevil was recorded from seven sites during the 2021 NLOW survey, mostly from Kingfisher Bridge NR or the Cam Washes SSSI but also from the new pond in the Wicken Fen Vision area at Swaffham Prior Fen and from the Old West floodplain at Willow Grange Farm.

During the current survey, galls of this species were recorded from the dried-up pond E of Grunty Fen Catchwater at Hall Fen (Site 8), Norlands Pond (Site 18) and Willow Grange Farm north pond (Site 21),

Phytobius leucogaster, a water-millfoil weevil

GB status: Nationally Scarce

Phytobius leucogaster is one of five or six British weevils which feed on water-millfoils. This species is usually found on Spiked Water-millfoil *Myriophyllum spicatum*. Although it can disperse by flying, it spends its entire life-cycle on the host plant, the larvae initially feeding on the flower buds.

This species was abundant on submerged stands of Spiked Water-millfoil at Hainey Farm Pond 1 (Site 25).

4.3 Other noteworthy species

4.3.1 Ten-spined Stickleback *Pungitius pungitius* was recorded from seven sample points (22%) including both drains and ponds (3, 5, 20-22, 39 and 41).

4.3.2 Odonata including Common Darter *Sympetrum striolatum* (adults and larvae) in two sample points (N5 & N7); Broad-bodied Chaser *Libellula depressain* a single sample point (N7) and Banded Damoiselle *Calopteryx splendens* in the slow-flowing outfall of Reach Lode at the Cam Washes SSSI (sample point 15).

4.3.3 Smooth Newt Lissotriton *vulgaris* (as larvae) was recorded from three sample points (7, 23 & 25),

4.3.4 Water Spider *Argyroneta aquatica* in the slow-flowing outfall of Reach Lode at the Cam Washes SSSI (sample point 15).

4.3.5 River Snail *Viviparus viviparus* was recorded from the junction of New Cut and Engine drains, Willow Grange Farm (sample point 22).

4.3.6 Mottled Backswimmer *Notonecta maculata* was recorded from one of the ponds within the Hainey Farm pond complex, Stretham (sample point 25).

4.3.7 Spined Loach *Cobitis taenia* is listed on Annex II of the EC Habitats and Species Directive and has its UK stronghold in Fenland. Spined loach (two adults and a juvenile) were accidently netted as part of water beetle sampling from three sample points: the Queenholme Drain (sample point 20); at the junction of New Cut and Engine drains, Willow Grange Farm (sample point 22); and in the slow-flowing outfall of Reach Lode at the Cam Washes SSSI (sample point 15).

Spined Loach *Cobitis taenia* accidently netted from the slow-flowing outfall of Reach Lode at the Cam Washes SSSI (sample point N15).

5 Scoring of water body sample points based on aquatic Coleoptera indicator species

5.1 WETSCORE (WETland Site COleoptera Record Evaluation) is a method developed to assess the nature conservation quality of wetland habitats using aquatic Coleoptera (Foster, 1987; Foster & Eyre, 1992). Each species recorded from a site is given an individual score based on its relative rarity in a national and regional context. The sum of individual species scores for the site is referred to as the **Species Quality Score (SQS)**[4]**.** This can be divided by the **number of species (NoS)** to give the **Species Quality Index (SQI)**: a measure of the average 'quality' of the species recorded.

5.2 All SQI systems use a geometric progression of individual species quality scores in order to reflect differences in relative rarity and/or conservation status. For the purposes of this analysis, a commonly-adopted scoring system has been followed (Table 4). Individual species scores are shown in Table 5.

Table 4: Aquatic Coleoptera species scores used in the current assessment

Status[5]	**Species score**
Widespread and common	1
Widespread but local	2
Uncommon: species listed as 'Local' in the ISIS methodology and species known to be scarce in the Fens are included in this category	4
Nationally Scarce	8
Near Threatened	16
Red List (Vulnerable/Endangered/Critically Endangered)	32

[4] Confusingly, the terms for these measures have been used differently in different versions of the methodology! We have used the term Species Quality Score as the sum of individual species score, as per Natural England guidance for site assessment using invertebrates (Drake *et al*, 2007).

[5] Assessment of species status has become more complicated in recent years, with parallel designations based on threat (using IUCN criteria) and rarity (Nationally Rare/Nationally Scarce). In addition, some minor changes have been made with regards to water beetles (see Table 2 in Foster *et al*, 2020). We have continued to use the status listings in the most recent JNCC review for British water beetles (Foster, 2010) to ensure comparability with previous surveys commissioned by Cambridgeshire ACRE.

Table 5 Species scores for water beetles used in this assessment

Family/Species	SQS	Family/Species	SQS	Family/Species	SQS
GYRINIDAE		*Hydroporus planus*	1	*Cercyon sternalis*	4
Gyrinus substriatus	1	*Hydroporus striola*	4	HYDRAENIDAE	
HALIPLIDAE		*Hydroporus tessellatus*	1	*Hydraena testacea*	4
Haliplus obliquus	2	*Scarodytes halensis*	8	*Limnebius papposus*	16
Haliplus flavicollis	2	*Graptodytes pictus*	1	*Ochthebius bicolon*	4
Haliplus lineatocollis	1	*Hygrotus confluens*	2	*Ochthebius dilatatus*	2
Haliplus mucronatus	8	*H. impressopunctatus*	1	*Ochthebius minimus*	1
Haliplus lineolatus	2	*Hygrotus inaequalis*	1	ELMIDAE	
Haliplus immaculatus	1	*Hygrotus versicolor*	2	*Oulimnius major/rivularis*	8
Haliplus ruficollis	1	*Laccornis oblongus*	16	DRYOPIDAE	
NOTERIDAE		*Hyphydrus ovatus*	1	*Dryops luridus*	1
Noterus clavicornis	1	*Laccophilus hyalinus*	2	SCIRTIDAE	
Noterus crassicornis	8	HELOPHORIDAE		*Contacyphon laevipennis*	2
HYGROBIIDAE		*Helophorus brevipalpis*	1	CHRYSOMELIDAE	
Hygrobia hermanni	2	*Helophorus grandis*	1	*Donacia semicuprea*	2
DYTISCIDAE		*Helophorus griseus*	4	*Donacia simplex*	2
Agabus bipustulatus	1	*Helophorus minutus*	1	ERIRHINIDAE	
Agabus didymus	2	*Helophorus obscurus*	1	*Tanysphyrus lemnae*	1
Agabus nebulosus	1	HYDROCHIDAE		CURCULIONIDAE	
Agabus paludosus	2	*Hydrochus crenatus*	16	*Gymnetron villosulum*	8
Agabus sturmii	1	HYDROPHILIDAE		*Phytobius leucogaster*	8
Agabus undulatus	16	*Berosus affinis*	4		
Ilybius chalconatus	4	*Laccobius bipunctatus*	1		
Ilybius fenestratus	4	*Laccobius sinuatus*	4		
Ilybius fuliginosus	1	*Hydrobius fuscipes*	1		
Ilybius quadriguttatus	2	*Hydrobius subrotundus*	2		
Colymbetes fuscus	1	*Hydrobius* c.f. *rottenbergii*	4		
Rhantus suturalis	4	*Anacaena bipustulata*	4		
Liopterus haemorrhoidalis	2	*Anacaena globulus*	1		
Acilius sulcatus	2	*Anacaena limbata*	1		
Dytiscus marginalis	1	*Cymbiodyta marginellus*	2		
Hydroglyphus geminus	4	*Enochrus nigritus*	16		
Nebrioporus assimilis	4	*Enochrus quadripunctatus*	8		
Hydroporus discretus	2	*Enochrus testaceus*	2		
Hydroporus incognitus	1	*Helochares lividus*	4		
Hydroporus memnonius	1	*Cercyon convexiusculus*	4		
Hydroporus palustris	1	*Cercyon marinus*	2		

5.3 These metrics (SQI, SQS, NoS) are different measures of the conservation quality of the water beetle fauna recorded from a site. They should be applied with caution, especially when comparing species lists that have not been allocated to different communities. Briefly:

- **Number of Species** is the simple measurement of species richness. In steep-sided Fenland drains, accessibility can be a significant constraint on how many species can be recorded from a site.

- **Species Quality Index** is a measure of the mean (average) quality of the water beetle list for a site. Use of a mean figure is claimed to correct for differences in recording effort (Foster, 1997b). SQI works best for sites supporting a moderately diverse fauna: short species lists tend to be distorted by the presence of one or two scarcer species whilst long lists tend to converge on a 'middling' score due to the presence of many common species even when rarities are recorded.

- **Species Quality Score** reflects both the number of species and their individual scores. This metric is more influenced by recording effort than SQI but it highlights species-rich sites with a high proportion of less common species as well as sites with shorter lists supporting a high concentration of rarities.

5.4 An inherent problem with the **Species Quality Index (SQI)** metric is that short lists are liable to skewed by the presence of high-scoring species (Williams, 2000; Drake *et al*, 2007). This distorting effect can be reduced by stipulating a minimum number of species when an index value is to be calculated: Foster & Eyre (1992) suggested 5. On this basis, sites which yielded fewer than five water beetle taxa have not been assessed using these metrics. This applies to Sites 8 (Pond E of Grunty Fen Catchwater, Little Thetford), 28 (Thetford Catchwater Drain), 29 (St George's Church pond, Little Thetford), 32 (Line Drain, Aldreth) and 41 (New Cut Drain).

5.5 In terms of **Number of Species (NoS)**, the water beetle data show that between 0 and 24 species were recorded per sampling point (the two Cam Washes sites which held water yielded no beetles). Of the 25 sites sampled, the most species-rich is Norlands Pond with 24 species followed by Queenholme Drain with 22 species and Willow Grange Farm north pond with 20. It should be borne in mind that the exceptionally dry conditions in spring and early summer 2025 resulted in very low water levels on some sites (e.g. Cottenham SUDS pond), which will have influenced results. Sites are ranked by Number of Species (NoS) in Table 6.

Table 6 Sites ranked by number of water beetle species recorded		
Site Code	**Site name**	**NoS**
18	The Norlands (pond), Queenholme Farm, NE of Willingham	24
20	Queenholme Drain (berm), NE of Willingham	22
21	Willow Grange Farm (north pond), Chittering	20
6	Field pond by Red Fen Road, Little Thetford	18
7	Field drain by Red Fen Road, Little Thetford	16
11	New pond, Wicken recreation area	16
39	Smithey Fen Engine Drain (ii), Smithy Fen, N of Cottenham (Fen End Farm)	16
19	The Norlands (gravel pit), Queenholme Farm, NE of Willingham	14
22	Embayment at junction of New Cut and Engine drains, Willow Grange Farm	14
33	Haddenham Engine Drain at Hoghill Drove Bridge, S of Haddenham	14
5	Grunty Fen Drain, Witchford	12
25	Pond 1 in pond complex at Hainey Farm, Stretham	12
36	Smithey Fen Engine Drain (i), Smithy Fen, N of Cottenham (Fen End Farm)	12
16	Duce's Pond, Fen End Road, Over	10
34	Cottenham recreation ground (new pond)	10
40	Smithy Fen Engine Drain, Smithy Fen, by Rampton Road	9
24	Berm on north bank of New Cut Drain, Willow Grange Farm (ii)	8
3	Grunty Fen Catchwater Drain, Little Thetford	7
15	Reach Lode (outfall to Cam), Cam Washes SSSI	7
23	Berm on north bank of New Cut Drain, Willow Grange Farm (i)	7
35	Woodland pond adj B1049, Wilburton	7
17	Scrape beside Old West, NE of Willingham	6
42	Cottenham Recreation Ground (large SUDS pond)	6
9	Grunty Fen Catch water, Hall Fen, Little Thetford	5
26	Pond 2 in pond complex at Hainey Farm, Stretham	5

5.6 Table 7 lists all sites with five or more species, ranked by SQI (*n* =25). Scores ranged from 1.0 to 4.19. The mean SQI for these sites was 2.63. Foster & Eyre (1992) suggest that an SQI of 2.0 or over indicates a 'good' quality site. On this basis, 72% of sites supporting at least five water beetle species can be considered to support a good quality assemblage. This high proportion is unsurprising as these were mainly habitat creation or enhancement sites.

Table 7 Sites ranked by Species Quality Index for water beetles		
Site Code	**Site name**	**SQI**
39	Smithey Fen Engine Drain (ii), Smithy Fen, N of Cottenham (Fen End Farm)	4.19
21	Willow Grange Farm (north pond), Chittering	3.9
11	New pond, Wicken recreation area	3.75
17	Scrape beside Old West, NE of Willingham	3.67
3	Grunty Fen Catchwater Drain, Little Thetford	3.57
33	Haddenham Engine Drain at Hoghill Drove Bridge, S of Haddenham	3.5
20	Queenholme Drain (berm), NE of Willingham	3.32
18	The Norlands (pond), Queenholme Farm, NE of Willingham	3.21
25	Pond 1 in pond complex at Hainey Farm, Stretham	3.17
36	Smithey Fen Engine Drain (i), Smithy Fen, N of Cottenham (Fen End Farm)	2.92
16	Duce's Pond, Fen End Road, Over	2.9
19	The Norlands (gravel pit), Queenholme Farm, NE of Willingham	2.64
22	Embayment at junction of New Cut and Engine drains , Willow Grange Farm	2.64
26	Pond 2 in pond complex at Hainey Farm, Stretham	2.6
9	Grunty Fen Catch water, Hall Fen, Little Thetford	2.4
34	Cottenham recreation ground (new pond)	2.4
42	Cottenham Recreation Ground (large SUDS pond)	2.17
23	Berm on north bank of New Cut Drain, Willow Grange Farm (i)	2
40	Smithy Fen Engine Drain, Smithy Fen, by Rampton Road	1.89
24	Berm on north bank of New Cut Drain, Willow Grange Farm (ii)	1.88
6	Field pond by Red Fen Road, Little Thetford	1.83
15	Reach Lode (outfall to Cam), Cam Washes SSSI	1.71
7	Field drain by Red Fen Road, Little Thetford	1.31
5	Grunty Fen Drain, Witchford	1.25
35	Woodland pond adj B1049, Wilburton	1

5.7 The SQI results should be interpreted with caution. Sites 17 and 3 produced few species (seven and six respectively), so the presence of a single Near Threatened species at each of these locations exaggerates the score. Sites 26 and 9 also scored well but with only five species at each.

5.8 **Species Quality Score (SQS)** is a metric which combines species-richness and species quality. It will be influenced by recording effort and accessibility but arguably provides a more balanced measure of the 'quality' of the water beetle assemblage overall. Table 8 lists all sites with 5 or more species ranked by SQS. Scores vary from 7 to 78.

Table 8 Sites ranked by Species Quality Score for water beetles		
Site Code	**Site name**	**SQS total**
21	Willow Grange Farm (north pond), Chittering	78
18	The Norlands (pond), Queenholme Farm, NE of Willingham	77
20	Queenholme Drain (berm), NE of Willingham	73
39	Smithey Fen Engine Drain (ii), Smithy Fen, N of Cottenham (Fen End Farm)	67
11	New pond, Wicken recreation area	60
33	Haddenham Engine Drain at Hoghill Drove Bridge, S of Haddenham	49
25	Pond 1 in pond complex at Hainey Farm, Stretham	38
19	The Norlands (gravel pit), Queenholme Farm, NE of Willingham	37
22	Embayment at junction of New Cut and Engine drains, Willow Grange Farm	37
36	Smithey Fen Engine Drain (i), Smithy Fen, N of Cottenham (Fen End Farm)	35
6	Field pond by Red Fen Road, Little Thetford	33
16	Duce's Pond, Fen End Road, Over	29
3	Grunty Fen Catchwater Drain, Little Thetford	25
34	Cottenham recreation ground (new pond)	24
17	Scrape beside Old West, NE of Willingham	22
7	Field drain by Red Fen Road, Little Thetford	21
40	Smithy Fen Engine Drain, Smithy Fen, by Rampton Road	17
5	Grunty Fen Drain, Witchford	15
24	Berm on north bank of New Cut Drain, Willow Grange Farm (ii)	15
23	Berm on north bank of New Cut Drain, Willow Grange Farm (i)	14
26	Pond 2 in pond complex at Hainey Farm, Stretham	13
42	Cottenham Recreation Ground (large SUDS pond)	13
9	Grunty Fen Catch water, Hall Fen, Little Thetford	12
15	Reach Lode (outfall to Cam), Cam Washes SSSI	12
35	Woodland pond adj B1049, Wilburton	7

5.9 It can be seen that several habitat creation and enhancement sites rank highly on this metric including the north pond at Willow Grange Farm, the berm site on Queenholme Drain, the two berm sites on Smithey Fen Engine Drain and the new pond at Wicken Recreation Ground. One of the Hainey Farm ponds, the embayment on New Cut at Willow Grange Farm, the field corner pond by Red Fen Road and Duce's Pond at Over scored moderately well. By contrast, the woodland pond at Wilburton supported a banal assemblage consisting of widespread species only.

6 Representation of scarce water beetle species

6.1 Of all sites surveyed, 16 supported Near Threatened and/or Nationally Scarce water beetle species. Such species were well distributed on habitat creation/enhancement sites.

6.2 The Near Threatened diving beetle *Agabus undulatus*, for example, was closely associated with drains where berms or embayments had been created to increase the quality and extent of marginal habitat. It was present at both berm sites on Smithey Fen Engine Drain, on the berm at Queenholme Drain and in the embayment on New Cut at Willow Grange Farm. Another Near Threatened Fenland speciality, *Hydrochus crenatus*, was recorded from seven locations, five of which were habitat creation/enhancement sites.

6.3 Of the berms/embayments which we considered to have been successfully created, those at Queenholme Drain and Smithey Fen Engine Drain (II) scored exceptionally for all three water beetle metrics. Site I at Smithey Fen Engine Drain scored well but not as highly, probably because it was densely crowded with Common Reed. The embayment at the junction of New Cut and Engine drains at Willow Grange Farm produced moderately good scores. All these sites produced at least one Near Threatened species with Queenholme and Smithey Fen Engine Drain (II) yielding two (the latter also supported two Nationally Scarce beetles). The berms on the north bank of New Cut at Willow Grange Farm were indistinct and not sampled for water beetles.

6.4 Recently-created, clay-bedded ponds with patchy pioneer vegetation generally supported water beetle assemblages typical of base-rich water over an exposed mineral substrate, e.g. the Hainey Farm ponds, the field corner pond near Red Fen Road and the new pond at Cottenham Recreation Ground. Characteristic species include the diving beetles *Agabus nebulosus*, *Hygrotus confluens* and *Hydroglyphus pusillus* and the scavenger water beetle *Berosus affinis*. However, the Hainey Farm ponds produced the declining Fenland speciality *Limnebius papposus* (Near Threatened) and the algivorous water beetle *Haliplus mucronatus* (Nationally Scarce).

6.5 The recently-created clay-bedded pond at Wicken Recreation Ground was, however, particularly notable. Despite its recent origin and patchy vegetation, it produced *Limnebius papposus* and the localised dytiscids *Ilybius chalcontus* and *Hydroporus striola*, both more typical of richly-vegetated, long-established ponds. It also produced a single specimen of the diving beetle *Laccornis oblongus* (Near Threatened), a species usually considered restricted to ancient fens.

7 Comments on individual sites

7.1 Site 1 - Field pond near A142/A10 roundabout, Ely

A shallow pond that was dry at the time of survey with a small number of emergents including False Fox-sedge *Carex otrubae*, Common Spike-rush *Eleocharis palustris*, Jointed Rush *Juncus articulatus*, Soft Rush *Juncus effusus* and Grey Club-rush *Schoenoplectus tabernaemontani*. Stands of the moss *Drepanocladus aduncus* and terrestrial plants of Common Water-crowfoot *Ranunculus aquatilis* were of note. No water beetle assessment was possible.

7.2 Site 2 - Ephemeral scrapes beside the Grunty Fen Catchwater, Little Thetford

A series of connected shallow clay scrapes directly adjoining the Grunty Fen Catchwater and that had only recently drawn down exposing the wet muddy bed. A good number of emergents have colonised the scrapes including Creeping Jenny *Lysimachia nummularia*, False Fox-sedge *Carex otrubae*, Reed Canary-grass *Phalaris arundinacea*, Water-plantain *Alisma plantago-aquatica*, Branched Bur-reed *Sparganium erectum,* Jointed Rush *Juncus articulatus*, Hard Rush *Juncus inflexus* and Floating Sweet-grass *Glyceria fluitans.* No water beetle assessment was possible.

7.3 Site 3 - Grunty Fen Catchwater Drain, Little Thetford

A narrow (0.8 m wide) IDB drain with dominant emergent stands of Reed Canary-grass *Phalaris arundinacea*, Branched Bur-reed *Sparganium erectum,* False Fox-sedge *Carex otrubae* with occasional Fool's Water-cress *Helosciadium nodiflorum* and Blue Water-speedwell *Veronica anagallis-aquatica*. Quite drawn-down, the shallow open water (20 cm) was quite eutrophic with abundant Fat Duckweed *Lemna gibba*, the macro alga *Cladophora* with occasional Canadian Water-weed *Elodea canadensis*. Only a very few common water beetles were collected.

7.4 Site 4 - Pond by Grunty Fen Catchwater, Witchford

A shallow pond that was dry at the time of survey with dominant stands of reed and other emergents marking the winter water's edge including Reed Canary-grass *Phalaris arundinacea*, False Fox-sedge *Carex otrubae,* Tufted Hair-grass *Deschampsia cespitosa*, Hairy Willowherb *Epilobium hirsutum*, Jointed Rush *Juncus articulatus*, Hard Rush *Juncus inflexus,* Water-mint *Mentha aquatica*, Fleabane *Pulicaria dysenterica*, Woody Nightshade *Solanum dulcamara* and the more local species Blunt-fruited Rush *Juncus subnodulosus* and Brookweed *Samolus valerandi*. No water beetle assessment was possible.

7.5 Site 5 - Grunty Fen Catchwater Drain, Witchford

A second sample of this small IDB drain was very similar to site 3 with mildly eutrophic drawn-down shallow water. Frequent submerged stands of Various-leaved Water-starwort *Callitriche platycarpa* were of added interest and only a similar small number of common water beetles were collected.

7.6 **Sites 6 & 7 - Field pond and drain at Red Fen Road**

This clay-bedded pond and ditch both held water when nearby sites on more porous soils were bone-dry. The beetles were typical of recently-created habitats, with the stonewort-feeding *Haliplus obliquus* abundant on Common Stonewort *Chara vulgaris*. Other 'quality' species included the small diving beetle *Hygrotus versicolor* and the scavenger water beetle *Berosus affinis*. While no rarities were recorded, the pond and drain supported an impressive biomass of aquatic invertebrates including abundant Odonata larvae of several species. Recently constructed, these features were at an early stage of vegetation succession with the only emergent comprising scattered small patches of Reed Canary-grass *Phalaris arundinacea*, Hard Rush *Juncus inflexus* and occasional Water-cress *Nasturtium officinale agg.* The local Fenland plant Stone Parsley S*ison amomum* was of interest growing on the open banks.

7.7 **Site 8 - Pond E of Grunty Fen Catch water, Hall Fen, Little Thetford**

A shallow clay pond surrounded by arable that was dry at the time of survey but had an impressive variety of emergents including Water-plantain *Alisma plantago-aquatica*, Greater Pond-sedge *Carex riparia*, Jointed Rush *Juncus articulatus, Gipsywort L*ycopus europaeus, Grey Club-rush *Schoenoplectus tabernaemontani*, Bulrush *Typha latifolia*, Pink-flowered Water-speedwell *Veronica catenata* along with stands of the locally uncommon wetland plants Orange Foxtail *Alopecurus aequalis* and Marsh Horsetail *Equisetum palustre*. Various-leaved Water-starwort *Callitriche platycarpa* was locally abundant growing terrestrially (and showing that the water had only recently drawn-down) along with notable stands of the local aquatic Common Water-crowfoot *Ranunculus aquatilis*. No water beetle assessment was possible.

7.8 **Site 9 - Grunty Fen Catch water, Hall Fen, Little Thetford**

A third sample of this drain was very similar to sample points 3 and 5 showing eutrophic water (in these case with an abundance of the macro alga *Ulva*) with few other aquatics. Only a very few common water beetles were collected.

7.9 **Site 10 - Existing pond, Wicken recreation area**

A pond shaded by bankside ash and hawthorn scrub with a small number of emergents including False Fox-sedge *Carex otrubae*, Greater Willowherb *Epilobium hirsutum*, Woody Nightshade *Solanum dulcamara* and Bulrush *Typha latifolia*. It was dry and no water beetle assessment was possible.

7.10 **Site 11 - New pond, Wicken Recreation Ground**

A new and open clay pond at an early stage of vegetation succession with stands of Fragile Stonewort *Chara globularis* and Common Stonewort *Chara vulgaris* in the shallow drawdown open water. Bulrush seedlings might be the less common Lesser Bulrush *Typha angustifolia*. Particularly notable for water beetles (see above) with *Limnebius papposus*, the localised dytiscids *Ilybius chalcontus* and *Hydroporus striola*

and the Near Threatened diving beetle *Laccornis oblongus*, a species usually considered restricted to ancient fens.

7.11 **Sites 12, 13 & 14 – pools at Cam Washes SSSI**

Shallow pools that draw-down in summer and that are cattle grazed. The open water has no aquatic plants but the cattle-poached margins have a broad range of characteristic washland plants including Tufted Hair-grass *Deschampsia cespitosa*, Common Spike-rush *Eleocharis palustris*, Reed Sweet-grass *Glyceria maxima*, Water-mint *Mentha aquatica*, Common Forget=me not *Myosotis scorpioides*, Water-cress *Nasturtium officinale agg*., Celery-leaved Buttercup *Ranunculus sceleratus*, Creeping Yellow-cress *Rorippa sylvestris*, Flowering Rush *Butomus umbellatus*, Water Chickweed *Stellaria aquatica*, Brooklime *Veronica beccabunga*, Pink Water Speedwell *Veronica catenata*, Trifid Bur-marigold *Bidens tripartita*, drawdown specialists such as Red Goosefoot *Oxybasis rubra* and Marsh Cudweed *Gnaphalium uliginosum*, along with the rather local Fenland plant Golden Dock Rumex maritimus. Surprisingly no water beetles were found, perhaps reflecting the lack of vegetation structure.

7.12 **Sites 15 – Reach Lode (outfall to the Cam), Cam Washes SSSI**

A sluggish large drain with river ecology. The banks have tall emergent mixed stands of Reed Canary-grass *Phalaris arundinacea*, Reed Sweet-grass *Glyceria maxima* and Branched Bur-reed *Sparganium erectum* with Water-plantain *Alisma plantago-aquatica*, Lesser Water-parsnip *Berula erecta* and False Fox-sedge *Carex otrubae*. The open water was dominated by Yellow Water-lily *Nuphar lutea* with Perfoliate Pondweed *Potamogeton perfoliatus*, Arrowhead *Sagittaria sagittifolia* and Unbranched Bur-reed *Sparganium emersum*. Few water beetle species were recorded but included the reed beetle *Donacia simplex* on marginal emergent vegetation with other species noted including Spined Loach *Cobitis taenia,* Banded Damoiselle *Calopteryx splendens* and Water Spider *Argyroneta aquatica.*

7.13 **Site 16 - Duce's Pond, Over**

Following work to reprofile the pond margin, emergent vegetation is more extensive and varied with stands of Greater Pond-sedge *Carex riparia*, Branched Bur-reed *Sparganium erectum*, False Fox-sedge *Carex otrubae*, Woody Nightshade *Solanum dulcamara*, Floating Sweet-grass *Glyceria fluitans*, Jointed Rush *Juncus articulatus* and the locally uncommon Cyperus sedge *Carex pseudocyperus*, this a colonist not recorded during the previous survey. Mature bankside willows and alder remain shading some of the open water providing suitable conditions for the semi-aquatic moss *Leptodictyum riparium*. The improvements in the structure of emergent vegetation is reflected in an increase in water beetle species from four in 2021 to ten in 2025. SQI improved from 1 to 2.9 and SQS from 4 to 29. Notably, the Near Threatened scavenger water beetle *Hydrochus crenatus*, which has its national stronghold in the Fens, was recorded. The tiny *Cercyon sternalis*, which lives among plant debris, is another uncommon species found here. While the water beetle assemblage associated with emergent vegetation in very shallow water has improved

markedly, there are still very few species associated with more open water. This is likely due to fish predation pressure. The aquatic communities of the open water are also suggestive of some eutrophication with Fat Duckweed *Lemna gibba*, Ivy-leaved Duckweed *Lemna trisulca*, Rigid Hornwort *Ceratophyllum demersum* and the macro algae *Cladophora* and *Ulva*.

7.14 **Site 17 - Scrape adjoining the Old West, NE of Willingham**

A linear feature connected to the Old West with dominant marginal stands of Reed Sweet-grass *Glyceria maxima* with occasional patches of rushes (*Juncus effusus* and *J. inflexus*), sedges (*Carex otrubae* and *C. riparia*) and Hairy Willowherb *Epilobium hirsutum*. The open water is partly shaded by mature bankside White Willow *Salix alba* but is generally eutrophic with only Fennel Pondweed *Stuckenia pectinata*, the aquatic form of Amphibious Bistort *Persicaria amphibia* and an abundance of the macro alga *Cladophora*. The invertebrate interest is likely to be limited by the poor water quality in the Old West though nonetheless, it produced the Near Threatened scavenger water beetle Hydrochus crenatus,

7.15 **Sites 18 & 19 - The Norlands ponds**

Site 18 produced 24 species compared to 33 in June 2021. The SQS for 2025 was 77 compared to 84 for the previous survey. The SQI score was 3.21 compared to 2.88 in 2021. So, although fewer species were recorded in 2025, the average 'quality' was rather higher. The low-nutrient water associated with ground connection to surrounding gravel beds has allowed development of a rich emergent flora including Common Spike-rush *Eleocharis palustris*, Water-plantain *Alisma plantago-aquatica*, Branched Bur-reed *Sparganium erectum*, Bulrushes (both *Typha latifolia* and *T. angustifolium*, Yellow Iris *Iris pseudacorus*, Fool's Water-cress *Helosciadium nodiflorum*, Gypsywort *Lycopus europaeus*, Water-cress *Nasturtium officinale agg*., Water-mint *Mentha aquatica*, Pink Water-speedwell *Veronica catenata* and the local species Orange Foxtail *Alopecurus aequalis* and Tufted Forget-me-not *Myosotis laxa subsp. caespitosa.* Though deeply drawn-down due to the drought, shallow pools remain with stands of the large pondweeds *Potamogeton lucens* and *P. natans*, Common Stonewort *Chara vulgaris*, a single patch of Yellow Water-lily *Nuphar lutea* and of note were terrestrial populations of both Thread-leaved Water-crowfoot *Ranunculus trichophyllus* and Common Water-crowfoot *Ranunculus aquatilis*.

Water Beetle species of conservation concern this year included the scavenger water beetles *Hydrochus crenatus*, *Enochrus nigritus* (both Near Threatened) and *E. quadripunctatus* (Nationally Scarce). *Enochrus nigritus* is closely associated with high quality fen habitats, usually in very long-established wetlands though it is occasionally found in habitats of more recent origin (it was recorded from a recent pond on Swaffham Prior Fen in 2021). The Near Threatened *Berosus luridus* was recorded in 2021 along with several other water beetles, making a total of 42 species over the two visits. This is an exceptionally rich pond for water beetles and would warrant survey in spring, when the mossy margins are likely to be especially productive.

The newer gravel-pit pond to the south-east of the pond (Site 19) has steep sides and limited marginal habitat. Nonetheless its invertebrate interest has clearly improved since 2021: just 2 species were found then, compared to 14 in 2025. Notably, the Near Threatened *Hydrochus crenatus* was among those recorded.

7.16 **Site 20 - Queenholme Drain berm site**

Habitat enhancement here has created an extensive shelf dominated by Common Stonewort *Chara vulgaris* in shallow water. This was a very high-scoring site for water beetles with 22 species producing a SQS of 73 and SQI of 3.32. Near Threatened species included the diving beetle *Agabus undulatus* in good numbers along with the scavenger water beetle *Hydrochus crenatus*. Uncommon species included the diving beetle *Nebrioporus assimilis* and the small water beetle *Ochthebius bicolon*. The rare fish Spined Loach was also present. The deeper water towards the centre of the drain support a diverse aquatic plant community with Blunt-fruited Water-starwort *Callitriche obtusangula*, both Canadian and Nuttall's Water-weeds (*Elodea canadensis* and *E. nuttallii*), large beds of Shining Pondweed *Potamogeton lucens*, Arrowhead *Sagittaria sagittifolia* and Fennel Pondweed *Stuckenia pectinata*.

When this drain was sampled in 2021, this site yielded just 5 water beetle species with an SQI of 1.2. So, NoS had more than quadrupled and SQI had almost trebled. This may, in part, reflect greater ease of sampling along the berm compared to the steep, trapezoidal channel. Nonetheless, there was clearly a huge improvement in shallow-water and marginal habitat with several water's edge beetles present (*H. crenatus*, *Laccobius sinuatus*, *Hydrobius* species, *O. bicolon*, *Dryops luridus*). This should be considered an exemplar site for berm creation.

Out of 110 drains sampled in the NLOW project area in 2021 and 2025, the Queenholme berm site produced the highest SQS score[6].

7.17 **Site 21 North pond, Willow Grange Farm (Chittering)**

This shallow pond had been created at the T-junction of two ditches, providing shallow water with patchy wetland vegetation. The marginal water's-edge vegetation includes Branched Bur-reed *Sparganium erectum*, rushes (*Juncus articulatus* and *J. effusus*) and Pink Water-speedwell *Veronica catenata* while the open water was dominated by Various-leaved Water-starwort *Callitriche platycarpa* with Horned Pondweed *Zannichellia palustris* and occasional stands of the local Fenland plant Hair-like Pondweed *Potamogeton trichoides*.

The ditch here produced 11 water beetle species in 2021 with a SQS of 18 and SQI of 1.64. The Nationally Scarce burrowing water beetle *Noterus crassicornis* was recorded. In 2025, the pond yielded 20 species with a SQS of 78 and a high SQI of 3.9. *Noterus crassicornis* was still present but joined by the Near Threatened *Hydrochus crenatus* and *Limnebius papposus* along with the Nationally Scarce *Enochrus quadripunctatus*. Pond creation has evidently resulted in an important increase in the diversity and

[6] Does not include ponds

quality of the water beetle assemblage as well as the number of scarce/threatened species.

7.18 **Sites 22, 23 & 24 - New Cut and Engine drains (north bank) including embayment at their junction, Willow Grange Farm**

In 2021, the New Cut drain at Willow Grange Farm produced 13 species with a SQI of 2.08 and a SQS of 27. In 2025, the recently-created shallow embayment at the junction with Engine Drain provided an extended area of water-margin habitat with emergent vegetation. The metrics were, respectively, 14 species, SQI of 2.64 and SQS of 37. The Near Threatened diving beetle *Agabus undulatus* was recorded (not found previously). This represents a modest improvement. The shallow open water of the created berm had a relatively diverse flora in contrast to the rest of the drain with Water-plantain *Alisma plantago-aquatica*, Common Stonewort *Chara vulgaris*, Nuttall's Water-weed *Elodea nuttallii* with stands of Broad-leaved Pondweed *Potamogeton natans* and the local Fenland plant Hair-like Pondweed *Potamogeton trichoides*.

The berm sections on New Cut (Sites 23 & 24) were ill-defined and difficult to access. One seemed to be represented by a narrow fringe of Soft Rush *Juncus effusus* above the water line. Results from these locations were mediocre for water beetles though the deeper open water towards the centre of the drain was notable for having the locally uncommon Clustered Stonewort *Tolypella glomerata* along with localised stands of Common Stonewort *Chara vulgaris*, Mare's-tail *Hippuris vulgaris* and Arrowhead *Sagittaria sagittifolia.*

7.19 **Sites 25 & 26 - Hainey Farm ponds, Soham**

Two of the recently created ponds on this site held shallow water, though depleted due to drought conditions. Vegetation is at a very early successional stage with scattered marginal patches of Common Spike-rush *Eleocharis palustris*, seedlings of Bulrush *Typha latifolia* and the open shallow water dominated by Common Stonewort *Chara vulgaris* with Nuttall's Water-weed *Elodea nuttallii*, Spiked Water-milfoil *Myriophyllum spicatum*, a macro algae *Spirogyra sp.* and the rather local Fenland plant Small Pondweed *Potamogeton berchtoldii*.

The larger pond (Site 25) produced an impressive SQI of 3.17 albeit with just a dozen species of water beetle. These included the Near Threatened *Limnebius papposus* and the Nationally Scarce weevil *Phytobius leucogaster*, which was abundant on submerged beds of Spiked Water-milfoil.

The second pond sampled had extensive stands of stonewort and yielded the Nationally Scarce algivorous water beetle *Haliplus mucronatus* among a meagre 5 species.

The early successional stage of these ponds is reflected in the limited water beetle fauna but this is an important habitat nonetheless. It would be valuable to revisit these ponds in less stressed weather conditions in future. Of note were terrestrial plants of

Water-violet *Hottonia palustris* (Vulnerable in England) recorded from a dry pond adjoining sample site 25.

7.20 **Site 27 - New liner pond at Holt Fen Recreation, Little Thetford**

A small liner pond with planted Marsh Marigold *Caltha palustris*, Yellow iris *Iris pseudacorus* and the invasive alien *Hydrocotyle ranunculoides* that is presumed to have been planted in error for the native Marsh Pennywort *H. vulgaris*. The only emergent present was Hairy Willowherb *Epilobium hirsutum*. It was dry and no water beetle assessment was possible.

7.21 **Site 28 - Thetford Catch water Drain, Little Thetford**

A mildly eutrophic small IDB drain with rough grass banks that are shaded by planted trees included ash and Leyland Cypress. A small number of emergent plants include Reed Sweet-grass *Glyceria maxima* with occasional Fool's Water-cress *Helosciadium nodiflorum* and Woody Nightshade *Solanum dulcamara*. The open water was dominated by Fat Duckweed *Lemna gibba* with occasional Various-leaved Water-starwort *Callitriche platycarpa* and Nuttall's Water-weed *Elodea nuttallii*. Only 4 common species of water beetle were recorded.

7.22 **Site 29 - St George's Church, Little Thetford**

This very small butyl-lined pond has been planted with Marsh Marigold *Caltha palustris*, Yellow iris *Iris pseudacorus* and is choked with duckweed (*Lemna gibba* and the alien species *L. minuta*). Under a tree canopy it has accumulated much detritus. It yielded only one ubiquitous water beetle species. Annual removal of sediment might help improve water quality, though its potential is limited.

7.23 **Site 30 & 31 – two sections of a semi-circular drain adjoining Old West (SE of Aldreth)**

A narrow drain dominated by stands of Reed Sweet-grass *Glyceria maxima* with occasional stands of Reed Canary-grass *Phalaris arundinacea* and Clustered Dock *Rumex conglomeratus*. It was dry and no water beetle assessment was possible.

7.24 **Site 32 – Line Drain (adjoining plantation), SE of Aldreth**

A small field drain with dominant marginal stands of Reed Sweet-grass *Glyceria maxima* with occasional Hairy Willowherb Epilobium hirsutum. The mildly eutrophic open water is dominated by duckweed (*Lemna gibba* and the alien species *L. minuta*) and only 4 common species of water beetle were recorded.

7.25 **Site 33 - Haddenham Engine Drain at Hoghill Drove Bridge**

A large gravel-bedded IDB drain with marginal stands of Reed Sweet-grass *Glyceria maxima* with mild shading from plantings including Grey Poplar. The open water is rich in macrophytes including Various-leaved Water-starwort *Callitriche platycarpa*, Rigid Hornwort *Ceratophyllum demersum*, Curled Pondweed *Potamogeton crispus*, Greater Duckweed *Spirodela polyrhiza*, Horned Pondweed *Zannichellia palustris* and includes

the local Fenland species River Water-dropwort *Oenanthe fluviatilis* (a single flowering patch at the centre of the drain) and Hair-like Pondweed *Potamogeton trichoides*.

In 2021, this site yielded 15 water beetle species including the Nationally Scarce large diving beetle *Hydaticus transversalis* and the burrowing water beetle *Noterus crassicornis* along with the Near Threatened *Berosus luridus*. SQI was 3.53 with a SQS of 53. In 2025, neither *H. transversalis* nor *B. luridus* could be found but 14 species included *Hydrochus crenatus*, *N. crassicornis* and an indeterminate female riffle beetle which was likely to be either *Oulimnius major* or *O. rivularis*. SQI was 3.5 with SQS of 49. Despite some differences in the species encountered, the quality of the water beetle assemblage is stable.

Combining the two surveys, this location has produced 22 species of water beetle including 2 which are categorised as Near Threatened and 3 which are Nationally Scarce. It is one of the richest drains in this part of Fenland for these insects.

7.26 **Site 34 - New pond at Cottenham Recreation Ground**

Vegetation of this pond complex is at a very early successional stage with scattered marginal patches of Creeping Bent *Agrostis stolonifera*, seedlings of Bulrush *Typha latifolia*, Yellow Iris *Iris pseudacorus* and Grey Club-rush *Schoenoplectus tabernaemontani.* The only submerged aquatic plant present was Rigid Hornwort *Ceratophyllum demersum*.

Only the largest pond here held water. It supported a modest assemblage of 10 water beetle species, predominantly pioneer colonists such as *Agabus nebulosus*, *Hygrotus confluens*, *Hydroglyphus pusillus*, *Laccobius sinuatus* and *Berosus affinis*. Nonetheless, a SQI of 2.4 is a 'good' score. A more 'Fenland' fauna may develop over time as the ponds mature but it is important to exclude dogs as there is increasing evidence that veterinary medications can cause serious and long-lasting harm to aquatic invertebrate communities[7].

[7] See Freshwater Biological Association information note: https://www.fba.org.uk/info-notes/pet-treatments-could-be-harming-freshwater-life

7.27 **Site 35 - Woodland pond, Wilburton**

This small, butyl-lined pond was choked with Fat Duckweed *Lemna gibba* and supported only a restricted and commonplace water beetle assemblage. Nonetheless, this did include two small diving beetles typical of detritus-rich woodland pools (*Hydroporus incognitus* and *H. memnonius*), which appear to be uncommon in poorly-wooded Fenland.

7.28 **Sites 36 & 39 - Berm sites at Smithey Fen Engine Drain, Fen End Farm**

Two sections of berm were sampled on Smithey Engine Drain. Site 36 was densely choked with Common Reed and produced a dozen water beetle species including the Near Threatened diving beetle *Agabus undulatus*, resulting in a solid SQI of 2.92. Site 39 had more varied vegetation structure including small patches of exposed clay on the water margin. Sixteen species here gave a SQS of 67 and an exceptional SQI of 4.19, the highest score for this metric of all sites surveyed in 2025. Species included *A. undulatus*, *Hydrochus crenatus* and the Nationally Scarce *Scarodytes halensis* and *Enochrus quadripunctatus*. The open water included some interesting macrophytes including Fan-leaved Water-crowfoot *Ranunculus circinatus*, Common Water-starwort *Chara vulgaris* along with the local Fenland species Hair-like Pondweed *Potamogeton trichoides*.

The same section of Smithey Fen Engine Drain yielded just four common species in 2021, so this is a remarkable transformation. It suggests that even without any improvement in water quality, creation of shelves just below the summer water line results in more extensive and varied marginal vegetation structure in trapezoidal drains, with a concomitant improvement in the species-richness and quality of the water beetle assemblage, a proxy indicator of the wider aquatic invertebrate community. Where such berms are liable to become dominated by Common Reed, a wider and more shelving berm or occasional scraping of selected sections to suppress reed growth are likely to be beneficial.

Out of 110 drains sampled in the NLOW project area in 2021 and 2025, Smithey Fen Engine Drain (II) produced the third highest SQI score and the second highest SQS score.

7.29 **Sites 37 - existing pond at Fen End Farm, N of Cottenham**

A small open pond with banks dominated by coarse grasses with nettles and bramble. It appears to be an ephemeral pond holding water during the winter months only, its bed having only the single emergent wetland species False Fox-sedge *Carex otrubae.* It was dry and no water beetle assessment was possible.

Engine Drain (II) produced the third highest SQI score and the second highest SQS score.

7.30 **Sites 38 - Field drain at Fen End Farm, N of Cottenham**

A small field drain closely adjoining site 37. The lower banks are dominated by Reed Sweet-grass *Glyceria maxima* with occasional stands of Reed Canary-grass *Phalaris arundinacea,* scattered Amphibious Bistort *Persicaria amphibia* and Bulrush *Typha latifolia*. It was dry and no water beetle assessment was possible.

7.31 **Site 40 - Smithy Fen Engine Drain near Rampton Road**

A reed-dominated IDB drain with Meadowsweet *Filipendula ulmaria* and Fool's Water-cress *Helosciadium nodiflorum* at the water's-edge. This more typical overgrown drain, with shallow water dominated by just duckweeds (*Lemna gibba* and *L. trisulca)* had a modest water beetle assemblage but the diving beetles *Agabus paludosus* and *Hydroporus discretus* are typical of shallow, slow-moving water with some groundwater input, suggesting unusual hydrological conditions.

7.32 **Site 41 - New Cut Drain (Cottenham Lode), NW of Cottenham**

An IDB drain with dense marginal stands of Branched Bur-reed *Sparganium erectum* and occasional stands of Reed Canary-grass *Phalaris arundinacea* with Purple Loosestrife *Lythrum salicaria*. A small number of aquatics were present including Water-plantain *Alisma plantago-aquatica*, Various-leaved Water-starwort *Callitriche platycarpa*, Nuttall's Water-weed *Elodea nuttallii*, Ivy-leaved Duckweed *Lemna trisulca*, and Curled Pondweed *Potamogeton crispus* while the abundance on the bed of macro algae (*Vaucheria* and *Cladophora*) is suggestive of eutrophication. Only 2 species of water beetle were recorded perhaps reflecting the poor water quality.

7.33 **Site 42 - Cottenham SUDS pond**

A large mature pond that has been invaded by willow and tall emergents including reed, Grey Club-rush *Schoenoplectus tabernaemontani*, Branched Bur-reed *Sparganium erectum*, Bulrush *Typha latifolia* and yellow Iris *Iris pseudacorus*. Lower-growing emergents include False Fox-sedge *Carex otrubae*, Cyperus Sedge *Carex pseudocyperus*, Common Spike-rush *Eleocharis palustris*, Jointed Rush *Juncus articulatus*, Creeping Jenny *Lysimachia nummularia*, Water-mint *Mentha aquatica* and the invasive alien New Zealand Pigmy-weed *Crassula helmsii* is frequently dominant. No submerged aquatics were recorded though the centre of the pond could not be accessed. Stone Parsley *Sison amomum*, a rather local species in Fenland, was recorded on the banks.

Seven species of water beetle were recorded but very low water levels here meant that the sample was not really comparable to the 2021 survey.

7.34 **Site 43 - New pond at field boundary (adjoining hedge), Witchford old aerodrome**

A new pond at a relatively early stage of vegetation succession with the only emergents comprising Hairy Willowherb *Epilobium hirsutum*, Hard Rush *Juncus inflexus* and Pink Water-speedwell *Veronica catenata*, the latter dominating the drawn-down centre. Being dry, no water beetle assessment was possible.

8 Habitat enhancement sites in a wider context

8.1 Data are available for 299 Fenland drains sampled and analysed in the same manner, resulting from surveys of: the farmland surrounding the Ouse Washes (Graham & Hammond, 2015); the NLOW project area (Graham & Hammond, 2021); and Wicken and Woodwalton Fen reserves (Hammond, 2023). Arguably SQS is the most useful metric for the ecological quality of the water beetle assemblages in this large dataset. When SQS, is considered, the Queenholme berm site is the third highest scoring of 299 sites (jointly with 2 other sites) while Smithey Fen Engine Drain (II) is eighth.

Site	SQS
Long Lane, N of Over (b)	100
Adventurer's Head Drain, S of Third Bridge (NW of Aldreth)	95
Queenholme Drain (berm), NE of Willingham	73
North Fen Drain at Dam Bank Bridge, Gall Fen	73
Sutton West Fen: N of Tubb's Drove	73
Lady Fen 1, WWT Welney	72
Crooked Drain, S of Mepal Outdoor Centre	68
Smithey Fen Engine Drain (ii), Smithy Fen, N of Cottenham (Fen End Farm)	67
Old Mill Drove (nr old pumping stn), N of Welches	64
Wicken Fen ditch WF4	63

9 Conclusions

9.1 The predominantly agricultural water bodies surveyed within the New Life on the Old West (NLOW) project area have significant ecological value for their ditch plant and water beetle assemblages.

9.2 Many noteworthy plant species were recorded from across all drainage districts surveyed including Clustered Stonewort *Tolypella globularis*, Orange Foxtail *Alopecurus aequalis*, River Water-dropwort *Oenanthe fluviatilis*, Hairlike Pondweed *Potamogeton trichoides*, Common Water-crowfoot *Ranunculus aquatilis* and Golden Dock *Rumex maritimus*. Five water beetles have the status of Near Threatened in Great Britain: the diving beetles *Agabus undulatus* and *Laccornis oblongus*; the scavenger water beetles *Hydrochus crenatus* and *Enochrus nigritus*; and the small water beetle *Limnebius papposus*. In addition, four water beetles are listed as Nationally Scarce: the burrowing water beetle *Noterus crassicornis*, the diving beetle Scarodytes halensis, the scavenger water beetle *Enochrus quadripunctatus* and the riffle beetle *Oulimnius major/O. rivularis*. Two weevils, Pink Water-speedwell Weevil *Gymnetron villosulum* and *Phytobius leucogaster* are formally still listed as Nationally Scarce, although they probably no longer warrant this status.

9.3 The Old West, in particular, is shown to be highly eutrophic. All sample points on the Old West had very few submerged aquatic plants, few or no water beetles and with the bed dominated by smothering macro algae (especially *Cladophora*). The Old West is a key source of summer recharge water for surrounding IDB drains within the project area and as such has a wide-ranging negative impact. This could be a significant constraint in recreation of high-quality habitats for nature conservation.

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Appendix 1 List of 43 sample points

Site code	Type (& code for previous reports)	Grid ref	Parish	Location	Enhancement works
1	New site	TL5275979290	Witchford	South-west of Ely	Pond at centre of pasture
2	New site	TL5108777288	Witchford	near Little Thetford catchwater	3 linear ephemeral ponds
3	New site	TL5112477250	Little Thetford	Little Thetford	Grunty Fen Catch water Drain
4	New site	TL5054778227	Witchford	Between Little Thetford Catchwater and Littleport/Downham main drain	Scrape and pond
5	New site	TL5054478222	Witchford	South-east of Witchford	Grunty Fen Drain
6	New site	TL5207476398	Little Thetford	Bedwell Hey Farm, Little Thetford	Pond (100 m2) by Murfitt's Woods
7	New site	TL5206576441	Little Thetford	South-west of Little Thetford	Field drain by Red Fen Road
8	New site	TL5350477163	Little Thetford	Bedwell Hey Farm, Little Thetford	Pond (70 m2) near to the Catchwater
9	New site	TL5349977169	Little Thetford	Hall Fen, Little Thetford	Grunty Fen Catch water
10	Previously surveyed (WK17)	TL56877102	Wicken	pond in recreation ground (Wicken)	Pond expansion advised against, pruning suggested instead
11	New site	TL5697171208	Wicken	Recreation ground	4m x 4m pond (maximum depth 50cm)

12	Previously surveyed (WK13)	TL53716975	Wicken	E end of semi-circular linear pool feature (Cam Washes SSSI, Upware)	None
13	Previously surveyed (WK12)	TL53656964	Wicken	winter pooled area (Cam Washes SSSI, Upware)	None
14	Previously surveyed (WK14)	TL53556972	Wicken	W end of semi-circular linear pool feature (Cam Washes SSSI, Upware)	None
15	Previously surveyed (WK11)	TL5368069905	Wicken	Reach Lode (outfall to Cam), Cam Washes SSSI	None
16	Previously surveyed (O16)	TL38067085	Over	Duce's Pond (Fen End Road), Over	Reprofiled pond
17	Previously surveyed (WG01)	TL42117277	Willingham	Old West ('The Norlands', Queenholme Farm), NE of Willingham	Scrape adjacent to Old West River
18	Previously surveyed (WG03)	TL41897243	Willingham	established pond in arable ('The Norlands', Queenholme Farm), NE of Willingham	Enlarged existing pond
19	Previously surveyed (WG04)	TL4196472385	Willingham	'The Norlands', Queenholme Farm), NE of Willingham	New pond adjoining established pond in arable
20	Previously surveyed (WG09)	TL43187194	Willingham	Queenholme Drain (Queenholme Farm), NE of Willingham	800m berm along southern bank of Queenholme drain
21	New site	TL4992771488	Cottenham	Willow Grange Farm - Pond parallel to Chear Lode	7m x 5m Pond
22	New site	TL4933570930	Cottenham	Willow Grange Farm - junction between New Drain & Engine Drove	12 m crescent-shaped berm

23	New site	TL4943470928	Cottenham	Willow Grange Farm - Berm section 1	300m vegetated berm (section 1)
24	Previously surveyed (C31)	TL4979470991	Cottenham	Willow Grange Farm - Berm section 2	300m vegetated berm (section 2)
25	New site	TL5740474743	Stretham	Hainey Farm, Stretham	2354 m2 pond complex in field near Mere Pumping Station
26	New site	TL5746674710	Stretham	Hainey Farm, Stretham	4 x 4m pond ditch corner on Sedge Fen
27	New site	TL5334576024	Little Thetford	Holt Fen Recreation, Little Thetford	2x2m pond within wild area
28	New site	TL5329276102	Little Thetford	Thetford Catch water Drain, Little Thetford	None
29	New site	TL5315376300	Little Thetford	St George's Church	1.5 x 1.5m wildlife pond
30	Previously surveyed (H21)	TL46027137	Haddenham	Semi-circular drain (SW section) adjoining Old West (SE of Aldreth)	None
31	Previously surveyed (H20)	TL46077148	Haddenham	Semi-circular drain (NE section) adjoining Old West (SE of Aldreth)	None
32	Previously surveyed	TL4615571806	Haddenham	Line Drain (adjoining plantation), South-east of Aldreth	None
33	Previously surveyed (H24)	TL4654973170		Haddenham Engine Drain, South of Haddenham	None
34	New site	TL4480568407	Cottenham	Old recreation area	0.4 hectare pond complex
35	New site	TL4831274513	Wilburton	Former allotments	4m x 4m pond

36	Previously surveyed (C23)	TL44547061	Cottenham	Smithey Fen Engine Drain 'Smithy Fen' (Fen End Farm), N of Cottenham	900m berm in IDB drain
37	New site	TL4466870868	Cottenham	Fen End Farm	Enlarged existing pond at Engine Drain junction
38	Previously surveyed (C22)	TL44767080	Cottenham	Field drain beside track 'Smithey Fen' (Fen End Farm), N of Cottenham	None
39	New site	TL4465970898	Cottenham	Smithy Fen Engine Drain 'Smithy Fen' (Fen End Farm), N of Cottenham	None
40	Previously surveyed (C03)	TL43786806	Cottenham	Smithey Fen Engine Drain, NW of Cottenham	None
41	Previously surveyed (C02)	TL44236841	Cottenham	New Cut Drain (Cottenham Lode), NW of Cottenham	None
42	Previously surveyed (C30)	TL4487268355		Existing large pond in recreation area, N of Cottenham	None
43	New site	TL5269278488	Witchford	South-west of Ely	Pond at field margin (by old aerodrome)

Appendix 2 – Digital photographs of the 43 sample points

Photos of sample points					
1		**2**		**3**	
4		**5**		**6**	

7		**8**		**9**	
10		**11**		**12**	

13		**14**		**15**	
16		**17**		**18**	

19		**20**		**21**	
22		**23**		**24**	

25		**26**		**27**	
28		**29**		**30**	

31		**32**		**33**	
34		**35**		**36**	

37		**38**		**39**	
40		**41**		**42**	

43