

**BBOWT Wild Oxford Project
Lye Valley North Fen**

Report on the second year, 2015-2016

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*Lye Valley North Fen SSSI, view from newly-cleared west fen
across to east fen and bank to Peat Moors estate and recreation field, 02.04.2016.*

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All photographs in the account that follows are my own, except where otherwise indicated.

GENERAL INTRODUCTION AND AIMS OF THE PROJECT

The **Wild Oxford Project** is a collaborative initiative of BBOWT and Oxford City Council (OCC) grant-funded by the Trust for Oxfordshire's Environment (TOE2) and the Heritage Lottery Fund (HLF).

Its aims are to:

- Introduce local people to the wildlife on their doorstep
- Enable local people to take an active role in enhancing and protecting the sites
- Deliver improvements to the fen and other key habitats.

Introduction to Year 2 of the Wild Oxford Project in the Lye Valley

The background to this project, i.e. the type and importance of the Lye Valley alkaline fen habitat and the problems facing it in its now partially urban location, were explained in my report on the first year (2014-2015). That report also covered the fen's historical and current management, as well as the habitats and local and national species of importance found within it. Its appendices provided information on the biological heritage of the site and extensive species lists. Please see my first report (May 2015) for all such detail.

The map below is included again to provide a clear picture of the LNR/LWS/SSSI limits and Wild Oxford target work areas in the Lye Valley North Fen.

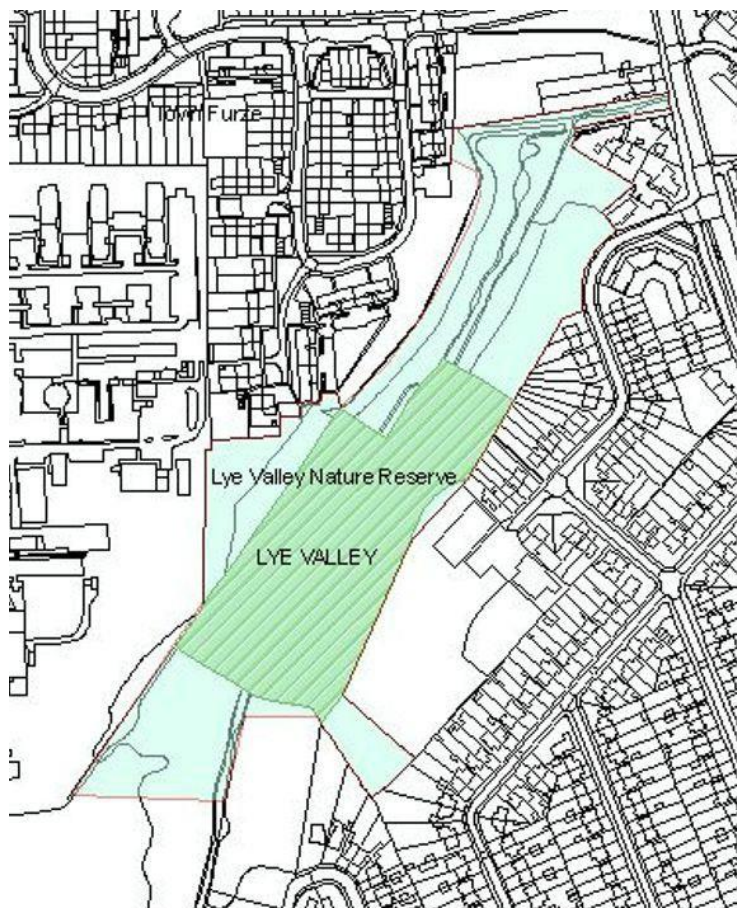


Figure 1: *Lye Valley Local Nature Reserve*

All the shaded area (total 4.5 ha), including the section marked with parallel lines, is owned by Oxford City Council and is part of a much larger Local Wildlife Site known as '**Lye Valley and Cowley Marsh LWS**'. Within these boundaries is the **North Fen section (Unit 1)** of the **Lye Valley SSSI** (1.8 ha), indicated by the parallel lines. Site centre of SSSI: SP 548057

This report details work carried out from spring 2015 to summer 2016 and gives an assessment of the habitat change that has resulted from this conservation work in the various target areas.

BBOWT WILD OXFORD PROJECT HABITAT ENHANCEMENT AREAS

The potential for habitat enhancement in the Lye Valley North Fen area by the project work was identified in 2014 as follows:

A. Alkaline fen restoration in LWS/LNR areas outside the SSSI

The LWS section at the head of the valley, previously Lye Valley Scrub SLINC, has been recognised as having numerous calcareous spring-fed peat and tufa-forming areas on the valley sides. However, their interest had declined because, without grazing, succession had progressed from short fen to shady secondary wet woodland. Even if restoration to high-grade short fen is not possible in the short term, restoration to floristically diverse tall herb fen, with abundant nectar and pollen-producing flowers (e.g. angelica, marsh woundwort, ragged robin, purple loosestrife) would be of great benefit to insects of all kinds in the valley and to all pollinators within reach in the Headington area in general. The target for the project work – a more biodiverse wetland community – might be met by establishing a tall herb community of unshaded conditions, such as NVC M27 (*Filipendula vulgaris* – *Angelica sylvestris*) mire.

B. Assistance with restoration of a greater area of short fen in the SSSI area

Whilst the high-grade short fen on the east side of the SSSI fen has been well managed by cutting and raking for more than 20 years by OCC staff and volunteers, it is a small area in total. Other SSSI fen areas were not in an ideal condition due to lack of OCC staff time. For example, at the start of this project little progress had been made in restoring the large area of dense common-reed-dominated, spring-fed, peat and tufa areas on the slope on the west side of the SSSI ('hanging-fen').

C. Glades and sunny, open, flower-rich areas on drier slopes and banks

Common lizards, slow worms and grass snakes are present in the Lye Valley in several areas (Town Furze allotments, the North Fen and Churchill Hospital field). All of these reptile species benefit from undisturbed sunny areas for essential basking. Provision of open, sunny, glades with refuges and hibernacula for all these reptile species on currently wooded or scrubbed-up secluded banks to the fen wetland would enable the reptiles to bask undisturbed and would result in more successful breeding. Additionally, the importance of more nectar-rich flowers in the area cannot be over stated. Whilst the fen wet peat and shallow fen pools provide good breeding areas for important insects, with aquatic larvae such as some hoverflies, soldierflies, crane flies and beetles, the fen vegetation can be dominated by rushes, sedges and reed at certain times of the year and be completely lacking in flowers that are good nectar and pollen sources. Many insects that breed in fens need the nectar and pollen sources in adjacent dry-land areas to complete their life cycles. Brown hairstreak butterfly reproduction will also be enhanced by some cutting of old blackthorn to encourage the young sucker growth preferred for egg-laying.

D. Pond enhancement in LWS south western area

Five previously-excavated ponds on the south-west side, which are breeding sites for the common frog, had become filled in with sediment and reed vegetation, but fortunately these had been re-excavated by work for a Freshwater Habitats Trust project in spring 2014. Since then a good diversity of submerged aquatic vegetation has recurred, but this regeneration was threatened by increasing shade from trees and reed re-invasion. Some removal of crack willow trees and scrub, along with cutting back of marginal reed, was identified as beneficial to pond-water plant diversity and thus to aquatic invertebrate diversity. Unshaded ponds are warmer and can therefore be colonised by some of the rarer insects, such as water beetles and soldierflies breeding in the shallow fen pools on the other side of the brook. Thus their populations will be more secure.

Considerable progress in all of these habitat enhancement areas *except* the ponds was achieved in the first year, 2014-2015.

The following sketch map shows the location of the habitat types and the progress achieved by the project in one year up to spring 2015.

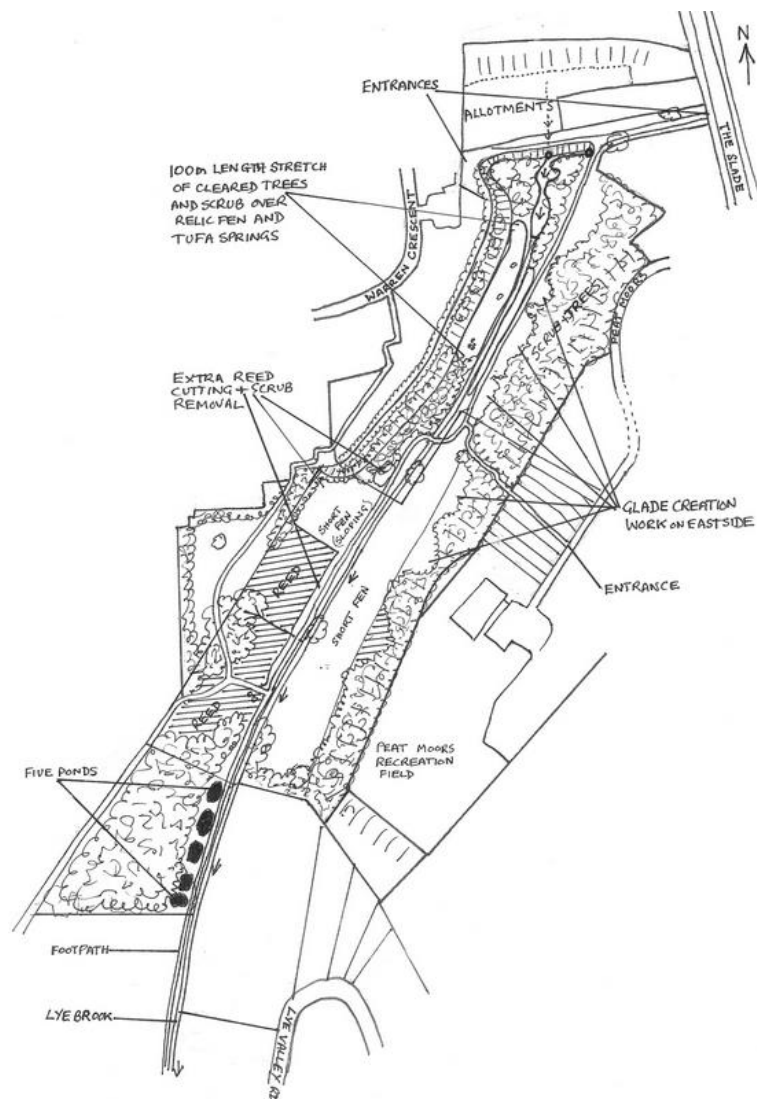


Figure 2:

*Sketch map indicating work done in the Lye Valley during the **first** year of the Wild Oxford Project, 2014-2015, and the extent of the resulting improvements to the various habitat types and to conservation.*

WILD OXFORD PROJECT
RESULTS OF THE SECOND YEAR, SPRING 2015-SUMMER 2016

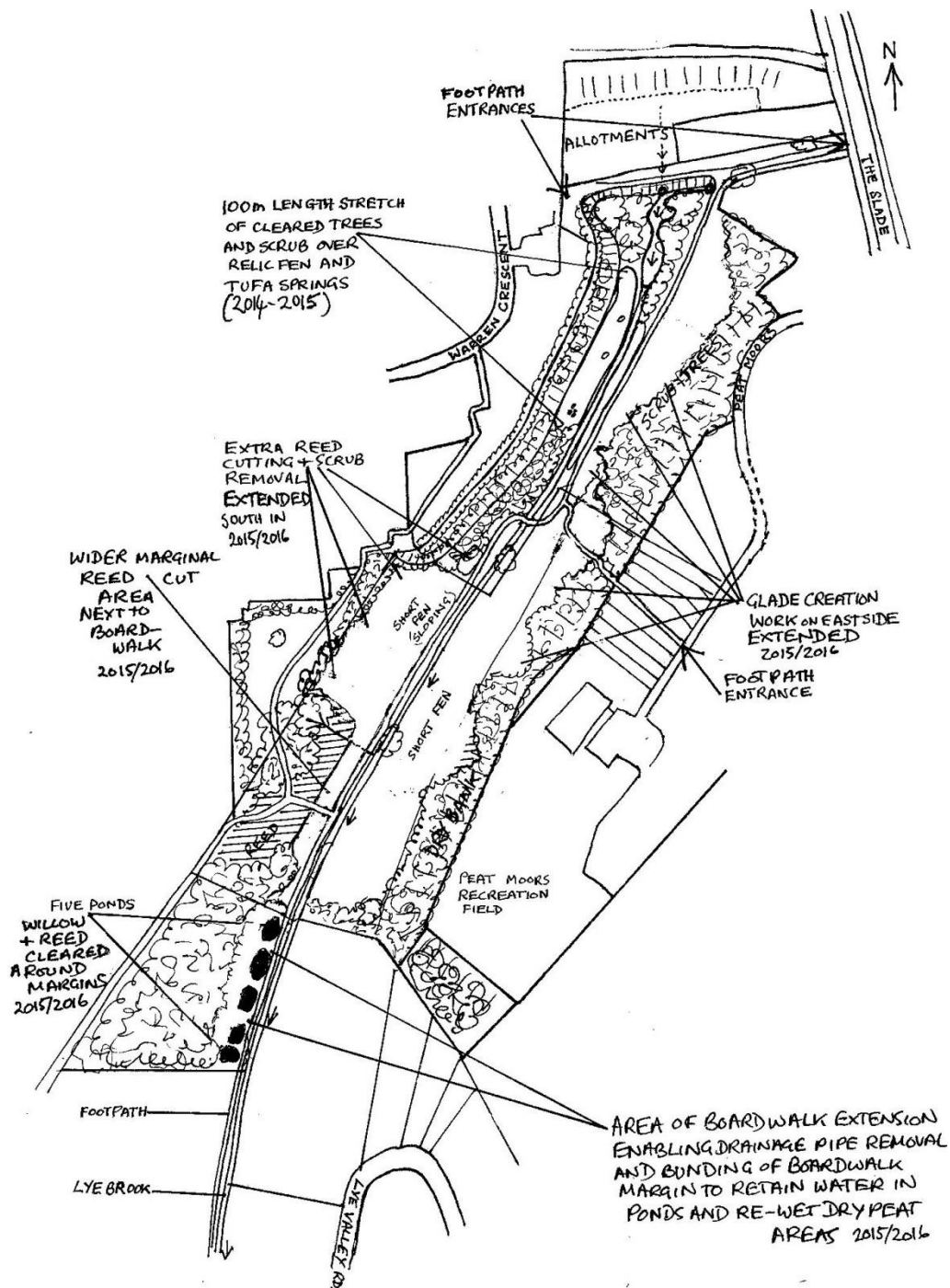


Figure 3:

Sketch map indicating work done in the Lye Valley during the **second** year of the Wild Oxford Project, 2015-2016, and the extent of the resulting improvements to the various habitat types and to conservation.

Time and volunteer input to the project:

Volunteers under the leadership of Andy Gunn contributed to remedial work on the SSSI North Fen west side and on the relic fen areas in the LWS/LNR to the north of the SSSI. Further progress has been made with clearing vegetation over tufa-forming springs and glade creation on the east side of the SSSI and LWS/LNR area. A great deal of pond marginal clearance work on reed and shading willows has been achieved in the south-west section of the LWS/LNR to the south of the SSSI.

A total of 8 days' work in the Lye Valley was undertaken between spring 2015 and July 2016, with an average of 12 volunteers at each session. As each session lasted for 5 hours, about 480 volunteer hours were put in (pers. comm. Andy Gunn). Additional occasional work sessions were contributed by the BBOWT midweek team under the leadership of Andy Gunn.

Oxford City Council Countryside Service workers gave additional help with large crack willow tree felling. The City Council's Countryside Volunteers team devoted some of their Thursday work sessions to scrub removal and fen raking. Oxford Conservation Volunteers (OCV) helped with scything, raking, scrub work and boardwalk extensions on at least 6 Sundays; their work is funded by Oxford City Council.

Friends of Lye Valley held separate volunteer sessions on occasional Wednesday mornings throughout the year in the north fen area, targeting scrub and nettles.

As regards habitat change, progress at this site has been particularly fast due to the involvement throughout the year of several different volunteer groups working at different times (Wild Oxford, BBOWT Midweek team, OCC Thursday group, OCV, Friends of Lye Valley). Volunteers are not necessarily dedicated to only one group, many join in with the work of two or three other groups. Monitoring of work progress in terms of vegetation response or species recorded took place either during the sessions or on separate visits after work sessions.

Explanatory Boards

The ecology of the whole site is now much more accessible and understandable to the casual walker visiting the site thanks to the installation of the three BBOWT explanatory boards at the site margins and next to the main fen area.



BBOWT explanatory board at south footpath entrance to the LNR



BBOWT explanatory board in central SSSI fen area.

Details of work carried out on specific areas

A. Work on the relic fen in the LWS/LNR area north of the SSSI

Both east and west banks marginal to the new boardwalk underwent cutting and raking of vegetation over springs and wet peat in 2015. This resulted in a magnificent display of flowering species, alive with insects of all sorts, in the summer of 2016



The 'bog-stars' group of students from St Clare's college cutting and raking in the section north of the SSSI, 10.10.2015



Abundant flowering of meadowsweet in cut area on 31.07.2015

A greater diversity of insects, attracted by the flowers, was noted in this area. Just one example is the wool carder bee *Anthidium manicatum* (a solitary bee) – recorded for the first time at the site. It was found specifically visiting marsh woundwort flowers in the now sunny conditions.



Marsh woundwort and hemp agrimony in flower in the cut area, 2016

As so much work had been done the previous year on the west bank below Warren Crescent (a 100m-long stretch, with 776m²/0.08 hectares cleared of scrub and trees), less volunteer time was spent in this area during 2015–2016. Tall herb vegetation was mostly left to grow up and flower, which facilitated identification and benefitted pollinating insects. However, a monoculture of great willow herb (a clonal, dominant, species) seemed to be developing in part of the area, so some time was spent pulling up most of this and removing clumps of pendulous sedge (another rampant species known to exclude others and reduce overall floristic diversity and provide no nectar).



The first vegetation response in the cleared west side LWS spring/fen peat area was a sea of tall great willow herb, which excluded most other plants. Photo taken 28.08.2016.

Some tall, shading, crack willows on the east side of the brook were removed by OCC Countryside Service workers; this assistance was much appreciated. With the removal of so much woody growth and the reduction in shade, abundant flowering in a variety of herbs (but most notably hemp agrimony) was visible and a much more interesting view down the valley has resulted. Walkers no longer feel 'hemmed in' by dense bramble and scrub as they did before.

Wetland plant species showing marked population increase and flowering success in this area by summer 2016:

Ragged robin *Silene flos cuculi*

Meadowsweet *Filipendula ulmaria*

Hemp agrimony *Agrimonia eupatoria*

Purple loosestrife *Lythrum salicaria*

Brooklime *Veronica beccabunga*

Water figwort *Scrophularia auriculata*

Square-stalked St John's Wort *Hypericum tetrapterum*

Marsh woundwort *Stachys palustris*

Greater bird's foot trefoil *Lotus pedunculatus*



*The summer after the removal of most of the dominant great willow herb, up came a mass of brooklime *Veronica beccabunga*, which had arisen from the seed bank in the cleared wet, peaty, area. Photo 01.06.2016*

Work on the west side LWS mature blackthorn patch was carried out in the winter by Friends of Lye Valley volunteers. This area has been coppiced, so that fresh growth can be available for brown hairstreaks next year. Opened up and lighter, it is showing a variety of herbaceous species germination. A new boardwalk extension as far as the blackthorn area allows walkers to go dry footed now all the way down the valley.

B. Fen Work in the SSSI, West side

On the sloping west bank of the SSSI, volunteers further extended the area of reed cutting and willow scrub removal over the whole stretch of the slope by at least **another 20m to the south** of the previously cut area. Reed cuttings and willow scrub were removed to piles on the drier bank near the top of the valley side on the western side



West side SSSI sloping fen area on 08.08.2016 before further work in 2015-2016. View from the short area in the east-side fen, looking west over the brook (in photo centre) to the west bank of the SSSI, showing dominant reed monoculture and patches of willow scrub.



Volunteers extending the west-side sloping fen short area by scything dense reed on 24.09.2015 and subsequently scything off the re-growth on 21.05.2016



Volunteers extending the west side sloping fen short area by scything dense reed on 24.09.2015 and subsequently scything off the re-growth on 21.05.2016



Newly-cleared extended area of west-side sloping fen, 25.11.2015

It was considered important to cut back the dense reed and remove dead material near the new plastic boardwalk to minimise the risk of arson to the dry reed and consequent damage to the boardwalk. This is particularly important in the light of a recent arson attack on the northern section of the boardwalk above the SSSI, which happened in early January 2016. A motorbike was set on fire on the boardwalk, resulting in burning of a 20m long section, which was quickly replaced.

Thus, in the middle of the SSSI fen, the cut-short swathe that previously extended 1-2m from the boardwalk was increased to a **cut-short zone extending 6m from the boardwalk all along its edge on the western side**. This will need to be kept short annually, so that no combustible dead reed thatch accumulates adjacent to the boardwalk.

Cutting this wider 6m swathe brought the additional benefit of making progress easier for walkers (previously reed tended to flop over the boardwalk by midsummer), and having shorter vegetation here opens up a more pleasant and interesting view down the valley.



Before recent work, looking south, newly constructed boardwalk through still dense tall reed, 06.09.2013.



Volunteer scything reed on the west side SSSI to produce a wider zone of short vegetation adjacent to boardwalk on 21.05.2016

A detailed assessment of the changes in vegetation, and in invertebrates using the area, was carried out in autumn 2015 and submitted to OCC and BBOWT. For this full report, which includes full details of vegetation transect quadrat data, see Appendix 1.

The 20m extension southwards, comprising a newly-cut area of scrub and reed, has not had time yet to show much species regeneration, having benefitted from only two brush-cutting or scything-and-raking sessions. Next year will be the appropriate time to carry out a full ecological assessment of changes, when species will have had more time to appear from the seed bank or move in and grow big enough for identification.

However, the following anecdotal observations can be reported:

- Reed regrowth is, as expected, much shorter, weaker and sparser, resulting in warm conditions on the wet peat surface.
- Patches of the common calcareous fen moss *Cratoneuron filicinum* are spreading. This is a tufa-forming moss, which provides a good breeding site for specific fen invertebrates
- Small patches of Chara stonewort algae have been seen in wet runnels.
- Much greater growth and abundant flowering of hemp agrimony, a beneficial nectar source much used by insects. (Clumps of this were avoided during scything or brush cutting.)
- The occasional occurrence of small young plants of valuable fen species, such as marsh lousewort, purple loosestrife, marsh arrowgrass, brooklime, water mint, blunt-flowered rush, square-stalked St John's wort.
- Sighting of several specimens of the rare invertebrate water penny beetle *Eubria palustris* (RDB3). This beetle requires short fen with bare, warm, wet areas



Water penny beetle and ferny leaves of young marsh lousewort plants between re-sprouting reed in newly-cut-over area.

C. Glades and sunny, open, flower-rich areas on drier slopes and banks

Less work was carried out in these areas above the north fen SSSI during 2015-2016 while the cleared areas were allowed to re-grow and species response was monitored. Most volunteer effort was instead focused on the area that had received little input in the previous year, i.e. the four ponds discussed below.

It is perhaps sufficient to note that increased light conditions led to the greatly increased flowering success of many flowers beneficial to insects. Particularly abundant were garlic mustard (responsible for the large increase in orange tip butterfly observations in spring), hemp agrimony, meadowsweet and great willow herb.

D. Pond enhancement in the LWS south-western area

During 2015-2016 improving four of the six ponds and the area around them has been a major focus for volunteer work, with the work of Wild Oxford volunteers on Saturdays augmented by that of Friends of Lye Valley on occasional Wednesday mornings.

Six ponds on the western side adjacent to the path and just south of the SSSI limit on that side were dug in line in a peaty area in the late 1980s. A photograph exists in OCC archives of this pond-digging (by hand) dated 1989. These ponds are all within the LNR/LWS but outside the SSSI. By 2013 it was practically impossible to see where 5 of the 6 ponds were because they had been heavily colonised by tall reed, and tall crack and grey willows had grown up and were them. Only one pond nearest the path was kept partially open by children occasionally fishing for tadpoles and sticklebacks.

Whilst frogs were recorded as breeding in one of the ponds, no dragonflies or damselflies were recorded in 2003-2013 due to the dense reed choking the ponds and the shading by the trees, which had made the habitat cold and unsuitable. Aquatic flora was limited to watercress, water starwort and duckweed visible in the small portion of one pond kept open by children. Small patches of flag iris, greater pond sedge, lesser pond sedge, reed sweet grass, water figwort and marsh woundwort were visibly present in dense, dominant, reed.

In November 2013 a grant-funded project organised by the Freshwater Habitats Trust facilitated the removal of sediment and invading, reed-dominated, vegetation from 5 of the 6 ponds to create open-water conditions again. The southernmost (sixth) pond was left untouched in its heavily-shaded condition. No tree reduction or marginal zone vegetation work was carried out around the five cleaned-out ponds.

By the summer of 2014, despite shading by surrounding dense reed and willows, the now open-water area was attracting some damselflies and dragonflies, and a resurgence of a greater variety of aquatic plants was seen in all 5 ponds. A big flush of water starwort and watercress dominated some ponds, whilst others featured extensive mats of stoneworts (*Chara* sp.) and curled pondweed. Seeds or spores of these species must have been present in the peat.



Pond before recent Wild Oxford marginal reed and willow work. Note pipe drain, which takes water under the boardwalk to the stream (later this was removed), autumn 2014.

All ponds featured clumps of frog spawn, whereas previously this had been restricted to only two ponds and in very small numbers. The total number of frog spawn clumps in all the ponds in March 2016 was 153, the highest ever seen.

With the margins newly bared, it was possible to see water seepage zones dominated by bright orange-brown deposits of iron oxide on the western peaty edges (upslope banks) of all ponds. This indicates that the water flow is more predominantly from the iron-rich Beckley sands rocks underlying the Churchill Hospital site immediately above this slope of the valley. However, at some times of the year whitish tufa deposits are also seen on the aquatic vegetation, indicating water from more lime-rich rocks.



Iron-oxide-depositing spring on the edge of one pond, 29.07.2016.

By the summer of 2014 it was obvious that the marginal reed would need to be controlled to prevent it re-invading the open water and covering it again within very few years. Also, removal of the adjacent shading willows would create light and warm conditions more suited to a greater range of pond-loving invertebrates.



*Before pond marginal work. Looking south on 07.02.2015.
New boardwalk extension now runs past the ponds, which are just visible to the right of the photo, still surrounded by dense, tall, reed and willow scrub.*



Typical shaded state of pond before work

In November 2015 the first Wild Oxford work session started on the pond margins, and willows were targeted for coppicing. The aim was to remove all young willows from around the ponds but leave the very large collapsing and decaying crack willows upslope from the ponds. These were likely to be of significant fungal and invertebrate interest and one had a nest hole occupied by breeding greater spotted woodpeckers. One fallen large willow trunk was found to have the rare white, aniseed-scented, bracket fungus *Trametes suaveolens*. Some sensitive re-pollarding work may be desirable on these willows in the future.



Cutting and removing shading crack willow scrub, 21.11.2015.

Willow reduction was followed by pulling-out some invasive patches of reed sweet grass from one pond and overgrowth of water cress from another, plus scything-off reed and other tall vegetation from all the pond margins.



Scything reed around the ponds 21.11.2015



*Pond marginal reed and scrub clearance achieved by 02.04.2016.
(Compare with view on page 14)*



*Result of work: the most diverse central pond, with curled pondweed, chara stonewort and bladderwort *Utricularia* sp. in the water and short vegetation on margins.
Higher water level possible due to drain removal and bunding.*

The presence of the raised boardwalk now allowed walkers to pass alongside the ponds or linger near them and observe wildlife completely dry-footed. Consequently, under-drainage to reduce boggy conditions was no longer necessary. The previous drainage pipes under the old boardwalk made of sleepers had prevented the ponds from ever filling to their maximum capacity and the wider area of fen around and above them was being artificially dried out. A total of 4 drainage pipes were therefore removed and water-retaining bunds of peat and vegetation were built up all along the edge of the boardwalk adjacent to the ponds. This enabled the ponds to retain more water and fill to a much higher level with spring water from the western side.

Appendix 2 lists the species recorded so far for the four ponds that have received most work during 2015-2016. Highlights of the notable changes in the wildlife effected by reed and willow reduction and drainage reversal since the start of the Wild Oxford work include those to:

Aquatic submerged plants: increased abundance of stonewort *Chara* sp. algae, curled pondweed, water starwort, water cress and a few small portions of a bladderwort *Utricularia* sp. (the last being a Rare Plants Register species, found recently on only four other Oxfordshire sites). All these plants provide a good habitat for invertebrates.



Bladderwort, Utricularia sp, a rare aquatic species, found on 29.07.2016.

Marginal and emergent plants: with the reed reduced, there was a marked increase in the abundance and flowering of water mint, marsh woundwort, wild angelica, yellow flag iris, hogweed and great willow herb. Making a first appearance (not recorded before and therefore arisen from the seed bank) are: toad rush, hard rush, redshank, celery-leaved buttercup and common hemp nettle. The flowers of this last plant proved to be a great favourite with bees of all sorts in summer.



Common hemp nettle, a new species recorded around the ponds, arisen from the seed bank in the disturbed peat. Here with common carder bumble bee. Photos 20.07.2016.

Aquatic life: a pond-dipping session engaged in by an interested Friends of Lye Valley volunteer revealed sticklebacks and a good range of aquatic invertebrates, including *Gammarus* shrimps, water hoglice, nymphs of mayfly, damselfly, cased caddis and non-cased caddis fly, as well as one *Stratiomys* sp. soldierfly larva, indicating a healthy and diverse pond fauna. (Abundant frog tadpoles had also been seen earlier in the year.)

The use of the ponds by one of the large rare *Stratiomys* soldierfly species is particularly important.

Later in the summer a small range of damselflies and dragonflies were on the wing around the ponds. Particularly eye-catching were azure damselflies, and dragonflies such as broad-bodied chasers and southern hawkers.

Below (in frame): a selection of pond life photographed in the Lye Valley by Terry Newsome



Male broad-bodied chaser



Mayfly nymph



Damselflies mating



Damselfly nymph



Cased caddis larva



Stratiomys soldierfly larva



Southern hawker male on wild angelica by ponds, 12.08.2016

As for other species, it was very good news to have reports of two sightings of a kingfisher flying over the pond area, now this is bordered by shorter vegetation and less shaded.

Boardwalk extension, re-wetting and drainage removal

The boardwalk made from recycled plastic material was extended southwards in April 2016 by the Oxford Conservation Volunteers, so now it not only goes past the ponds but also over an area of very wet boggy ground produced by a strong-flowing iron-oxide spring. To make this area passable, a drainage pipe had been installed underground. This solved the access problem but accelerated damaging drying-out of the fen peat in the spring area. The raised boardwalk enabled removal of this damaging, drying, drainage pipe.



Before the new boardwalk and bunding work: the strongly-flowing iron-oxide spring runs over the foot path seen in the distance, photo taken 15.03.2012.



Boardwalk extension over the area of iron oxide spring flow that had previously required under-drainage to make the footpath passable (boardwalk extension on 01.05.2016 by Oxford Conservation Volunteers work party).

With the new boardwalk in place, bunding all along the western edge with boards, planks, peat and vegetation clumps could now proceed to hold back spring water to re-wet dry peat and create new temporary pools. Redundant railway sleepers at the northernmost end of the new boardwalk were moved down and inserted alongside the boardwalk as useful barriers.



Wild Oxford work party. Moving old railway sleeper from original boardwalk down to pond area to use as bunding barrier to re-wet peat, 21.05.2016



Using old railway sleepers and other boards to make bunds to retain water along margin of new boardwalk, 21.05.2016.



Board, railway sleeper and peat bunds on west margin of boardwalk retain iron oxide spring water previously lost. Dry peat area being re-wetted to the west and north. Removal of most of the willow trees to the left next winter will make the area even wetter and restore further fen areas. 21.05.2016

At the time of writing, a significant number of shading willows are present between pond 4 and ponds 5 and 6 at the southernmost end of the line of ponds. These will be a target for removal in the next tranche of biodiversity improvement work.

No more pond digging within the old peat that used to be fen is recommended. It would be far more valuable to bring back fen flora in such areas. Fen peat may contain a valuable seed bank of lost fen plants, which could be encouraged to recur.

SUMMARY AND CONCLUSIONS

The BBOWT Wild Oxford Project continues to make a spectacular difference to the habitats in the Lye Valley North Fen area with the second year of work, with an average of 480 volunteer hours worked and all four target areas showing positive change. Volunteers' time has been spent on work on scrub and willows growing out of wet peat and tufa-forming springs, reed cutting in the SSSI and pond marginal work, with the biggest degree of change visible all along the western side of the site. This is particularly evident in four out of the six ponds that are now open, visible and populated by wildlife much enjoyed by all visitors. The boardwalk extensions have facilitated better public access and also provided the basis for a lot of bunding. This, along with drainage pipe removal, has enabled valuable spring water retention, resulting in higher pond levels and the beginning of the process of re-wetting dry peat areas and fen remediation. A detailed assessment of vegetation response to the reed cutting and raking on the western slope of the SSSI reveals improvements in the biodiversity of both plants and invertebrates (see **Appendices 1, 3 and 4**).

Achievements are:

- Further reduction in reed-dominated fen on the west bank of the SSSI through reed scything and willow scrub removal. Further extension of the short fen by 20m to the south west, plus a 6m marginal short zone to the boardwalk. Reed has been weakened, resulting in greater plant and invertebrate biodiversity.
- LWS areas in the northern section of the site have shown an increase in sunny warm conditions as a result of further scrub work and vegetation cutting and raking. A reduction in scrub and bramble enabled abundant flowering of tall herbs, which attracted a greater diversity of insects, including more bees and butterflies.
- Four of the six ponds have had their water level raised and marginal scrub and reed reduced, producing open, sunny, warm conditions, which have resulted in greater aquatic plant diversity, increased use of the ponds by frogs and a diverse range of aquatic invertebrates, as well as attracting spectacular damselflies and dragonflies.

ACKNOWLEDGEMENTS

I am grateful to Carl Whitehead of Oxford City Council for discussions and for access to documents held on the site in the City Council's archives and to Andy Gunn of BBOWT for discussions as the work progressed. Marilyn Cox gave invaluable editorial help with this report.

APPENDIX 1: 'West side of the Lye Valley North Fen SSSI unit in 2015, Changes for the Better', informal vegetation report to Oxford City Council and BBOWT, Dr J A Webb, 29.01.2016

APPENDIX 2: Species lists for the pond area after habitat work 2015-2016, August 2016.

SEPARATE DOCUMENT:

APPENDIX 3: Transect A-B data from West side of Lye Valley Fen North Fen SSSI, 02.09.2015

APPENDIX 4: Transect C-D data from West side of Lye Valley Fen North Fen SSSI, 02.09.2015

West side of the Lye Valley North Fen SSSI unit in 2015 – Changes for the better

Informal vegetation study report to Oxford City Council and BBOWT, Dr J A Webb, 29.01.2016

Full transect data for this report can be found in Appendices 3 & 4 (separate document)

Introduction and Background

The west side of the North Fen SSSI is a sloping ‘**hanging fen**’, with the spring line starting very high up the slope. The fen covers an area sloping down a 5-6m drop to the Lye Brook adjacent to the footpath/boardwalk and is accumulating a layer of deposits forming a mosaic of wet peat, white tufa and reddish iron oxide. In 2012 this wet slope had become dominated, in the 100 years since grazing ceased, almost exclusively by common reed.

The level side of the fen east of the Lye Brook had been cut and raked since the 1980s, preserving the biodiversity. However, on the west side of the brook, the sloping nature of the fen made this work much more difficult and Oxford City Council’s Countryside Service had not had the resources to cut and remove the now dominant reed over the whole slope (although for some years a narrow band through the middle of the slope was cut and raked-off as a fire-break). Reed is an aggressive dominant ‘thug’ species, which eliminates nearly all other plants by shading, if it is not grazed or cut. Arson events to the standing dead reed happened regularly. The small firebreak zone along the middle of the slope was the only place on the west side where some plant diversity survived. Blunt-flowered rush, purple moor grass and carnation and glaucous sedges were the only species apparent.

Cutting work on the whole north end of the west side was started in 2012 by Oxford City Council’s Countryside Service Rangers, and volunteers. A photographic record was made of the vegetation before the start of the work. In 2013, a baseline vegetation recording transect of 1m x 1m quadrats at 5m intervals diagonally up the slope was carried out. This provides evidence against which improvements can be measured. Now, with the extra cutting and raking possible over the last two years thanks to BBOWT Wild Oxford Project volunteers and Friends of Lye Valley volunteers, assisted by the Countryside Rangers, the biodiversity improvements to the west side since 2013 are really evident in the results of the September 2015 vegetation transect survey, which was carried out in exactly the same position as the one for the 2013 study.

The aim of remedial work on the west side of the North Fen SSSI

The aim is to bring all suitable areas of the west side fen back to the rare M13 fen vegetation type (present on the east side of the Lye Brook), which it undoubtedly used to have when under grazing 100 years ago. Suitable areas were identified by the deposition of lime or tufa deposits in the peat under the dominant reed. Tufa deposition ensures low phosphate content, which favours plant diversity, especially that of orchids.

Reed areas that had been subjected to repeated arson and which did not show any tufa formation, showed nutrient-enrichment changes due to the nitrogen and phosphorus released by the burning; (the indicator is abundant common nettle, which demands high phosphate). It was decided to leave such areas uncut for reed-specific invertebrates. Due to the nutrient enrichment these areas on the southern end of the west side would have been much more difficult to return to short, biodiverse, fen without stripping off the top layer of enriched peat throughout the whole area.

The north-eastern end of the west side of the North Fen towards Heath Close and Warren Meadow was targeted for remedial reed and scrub removal and intensive cutting and raking work, as it had the best tufa-forming springs (indicating a low level of nutrients) and the best relic plant biodiversity, and therefore the best chance of being brought back to short, biodiverse, fen with a few years’ work.

Methods

Transect locations

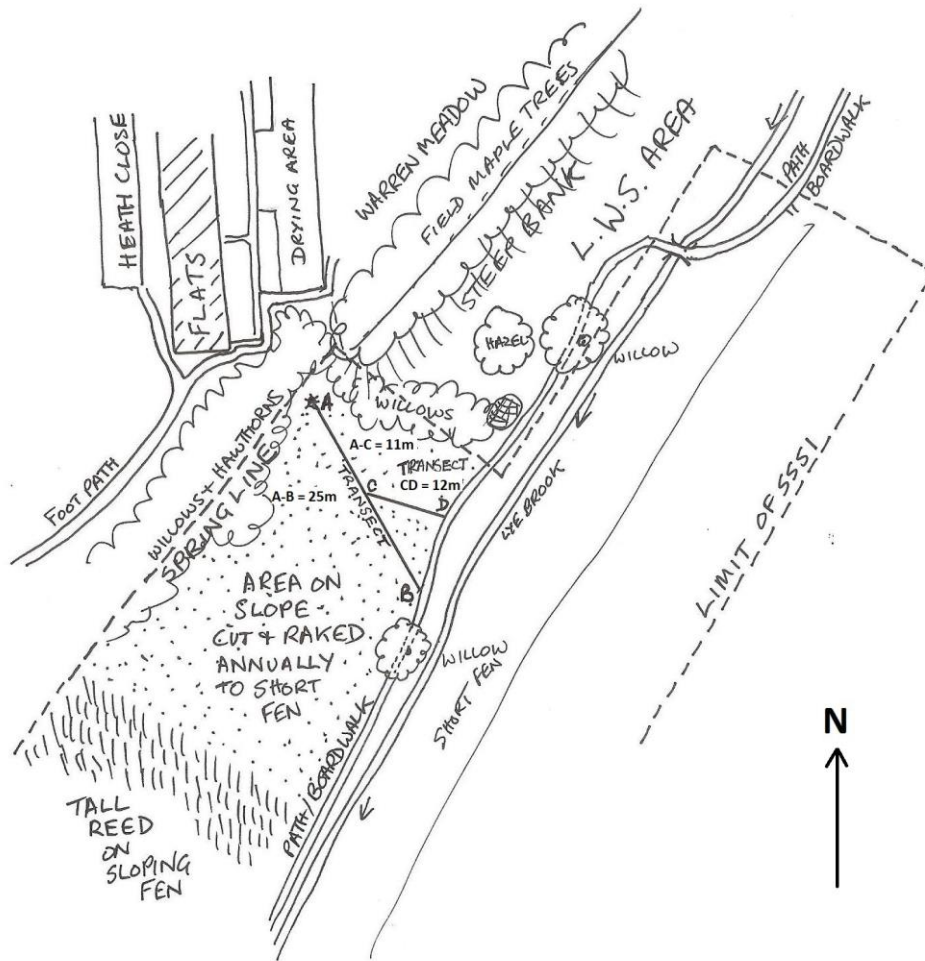


Figure 1: Sketch map of part of the Lye Valley North Fen SSSI showing position of the vegetation recording transects A-B and C-D on the west side fen

Transects in 2015 were contiguous belt transects of 1m x 1m quadrats placed centrally over the measuring tape laid out to mark the transect position. In addition to recordings made within the original diagonal transect of 25m (A-B), vegetation within a short side-branch transect of 11m (C-D) perpendicular to the boardwalk was recorded in order to capture information on more of the area that showed greater positive vegetation change than transect A-B.

Percentage cover of the various plant species and bare ground was estimated by eye, using an undivided quadrat, therefore it has to be regarded as somewhat approximate, but broad trends are still clearly visible.

At the survey date in early September, the majority of plant species were identifiable but the distinction between glaucous sedge and carnation sedge (in the absence of flower heads) was unreliable, as only their very similar leaves were present. Therefore these two species have been lumped together for the percentage cover estimations.

Results

Please see the accompanying tables of percentage cover of plant species along the west-side fen belt transects A-B and C-D (Separate document - Appendices 3 and 4).

Compared to the first vegetation transect assessment on the west side in 2013 (in position A-B but 1m x 1m quadrats only at intervals of 5 metres) the repeat survey in the same position in 2015, and general recording over the area that underwent remedial work, show the following positive indications:

- **Decrease in cover of reed** on average. Anecdotally, observations showed height and strength of reed stems to be reduced also – reed is now weak and spindly, rather than strong and above head height.
- **Increase in the amount of bare wet peat or tufa** and runnels between plants (due to reed reduction) – this means a greater area for seed germination and more fen surface warmed by the sun, which will favour the life cycles of specific insects, such as the soldierflies, whose larval development is temperature-dependent.
- **Seen for the first time** – small amounts of more common flower species, such as bugle, square-stalked St John's-wort and fleabane, but especially important are the small amounts of the rarer species: **long-stalked yellow-sedge, bog pimpernel and marsh willow-herb**; some of these must have arisen from the seed bank in the peat, with other colonisation through wind-blown seed. **Six plant species were recorded here for the first time, including three rare ones.**
- **Increased abundance and a greater area covered** by more common species, such as water figwort, hemp agrimony, water mint, marsh thistle and water cress, but especially important is the big increase in the two rare species, **marsh lousewort and parsley water-dropwort**, (both on the England Red List). **Seven flowering plants have increased populations.**

Marsh lousewort has extremely long-lived seeds and the remedial work of cutting, raking and associated trampling has brought dormant seed to the surface and stimulated germination – a **'back from the dead' species**. The increase in this species is particularly important to visiting bees, as the flowers are adapted to bee-pollination only. As the plant is a semi-parasite (roots join to the roots of plants around the marsh lousewort, and water, sugars and other nutrients are siphoned-off), its presence reduces vigour in surrounding sedges and rushes and assists the return to short vegetation. As it is mostly annual, when it dies back in the autumn, bare wet peat and tufa areas appear, which enable the germination and survival of seedlings of other species and an overall increase in diversity. It is thus a key species in fen site habitat improvement, acting in a similar way that yellow rattle, another key semi-parasite species, affects plant diversity in meadows.

- **A big increase in the specific tufa-forming mosses** from the uncovered spring head at the top of the slope all the way down to the boardwalk. The most significant response has been in the common Fern-leaved Hook-moss *Cratoneuron filicinum*, but with this are seen rarer amounts of locally very scarce tufa-forming mosses, such as Curled hook-moss *Palustriella commutata* (previously *Cratoneuron commutatum*) and Maidenhair pocket-moss *Fissidens adianthoides*. Such tufa-encrusted mosses are important breeding sites for rare invertebrates (crane flies, soldierflies and water penny beetle), so their increase will assist animal diversity and provide additional useful areas of habitat for dependent species.

Changes noted by general observations in 2015 in the west-side area where remedial work was carried out

Obviously the plant species diversity has increased, but is the abundance increase of many shorter species that is so striking. Not all plant species in the narrow 1m x1m belt transects are recorded, so the species changes occurring in the wider area (which was subject to increased cutting and raking) is also a positive result.

Cutting and raking reed in mid-summer and again in autumn prevents it building up a starch store in the rhizome, so it is weaker when growing the next year. Also reed is seen to occasionally just turn brown and die – possibly a low-nutrient phenomenon in the tufa-dominated areas. This increase in overall plant species diversity is due to a reduction in cover and shading by reed, combined with the parasitic activities of the increasing marsh lousewort population – this effectively decreases the vigour of ranker rush and sedge, reducing their dominance and thus making survival of a wider diversity of plant species possible.

Animal diversity and abundance

Changes in the vegetation have a knock-on effect on animal life. Insect diversity and abundance on the west side is vastly increased. The shorter vegetation makes the whole area warmer (tall reed had created cold shade). This warmth aids insect life cycles, and reptiles (viviparous lizards) can now usefully bask here. Thanks to the greater plant diversity, there were many more nectar- and pollen-rich flowers available here in 2015.

The west side, its vegetation now shorter, was literally humming with insect life all summer, with flies, bees and butterflies visiting the more abundant flowers for nectar and pollen. Female banded general soldierflies were also seen looking for egg-laying sites in the now warmer, more open, wet peat and tufa runnel areas.

The rare, tiny, **water penny beetle** *Eubria palustris* was recorded here for the first time in 2015 (it is normally found only on the east side). It breeds in warm, sun-exposed, water-logged moss mats, which have shown big area extensions.

When volunteers are at work raking in this area, they now have to be careful not to rake up the numerous juvenile frogs found hopping all over this slope. Such small frogs benefit from more open conditions with greater plant diversity and more abundant tiny insects as food sources. They would not have been able to move easily or find food easily in the previous monoculture of dense reed with a thick thatch layer of dead leaves underneath.

During the cutting and raking a metal sewer inspection hatch was revealed. This summer the warm metal cover was seen to be a favoured sunning spot for juvenile lizards, which look like little black demons. The west side is now a better food source (insects) and sunning area for lizards. Previously they basked on the boardwalk and were constantly disturbed by walkers, dogs and runners.

Thus there have been positive benefits to all mobile animal life using this side of the fen.

All the following photographs were taken by Judith Webb

Photographs taken between 2009-2011 (prior to any remedial work)



Slope on west side of North Fen SSSI photographed from the short east side before start of remedial cutting work. Almost total dominance of common reed except for the fire break (which is not visible – it is actually in the middle of the reed area). Photo 10.04.2011



Recently-cut fire break area in the middle of the west-side, sloping, hanging-fen, looking along the fire break to the south. Photo 26.08.2009

Photographs of the remedial work and the vegetation response



Volunteers scything and raking off the reed on the west side of the SSSI as part of the BBOWT Wild Oxford project. Both photos taken 16.05.2015



Full extent of cut-and-raked area on the west side of the SSSI that underwent remedial work. Photo 25.09.2015

Photographs from 2015 showing tufa and vegetation changes



Abundant whitish tufa (Calcium carbonate, lime) deposition at the spring head (also now discovered all over the slope of the west side fen). Photo 29.09.2014



Open, short, vegetation dominated by marsh lousewort in the middle of area of transect C-D. Brown dying reed seen in distance – thought to be a low-nutrient effect. Photo 18.07.2015



West side regrowth after remedial cutting and raking in midsummer, looking north to bank rising to Warren Crescent. Frequent flowers of rare parsley water dropwort (white). Many insects were using these flowers. Note how short the reed is now. Photo 18.07.2015



Parsley water-dropwort flowers with fen hoverfly and beetles, west side. This flower is particularly attractive to many species of insects as a nectar and pollen source. Photo 18.07.2015



*Marsh lousewort **Pedicularis palustris**. This is the species that has shown by far the biggest population increase on the west side. It is particularly attractive to bees and very important in promoting overall plant species diversity by its parasitic effects in reducing the vigour of rush and sedge. Photo 18.08.2015*



Female banded general soldierfly on marsh lousewort, west side. Photo 20.06.2014

Appendix 2

Species lists for the pond area after habitat work 2015-2016, August 2016

Lye Valley North Fen – west side Full plant survey and preliminary animal survey results J A Webb

Scientific Name	Common name	Group	Abundance/Numbers/sexes	Comment
ALGA				
<i>Chara</i> sp. cf <i>vulgaris</i>	Stonewort alga	Alga	Extensive mat in three ponds	
HORSETAILS				
<i>Equisetum palustre</i>	Marsh horsetail	Horsetail	Occasional	
<i>Equisetum arvense</i>	Field horsetail	Horsetail	Occasional	
FLOWERING PLANTS				
<i>Agrostis stolonifera</i>	Creeping bent	Flowering plant	Occasional	
<i>Angelica sylvestris</i>	Wild angelica	Flowering plant	Occasional	
<i>Callitriche</i> sp.	Water starwort	Flowering plant	Locally frequent	
<i>Calystegia</i> sp	Greater bindweed	Flowering plant	Occasional	
<i>Carex acutiformis</i>	Lesser pond sedge	Flowering plant	Frequent	
<i>Carex otrubae</i>	False fox sedge	Flowering plant	1 clump	
<i>Carex pendula</i>	Greater tussock-sedge	Flowering plant	3 small clumps	
<i>Carex pseudocyperus</i>	Hop sedge	Flowering plant	1 clump	
<i>Carex riparia</i>	Greater pond sedge	Flowering plant	Frequent	
<i>Circaea lutetiana</i>	Enchanter's nightshade	Flowering plant	Occasional	
<i>Cyperus longus</i>	Galingale	Flowering plant	Occasional	Probably introduced
<i>Epilobium hirsutum</i>	Great willow herb	Flowering plant	Occasional	
<i>Epilobium parviflorum</i>	Hoary willow herb	Flowering plant	Occasional	
<i>Galeopsis tetrahit</i>	Common hemp nettle	Flowering plant	11 plants	New site record
<i>Galium aparine</i>	Cleavers	Flowering plant	Occasional	
<i>Glyceria fluitans</i>	Floating sweet-grass	Flowering plant	Locally frequent	
<i>Glyceria maxima</i>	Reed sweet-grass	Flowering plant	One clump	
<i>Heracleum sphondylium</i>	Hogweed	Flowering plant	Occasional	
<i>Hypericum tetrapterum</i>	Square-stalked St John's wort	Flowering plant	Occasional	
<i>Iris pseudacorus</i>	Yellow flag iris	Flowering plant	Locally frequent	
<i>Juncus articulatus</i>	Jointed rush	Flowering plant	Rare	
<i>Juncus bufonius</i>	Toad rush	Flowering plant	Rare	New site record
<i>Juncus effusus</i>	Soft rush	Flowering plant	Rare	
<i>Juncus inflexus</i>	Hard rush	Flowering plant	Rare	
<i>Juncus subnodulosus</i>	Blunt-flowered rush	Flowering plant	Rare	
<i>Lemna minor</i>	Duckweed	Flowering plant	Occasional - locally frequent	Dominates one pond
<i>Lythrum salicaria</i>	Purple loosestrife	Flowering plant	Rare	
<i>Mentha aquatica</i>	Water mint	Flowering plant	Frequent	

Species lists for the pond area after habitat work 2015-2016, August 2016

Lye Valley North Fen – west side Full plant survey and preliminary animal survey results J A Webb

Scientific Name	Common name	Group	Abundance/Numbers/sexes	Comment
<i>Nasturtium officinale</i>	Common watercress	Flowering plant	Locally frequent	
<i>Persicaria amphibia</i>	Amphibious bistort	Flowering plant	Occasional	
<i>Persicaria maculosa</i>	Redshank	Flowering plant	Rare	New site record
<i>Potamogeton crispus</i>	Curled pondweed	Flowering plant	Dominant in one pond	
<i>Ranunculus sceleratus</i>	Celery-leaved buttercup	Flowering plant	2	New site record
<i>Salix cinerea</i>	Grey willow	Flowering plant	Occasional	Scrub
<i>Salix fragilis</i>	Crack willow	Flowering plant	Large trees nearby	
<i>Scutellaria galericulata</i>	Skullcap	Flowering plant	Rare	
<i>Stachys palustris</i>	Marsh woundwort	Flowering plant	Locally frequent	
<i>Urtica dioica</i>	Common nettle	Flowering plant	Occasional	
<i>Utricularia</i> sp	A bladderwort	Flowering plant	One clump, many strands	New site record
ANIMALS (no full survey, passing observations)				
<i>Rana temporaria</i>	Common frog	Amphibian	153 spawn clumps in total	Spring observation 2016
<i>Alcedo atthis</i>	Kingfisher	Bird	1	
<i>Anas platyrhynchos</i>	Mallard	Bird	1 female	
<i>Pacifastacus leniusculus</i>	Signal crayfish	Crustacea	1 juvenile, found dead	
<i>Asellus aquaticus</i>	Water hog louse	Crustacea	Numerous	
<i>Gammarus</i> sp	Freshwater shrimp	Crustacea	2	
<i>Gasterosteus aculeatus</i>	Stickleback	Fish	2	
<i>Stratiomys</i> larva	Larval General soldierfly	Fly	1	
<i>Hybomitra</i> sp.	A horsefly	Fly	1 male	
<i>Stratiomys</i> potamida	Banded general soldierfly	Fly	1	
<i>Bombus pascuorum</i>	Common carder bumble bee	Hymenoptera	A few workers	Workers on marsh woundwort and hemp nettle flowers
<i>Bombus terrestris</i>	Buff-tailed bumble bee	Hymenoptera	A few workers	Workers on marsh woundwort and hemp nettle flowers
<i>Bombus lapidarius</i>	Red-tailed bumble bee	Hymenoptera	A few workers	Workers on marsh woundwort and hemp nettle flowers
<i>Apis mellifera</i>	Honey bee	Hymenoptera	A few workers	Workers on marsh woundwort and hemp nettle flowers
<i>Planorbis planorbis</i>	The ramshorn	Mollusc	3	
<i>Lymnaea</i> sp	Pond snail	Mollusc	Numerous	
<i>Psyche casta</i>	Common sweep cased moth	Moth	1	Larval case on leaf
<i>Libellula depressa</i>	Broad-bodied chaser	Odonata	1 male	
<i>Coenagrion puella</i>	Azure damselfly	Odonata	1 male, 1 female	
<i>Aeschna cyanea</i>	Southern hawker	Odonata	2 males	