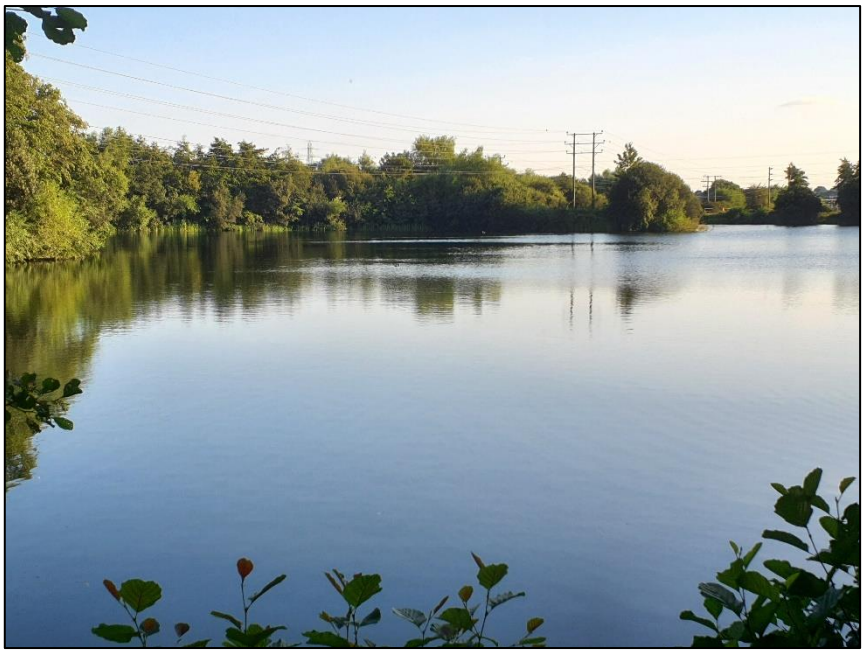
PHASE 1 HABITAT SURVEY

Witney Lake and Country Park

Nature Reserve

Witney, Oxfordshire



Date of report:
21 October 2021

Client:
Witney Town Council

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Report Reference:
211001

Photo**:** Tall ruderal vegetation on the bank of the River Windrush ©Frank Lucas 2021.

Acknowledgements

Grateful thanks are due to Craig Blackwell and David Morris for support with plant identification and to Robert Mileto of Eco Tech Ecological Consultancy for support with plant identification and for constructive comments on drafts of this report.

All maps were produced in QGIS free and open source GIS v.3.16.10.

Note on the use of common and scientific names: Throughout this report, species are referred to by their common (English) names. For plants these are generally the names used by Stace (2019). Scientific names of all species referred to in the text are given in Appendix 1.

Cover photo: Witney Lake from the north bank looking south towards the nature reserve ©Frank Lucas 2021.

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Photo: Looking east from footpath at Witney Lake over River Windrush in foreground with fringe of tall ruderal vegetation under crack willows behind ©Frank Lucas 2021

1 Background and Introduction

Witney Lake and Country Park is an amenity site running southwards from the centre of Witney then across the A40, connecting to the Lower Windrush Valley Project Area south of the A40.

Witney Lake lies to the south of the A40 and the west of the Country Park meadow, from which it is separated by the western branch of the River Windrush. It is a restored gravel pit dug to provide gravel for the construction of the Witney bypass. Since restoration in the 1980s it has been managed by Witney Town Council for the benefit of local people and wildlife. The northern half of the lake (not surveyed) is used for angling and general leisure purposes such as picnicking and walking. The southern half is managed as a nature reserve.

The Country Park comprises meadows and associated habitats lying both north and south of the A40. The two halves of the Country Park are connected by a pedestrian underpass under the A40. The southern meadow is earmarked as a biodiversity priority site by Witney Town Council.

In spring 2021 Witney Town Council commissioned a Phase 1 habitat survey of the nature reserve part of Witney Lake and the southern meadow of the Country Park. The survey area is shown edged in red on Map 1.

Map 1: Witney Lake and Country Park Nature Reserve Survey Area.

Survey area boundary shown in red.

2 Aims and Objectives

The principal aims of the survey were:

- To undertake a Phase 1 habitat survey and evaluation of the nature reserve part of Witney Lake and Country Park Meadow Nature Reserve to provide a baseline description and inform management decisions.
- To make outline recommendations on possible biodiversity conservation and enhancements for the surveyed area.

3 Methodology

3.1 Phase 1 Habitat Survey

The field survey followed the approach described in the 'Handbook for Phase 1 Habitat Survey' (JNCC, 2010).

Field surveys were undertaken on 9 July 2021 and 23 Aug 2021. All accessible parts of the survey area were visited. Habitats and main land uses were mapped onto field sheets or a Samsung Galaxy Tablet using QField open-source GIS software.

Small areas of habitat, generally less than 0.01ha (100m^2) and small features of ecological interest were target noted.

Submerged aquatic vegetation in Witney Lake was partially surveyed by casting a grapple c.5 to 10m from the bank at points SP 35870 08325 and SP 35876 08198 on the eastern side of the lake. These points are shown on Map 2. Specimens of material collected by the grapple were recovered for later identification. This does not constitute a full botanical survey of the lake, for which boat access would have been required.

The lake margins were only accessible at a few locations where woodland growth had been controlled to allow access. No emergent vegetation was evident at these points. The inaccessible margins of the main lake were scanned where possible by binocular for evidence of marginal vegetation on the opposite shoreline.

Following the survey, habitats were categorised according to the best fit Phase 1 survey definitions (see JNCC, 2010).

3.2 Scope and limitations of the habitat survey

3.2.1 Site accessibility

In general, site accessibility was very good, with a good network of paths and tracks present and few internal boundaries.

Dense vegetation prevented access to the main part of the peninsular which divides the lake and to parts of the plantation woodland fringing the northern part of the Country Park meadow. Vegetation in these areas was in part surveyed from nearby vantage points using binoculars.

To minimise health and safety risk, the lake edge and river banks were not approached closely. In many areas it was not possible to do this anyway, because of dense vegetation obscuring the banks.

It had been intended to take samples of submerged aquatic plants from the western and southern shores of the lake and from the shore of the peninsular sticking out into the lake, but the presence

of dense scrub prevented access to these areas. Because of this it is highly likely that some submerged aquatic plant species have been missed by the survey.

3.2.2 Timing of fieldwork

Fieldwork for this report was undertaken in July and August 2021. Most plant species can be found at this time, and whilst the plant species list is not intended to be comprehensive it is felt to be unlikely that many terrestrial species of conservation interest will have been missed.

3.2.3 Mapping accuracy

Mapping in the field was undertaken using the GPS on a Samsung Galaxy Tab Active3 with more accurate location detection enabled. Grid references were taken using the GridReferenceFreeOS Android app. In open areas these devices can provide accuracy to below 3m, but this cannot be guaranteed. To ground-truth the location of specific points and boundaries, mapped features were examined on open-source maps and aerial photographs. Whilst care was taken to ensure accuracy in mapping it should be noted that all stated mapped areas and lengths should be viewed as indicative, not definitive.

It should also be noted that in a Phase 1 survey, some features such as tracks and small water courses are considered to be 'linear' features, having length but not area. Following this approach, the most appropriate adjacent habitats are mapped to include the linear feature, even where the feature itself may measure several metres across. This will result in a marginal increase in the mapped area of the adjacent habitats. For the present survey this approach was applied to the length of the River Windrush separating the two halves of the survey area and to the footpaths around the site.

Photo: Witney Country Park Nature Reserve meadow from south west corner looking north ©Frank Lucas 2021.

4 Results of Phase 1 Habitat Survey

4.1 Overall summary

A summary of the habitat survey results is given in Table 1 below and shown on Map 2: Phase 1 Habitats at Witney Lake and Country Park Nature Reserve.

Each mapped land parcel is also shown on the map and table in Appendix 2, which gives each land parcel a specific reference number, a description of its location, a central grid reference, the Phase 1 habitat type, the overall area and a summary description.

Table 1: Phase 1 Habitats at Witney Lake and Country Park Nature Reserve June 2021

Phase 1 Habitat	Area (ha)
Broadleaved Semi-natural Woodland	0.54
Broadleaved Plantation Woodland	2.72
Dense Scrub	0.05
Semi-improved Neutral Grassland	6.01
Amenity Grassland	0.22
Tall Ruderal	1.10
Marginal Vegetation	0.02
Standing Water	2.76
Running Water	214 metres
Total	**12.88**

In all, 12.88ha of land was mapped and categorised into 9 different Phase 1 habitats. Habitat descriptions are given in the following sections.

4.2 Witney Lake Nature Reserve

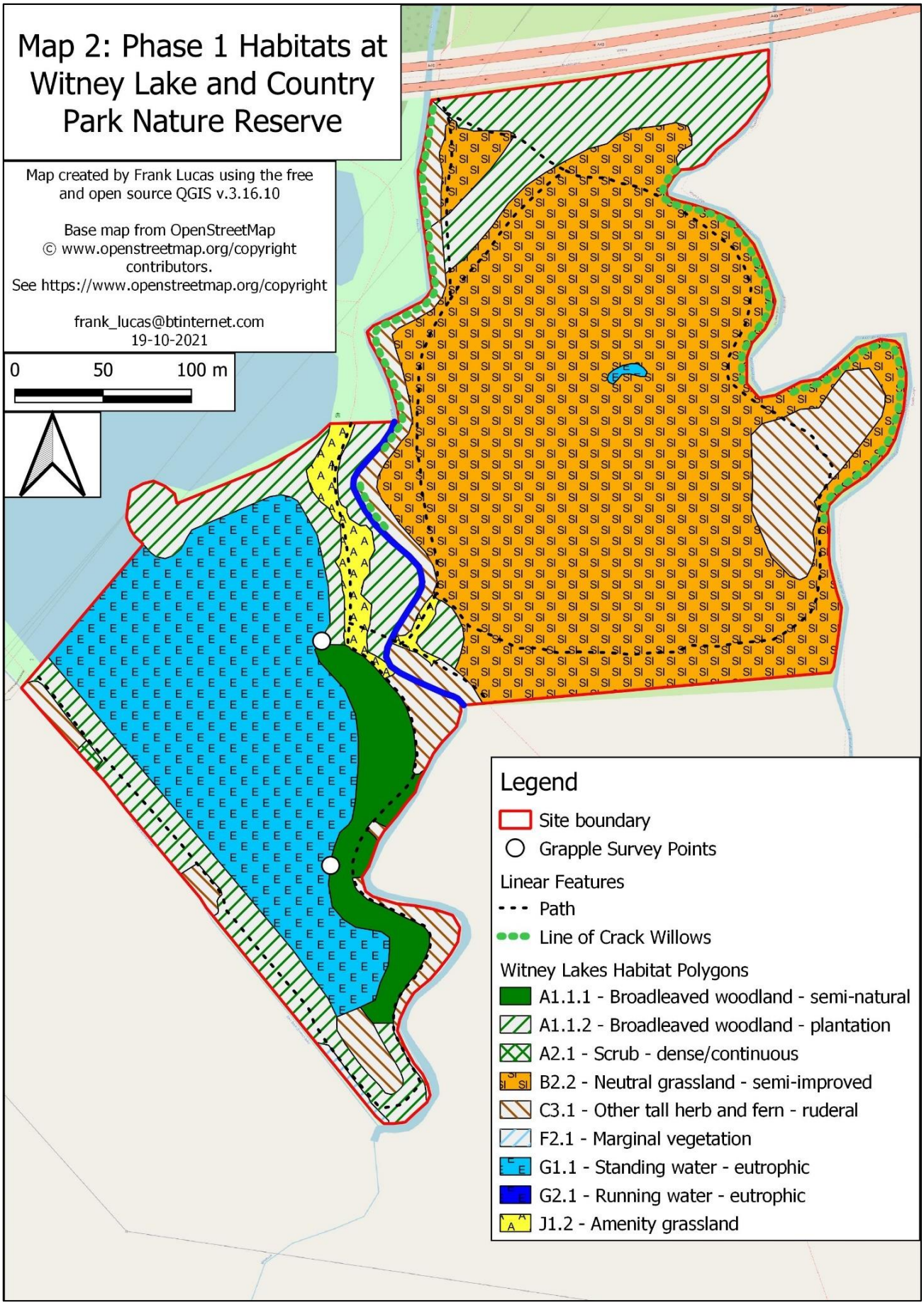
Witney Lake Nature Reserve comprises the southern part of Witney Lake, together with the associated habitats between Emma's Dike to the south-west and the western branch of the River Windrush to the east.

The area of open water in the nature reserve is c.2.75 ha. This is fringed by semi-natural and plantation woodlands which themselves lie adjacent to amenity grassland, tall ruderal and marginal vegetation habitats.

The lake itself is standing water, mapped as eutrophic following Lower Windrush Valley Project (LWVP) (2020), though clear evidence of nutrient status was not obtained during the present survey.

The grapple survey of submerged aquatic vegetation in the lake retrieved specimens of rigid hornwort and Nuttall's pondweed. No floating-leaved or emergent vegetation was observed from the shore of the lake. Little evidence of marginal vegetation on the lake edge was found, though occasional plants of species including yellow flag, water mint, gypsywort and wild angelica were found. Around most of the lake edge, shrub and woodland species form a sharp boundary with the water surface. Where access to the water's edge was possible it was noted that the lake edges fell steeply into water c.50cm deep or deeper at the time of survey, with no slopes or shelving margins suitable for emergent vegetation.

Map 2: Phase 1 Habitats at Witney Lake and Country Park Nature Reserve



A 2004 survey of the lake (Pond Conservation, 2005) found a total of 52 species of wetland plants associated with the lake, including three species of stonewort (opposite, bristly and common stonewort)). The report of survey concluded that *'this lake is the highest ranking for plants in the [*Lower Windrush*] valley*'. It was also ranked highly for freshwater invertebrates and birds.

Three areas of broadleaved plantation woodland were found at Witney Lake Nature Reserve. These lie around the south western edge of the lake, around the north-eastern edge of the lake and fringing the western bank of the River Windrush.

In the broadleaved plantation woodland around the south western edge of the lake the tree canopy is locally dominated by a range of species including ash, alder, sycamore, willow species and a species of poplar, all growing to c.20m tall. Much of the area has a dense shrub layer, locally dominated by a range of broadleaved species including hawthorn, field maple, hazel, elder, crab apple and dog rose. Where the surfaced path passes through the area, and in the densely shaded parts, the field layer is absent. In the less shaded parts, the field layer comprises a range of tall ruderal species including common nettle, hogweed, mugwort, cleavers, hedge bindweed, Himalayan balsam, wood avens and hedge woundwort. Ash saplings in the area showed signs of Chalara ash dieback disease.

Towards the southern tip of the site the broadleaved plantation woodland comprises a horseshoe-shaped band of closely planted field maples to c.15 m fringing an area of tall ruderal vegetation (see below), with a shrub layer below including hawthorn, hazel and occasional wild privet. The field layer is largely absent (including the surfaced path) but with scattered tall ruderal species including common nettle and garlic mustard.

Around the north-eastern edge of the lake and onto the peninsular, the broadleaved plantation woodland is locally dominated by a range of broadleaved species including alder to c12m tall, with ash and willows to c.8 – 12m and a tall shrub layer including hawthorn, blackthorn, willow, sycamore saplings and buckthorn. In densely shaded parts the field layer is absent or sparsely vegetated with species including bramble, wood avens and ground ivy, especially in more open areas.

A third area of broadleaved plantation woodland is found alongside the western edge of the River Windrush where it passes through the site. This area is dominated by crack willows to c.20m with occasional mature ash to c.20m and a sparse shrub layer including willows and buckthorn. and a field layer including common nettle, great willowherb, broad-leaved dock and Himalayan balsam.

Much of the eastern bank of the lake is dominated by semi-natural broadleaved woodland with a high water table and a wet woodland character. The canopy here is dominated by alder to c.20+m, white willow and crack willow. The understory is dense around the fringes and includes a range of co-dominant trees and shrubs including willow (possibly eared willow or a hybrid related to eared willow) together with hawthorn, buckthorn and occasional field maple and occasional elder. Under dense shade the field layer is absent, with sparse tall ruderal vegetation in more open areas, including common nettle, hogweed and Himalayan balsam.

The small area of this woodland between the path and the River Windrush is drier and comprises mainly willows to c.10m over a field layer locally dominated by common nettle and Himalayan balsam with occasional pendulous sedge on the river bank.

A small patch of dense scrub amounting to c.0.01 ha occurs on the western side of Witney Lake Nature Reserve, between the path and Emma's Dyke. This is dominated by elder and willow to c.4m, with a field layer of tall ruderal species including frequent common nettle and garlic mustard.

Whilst tall ruderal vegetation is scattered at low levels across the site, five larger discrete patches occur around Witney Lake Nature Reserve. Two of these patches lie between the path and Emma's Dyke. These are dominated by common nettle with a range of other species including frequent cleavers, common hogweed, hedge bindweed. The three other discrete patches of tall ruderal vegetation lie on the eastern side of the lake, between the footpath and the River Windrush. These areas are locally dominated by a range of species including common nettle, great willowherb and Himalayan balsam.

One small patch of marginal vegetation covering 0.018ha was found fringing Emma's Dyke at the southern tip of Witney Lake. This is locally dominated by reed sweet-grass with frequent Himalayan balsam and purple-loosestrife in the wetter areas close to the water, with the drier parts comprising locally dominant common nettle and great willowherb with frequent hedge bindweed, redshank, garlic mustard and greater plantain plus occasional common hemp nettle.

Towards the north eastern corner of Witney Lake Nature Reserve the footpath is bordered by regularly mown amenity grassland. This grassland is dominated by perennial rye-grass, cock's-foot and timothy, with a range of herbs tolerant of regular mowing including white clover, dandelion, greater plantain, ribwort plantain and creeping buttercup. Other species can be found including occasional tufted vetch, creeping cinquefoil, yarrow, red bartsia and black medick. Around the edges this grassland is being heavily encroached by tall ruderal vegetation growing as a field layer under and around the adjacent woodland. Species include common nettle, hogweed, broad-leaved dock, Himalayan balsam and wild angelica.

4.3 Witney Country Park Nature Reserve

Witney Country Park Nature Reserve lies south of the A40 and between the two arms of the River Windrush to the east and west. The field at the core of the site is a semi-improved neutral grassland. This is screened from the A40 to the north by a belt of broadleaved plantation woodland. Areas of tall ruderal habitat and scrub are scattered across the site and the watercourses to the east and west are fringed by lines of crack willow. A small pond occurs in the grassland area.

The main field is a semi-improved neutral grassland largely dominated by coarse grasses, covering c.5.93.ha. Locally dominant species include tall fescue, tufted hair-grass, Yorkshire fog, timothy, common bent, false oat-grass, cock's-foot and hard rush. Broadleaved herbs are generally localised and occasional or rare. Species include meadowsweet, greater plantain, creeping thistle, creeping cinquefoil and red clover and a scattering of tall ruderals including common nettle, hogweed and occasional hemlock.

Within the main meadow an area of c0.46ha of tall ruderal vegetation has established. Locally dominant species include common nettle and hogweed with grasses including cock's-foot and false oat-grass.

A small outlier area of semi-improved neutral grassland to the main meadow covering c.0.12ha lies in the north-west corner of the site. It is dominated by coarse grasses including cock's-foot, perennial rye grass, Yorkshire fog and tufted hair-grass with frequent common nettle, cleavers, broad-leaved dock, creeping buttercup and occasional spear thistle and cut-leaved cranesbill. The fringes of this area are being encroached by adjacent stands of tall ruderal vegetation.

The western edges of both the main meadow and this outlier where they adjoin the western branch of the River Windrush are dominated by a 5-15m wide band of tall ruderal locally dominated by

common nettle, great willowherb and Himalayan balsam, with hogweed and occasional purple-loosestrife, meadowsweet, a comfrey species and a sedge species.

Towards the centre of the meadow at NGR SP 36043 08479 lies a small kidney-shaped pond covering c.0.013ha. The water area had evidently shrunk over the course of the summer but it was still holding shallow water to c.20cm deep at time of survey (09 July 2021). Emergent species included locally frequent amphibious bistort and a sweet-grass, with a fringe of silverweed, hard rush and a sedge species, with occasional broad-leaved dock.

The river banks of both the eastern and western branches of the River Windrush either side of the main meadow are intermittently lined with crack willows to c.20m (not individually mapped) with occasional scrub, including hawthorn and buckthorn with tall ruderal vegetation below.

A band of broadleaved plantation woodland runs across the north of the site, more or less parallel to the A40 which it screens from the rest of the site. The canopy is locally dominated by white willow and a poplar to 20m with other canopy tree species including ash, alder, aspen and a pine to over 16m. There is a dense shrub layer locally dominated by hazel, hawthorn, field maple, ash saplings, occasional wild privet and a single yew. The field layer is absent in densely shaded areas with common nettle locally dominant in more open areas and wood avens, ground ivy and garlic mustard locally frequent.

In the south-west corner of the Country Park nature reserve, just to the east of the bridge connecting to Witney Lake, is a small area of broadleaved plantation woodland, amenity grassland and tall ruderal vegetation. The broadleaved plantation woodland is dominated by alder to c.15m with an understory including hazel and dogwood and a field layer locally absent towards the centre of the plantation with a fringe of common nettle, hogweed, creeping thistle, cock's-foot and occasional white dead-nettle. The mown amenity grassland is dominated by perennial rye-grass and cock's-foot with greater plantain. The tall ruderal vegetation in this area occurs alongside the path and is dominated by common nettle and hogweed with frequent hedge bindweed, Himalayan balsam and bramble.

4.4 River Windrush Western Branch

A c.214m length of the western branch of the River Windrush passes through the site. For the most part this is densely shaded by trees and scrub with little marginal, emergent or submerged aquatic vegetation. At points where the bank was safely accessible, the river bed was found to be predominantly comprised of bare gravel and mud.

A small stand of a submerged aquatic plant, not sampled but believed to be a species of water crowfoot, was observed within the channel at NGR SP3590908312.

5 Evaluation

5.1 Method for evaluation of features

The habitats, species and sites evaluations essentially follow the Chartered Institute of Ecology and Environmental Management (CIEEM) Guidelines for Ecological Impact Assessment (CIEEM, 2018).

The value or potential value of each feature identified is evaluated according to its importance in a geographical context, as follows:

- International
- National (England)
- County (Oxfordshire)
- Site (the site or a larger area if impacts extend further for certain features)
- Of negligible value/importance.

The CIEEM guidelines suggest that the value assigned to a feature should be a matter of professional judgement based on statutory requirements and policy objectives for biodiversity. These include the key sites, as well as habitats and species of principal importance for biodiversity conservation in the England, as derived from the Natural Environment and Rural Communities (NERC) Act 2006 (see CIEEM, 2018 for more detail). Habitats and species of principal importance for biodiversity conservation in the England are also common referred to as priority habitats and species respectively.

5.2 Habitats

5.2.1 Habitats of Principal Importance

The following habitats found at Witney Lake and Country Park Nature Reserve are considered to be habitats of principal importance (HoPI) for the conservation of biodiversity in England under Section 41 of the NERC Act 2006:

- Witney Lake - a eutrophic standing water
- The pond in Witney Country Park Nature Reserve Meadow – a freshwater pond
- The broadleaved woodland fringing the eastern bank of Witney Lake – a wet woodland.
- The other broadleaved plantation woodlands on site – lowland mixed deciduous woodland.
- The River Windrush and Emma's dyke - rivers

These habitats are important components of the biodiversity resource of the Lower Windrush Valley.

5.2.2 Other Habitats

The Country Park meadow, dense scrub, tall ruderal and marginal habitats present are not considered to be habitats of principal importance, and no other priority habitats are shown on the Magic map of "priority habitat" on https://magic.defra.gov.uk/MagicMap.aspx (accessed October 2021).

The dense scrub, tall ruderal and marginal habitats are considered to be of negligible biodiversity value.

The Country Park meadow is difficult to categorise. It is of at least site-level importance as a habitat, because of its size and the contribution it already makes to the biodiversity of the site, but it is rank and unmanaged and currently of low botanical diversity. It was also very dry under foot at the time of survey.

With appropriate management to improve botanical diversity, particularly increasing the occurrence of broad-leaved herbs typical of neutral grasslands, it could develop the characteristics of a lowland meadow habitat of principal importance (see https://data.jncc.gov.uk/data/f0553254-1d47-474a-98e5-37fa163a28b5/UKBAP-BAPHabitats-29-Lowland-Meadows.pdf). Alternatively, but technically more difficult to achieve, management to increase overall wetness and retain larger areas of standing water throughout the year would give it characteristics of a coastal and floodplain grazing marsh habitat of principal importance (see https://data.jncc.gov.uk/data/82b0af67-d19a-4a89-b987-9dba73be1272/UKBAP-BAPHabitats-07-CoastFloodGrazingMarsh.pdf). Both approaches would require a suitable mowing and/or grazing regime to be introduced, and measure will need to be taken to retain the public amenity value of the site.

5.2.3 The Landscape Context

The Lower Windrush Valley, in which the site lies, has been identified as a Nature Recovery Zone in the emerging Oxfordshire Nature Recovery Network (see LWVP (2020) and Wild Oxfordshire (2020)). As such the entire Lower Windrush Valley is provisionally identified at the County scale as a priority area for habitat creation and restoration. The LWV's lakes have additionally been classified as part of the Core Zone ('*the most important sites for biodiversity in Oxfordshire'*), where the highest level of biodiversity protection, management and enhancement should occur. In this context the Witney Lake and Country Park Nature Reserve must be seen as a key site for the conservation and enhancement of biodiversity in the Lower Windrush Valley and in Oxfordshire.

5.3 Species

5.3.1 Scope of Survey

The current survey was a habitat survey, so species records have only been collected incidentally to that, and are limited to vascular plants and stoneworts, 'Schedule 9' plants and Chalara ash dieback. It is acknowledged that the site may have value for the conservation of other species, such as wintering wildfowl, otters and water voles, but these are beyond the scope of this report.

5.3.2 Vascular Plant and Stonewort Species

The present survey did not include a detailed survey of vascular plants and stoneworts in Witney Lake, but it is clear from previous surveys (Pond Conservation, 2005) that the lake has been of the highest importance for these groups. LWVP (2020) have identified Witney Lake as a target lake for resurvey of aquatic plants. Until this resurvey is completed the lake should continue to be considered amongst the most important lakes in the Lower Windrush Valley for vascular plants and stoneworts.

Other habitats at the site, including the habitats of principal importance, are considered to be negligible value for vascular plant species conservation given that:

- The vascular plant species found are considered common and widespread.
- No individual species recorded are notable in a national context (Stroh, P.A., et al, 2014) or are considered particularly rare/scarce in county context.
- The diversity of vascular plants recorded is not considered to be of note for an area of this extent;

5.3.3 Schedule 9 Species (including invasive non-native and licensed release only species)

5.3.3.1 Overview

Section 14 of the Wildlife and Countryside Act 1981 ('the Act') seeks to prevent the release into the wild of certain plants and animals which may cause ecological, environmental, or socio-economic harm. To achieve this, it makes it an offence *inter alia* to plant or otherwise cause to grow in the

wild in Great Britain any species of plant listed in Schedule 9 to the Act. Two Schedule 9 plant species were observed during field survey – Himalayan balsam and Nuttall's waterweed.

5.3.3.2 Himalayan balsam

Himalayan balsam is widespread across the site and in the wider Lower Windrush Valley Project area, on the fringes of the watercourses and in areas dominated by tall ruderal vegetation. At present there is no agreed best course of action to eradicate it, and any local attempt to eradicate it at Witney Lake and Country Park is certain to fail because of the prevalence of the species in the wider landscape. If a landscape-scale initiative to eradicate this species is initiated then local measures should be taken to support the initiative. Meanwhile contractors operating on the site should be required to observe biosecurity measures to prevent the spread of Himalayan balsam from the site, notably the effective cleaning of equipment and clothing to prevent seeds or fragments of the plant being transferred to other sites.

5.3.3.3 Nuttall's waterweed

Nuttall's waterweed appears to be well established in Witney Lake having been recorded in the present survey and previously in the Pond Conservation (2005) survey. As with Himalayan balsam it is likely that this species is prevalent across the Lower Windrush Valley Project area and any local attempt to eradicate it is likely to fail. If a landscape-scale initiative is initiated then local measures should be taken to support it, and in the interim, contractors operating on the site should be required to observe biosecurity measures to prevent it's spread through the effective cleaning of equipment and clothing.

5.3.4 Chalara ash dieback

The presence of Chalara ash dieback in trees around Witney Lake and Country Park Nature Reserve requires further investigation and monitoring to ensure that dead or dying trees do not become a danger to visitors. Forest Research advise that '*With the exceptions of felling for public safety or timber production, we advise a general presumption against felling living ash trees, whether infected or not. This is because there is good evidence that a small proportion will be able to tolerate H. fraxineus infection. There is also the possibility that a proportion of ash trees can become diseased, but then recover to good health. These, too, would be valuable for our research, although it is still too early to know whether there are such trees in the British ash population*'. For further information see **https://www.forestresearch.gov.uk/tools-and-resources/fthr/pest-and-disease-resources/ash-dieback-hymenoscyphus-fraxineus/** (accessed August 2021)

5.4 Evaluation summary

The site is of high importance for biodiversity conservation and enhancement because of the presence of five England priority habitats and because of its location in the Core and Recovery Zones of the Lower Windrush Valley part of the draft Oxfordshire Nature Recovery Network.

With the probable exception of Witney Lake, for which more data is required, the botanical value of the site is low. With appropriate management, the botanical diversity of some habitats, most notably the Country Park meadow, could be significantly increased.

The site suffers from the presence of certain invasive non-native species, including Himalayan balsam and Nuttall's pondweed. It will only be possible to eradicate these species on the site as part of a landscape-wide initiative.

The presence on site of Chalara ash dieback is not unusual or noteworthy, given the widespread occurrence of this disease across England. It requires to be monitored and may require some management interventions (i.e. tree felling) to ensure public safety.

6. Conclusion and Recommendations

6.1 Conclusion

Witney Lake and Country Park Nature Reserve is an important site for biodiversity conservation in the northern part of the Lower Windrush Valley, Oxfordshire.

Witney Lake itself requires further survey work to confirm its status as an important location for aquatic plants.

Other habitats at the site are ecologically important but botanically impoverished. Appropriate management could enhance the botanical and general ecological value of the site.

6.2 Recommendations

6.2.1 Management Planning

In view of the ecological importance of the site it should be managed over the long term in such a way as to conserve and enhance its biodiversity, whilst respecting and maintaining the amenity value of the site. Management should contribute to the delivery of the Oxfordshire Nature Recovery Network by taking account of the geographic location in the Lower Windrush Valley. The most effective way to achieve consistent long-term management will be though an integrated management plan with widespread support from stakeholders.

> **Recommendation 1: A nature reserve management plan for Witney Lake and Country Park Nature Reserve should be developed and implemented.**

6.2.2 Botanical Survey of Witney Lake

Unless and until evidence is obtained to the contrary, Witney Lake must continue to be protected and managed as one of the foremost lakes for aquatic plants in the Lower Windrush Valley. A full repeat of the survey undertaken in 2004 (Pond Conservation, 2005) is a priority. Once the results of survey are available, the management of the lake, including its margins, should be reviewed and modified as appropriate.

> **Recommendation 2: Conduct a repeat of the Pond Conservation (2004) botanical survey of Witney Lake and review future management in the light of the survey results.**

6.2.3 Witney Country Park Meadow Management

The meadow is the largest single component of the site. The current condition suggests that it has had no recent management. It is now dominated by dense tussocks and mats of coarse grasses and rushes, together with scattered invasive tall ruderal species including common nettle and creeping thistle. This is typical of habitat of this type once traditional management by mowing and/or grazing has ceased. It generally leads to a loss of biodiversity. It may be offset by reinstatement of appropriate management.

> **Recommendation 3: Reinstate management of the meadow by an appropriate mowing and/or grazing regime to control invasive ruderal species and enhance its biodiversity value.**

6.2.4 Conservation Enhancements for Other Habitats and Features

The LWVP (2020) '*Review of Biodiversity Opportunities in the Lower Windrush Valley'* offers a range of possible local conservation enhancements relevant to the Witney Lake and Country Park Nature Reserves site. These should be reviewed with partners in the Lower Windrush Valley Project and considered at the management planning stage. They might include, but not be limited to:

- Restoration or creation of ponds within the meadow area.
- Measures to enhance the river corridors for water voles and otters.
- Pollarding of willows along the river corridors to reduce shading and encourage bankside vegetation.
- Planting of new species-rich hedgerow(s).
- Installation of bird and bat boxes into the young woodland areas to create nesting and roosting sites where few currently exist.

Recommendation 4: Use the LWVP (2020) review to engage with partners in the Lower Windrush Valley Project and identify relevant conservation enhancements to include in the site management plan.

ENDS

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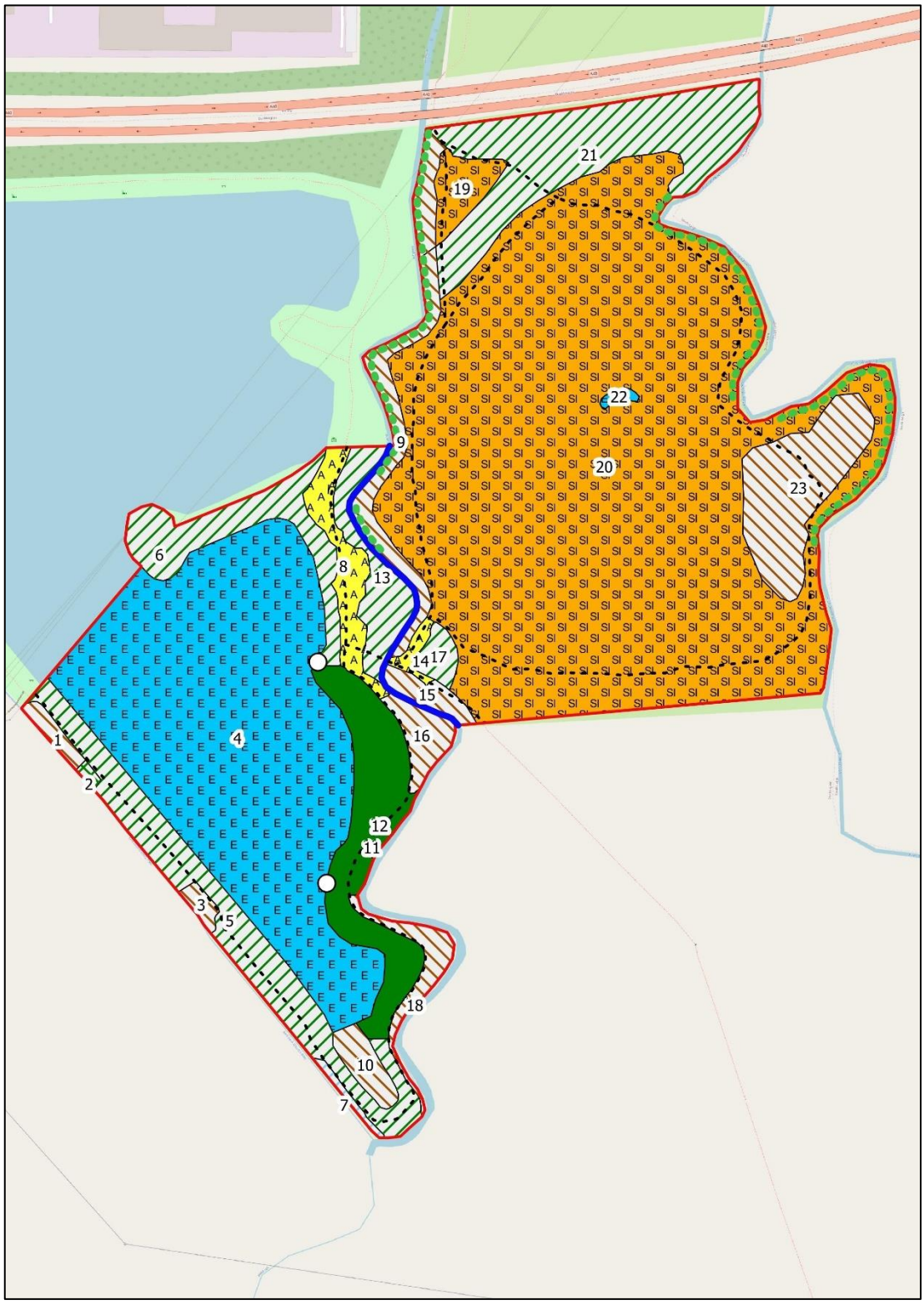
Appendix 1: English and Scientific Names of Species Named in the Report

English/common name	Scientific name
Alder	*Alnus glutinosa*
Amphibious bistort	*Persicaria amphibia*
Ash	*Fraxinus excelsior*
Blackthorn	*Prunus spinosa*
Broad-leaved dock	*Rumex obtusifolius*
Bristly stonewort	*Chara hispida*
Buckthorn	*Rhamnus cathartica*
Cleavers	*Galium aparine*
Cock's-foot	*Dactylis glomerata*
Common bent	*Agrostis capillaris*
Common couch	*Elymus repens*
Common hemp-nettle	*Galeopsis tetrahit*
Common nettle	*Urtica dioica*
Common ragwort	*Jacobea vulgaris*
Common reed	*Phragmites australis*
Common stonewort	*Chara vulgaris*
Common vetch	*Vicia sativa*
Cow parsley	*Anthriscus sylvestris*
Crab apple	*Malus sylvestris*
Creeping bent	*Agrostis stolonifera*
Creeping buttercup	*Ranunculus repens*
Creeping cinquefoil	*Potentilla reptans*
Creeping thistle	*Cirsium arvense*
Cut-leaved crane's-bill	*Geranium dissectum*
Cut-leaved dead-nettle	*Lamium hybridum*
Dandelion sp.	*Taraxacum sp.*
Dog rose	*Rosa canina*
Dogwood	*Cornus sanguinea*
Elder	*Sambucus nigra*
False oat-grass	*Arrhenatherum elatius*
Common horsetail	*Equisetum arvense*
Field maple	*Acer campestre*
Garlic mustard	*Alliaria petiolata*
Great willowherb	*Epilobium hirsutum*
Greater plantain	*Plantago major*
Grey willow	*Salix cinerea*
Gypsywort	*Lycopus europaeus*
Hawthorn	*Crataegus monogyna*
Hazel	*Corylus avellana*
Hedge bindweed	*Calystegia sepium*
Hedge woundwort	*Stachys sylvatica*
Himalayan balsam	*Impatiens*
Hogweed	*Heracleum sphondylium*

Ivy	*Hedera helix*
Meadow foxtail	*Alopecurus pratensis*
Mugwort	*Artemisia vulgaris*
Nuttall's pondweed	*Elodea nuttallii*
Opposite stonewort	*Chara contraria*
Osier	*Salix viminalis*
Otter	*Lutra lutra*
Pedunculate oak	*Quercus robur*
Perennial rye-grass	*Lolium perenne*
Pine	*Pinus sp*
Pineappleweed	*Matricaria discoidea*
Poplar	*Populus sp*
Purple-loosestrife	*Lythrum salicaria*
Red campion	*Silene dioica*
Red fescue	*Festuca rubra*
Redshank	*Persicaria maculosa*
Reed sweet-grass	*Glyceria maxima*
Ribwort plantain	*Plantago lanceolata*
Rigid hornwort	*Ceratophyllum demersum*
Silver birch	*Betula pendula*
Silverweed	*Potentilla anserina*
Spear thistle	*Cirsium vulgare*
Spindle	*Euonymus europaeus*
Sweet chestnut	*Castanea sativa*
Sycamore	*Acer pseudoplatanus*
Tall fescue	*Festuca gigantea*
Timothy	*Phleum pratense*
Tufted hair-grass	*Deschampsia caespitosa*
Wall barley	*Hordeum murinum*
Water crowfoot	*Ranunculus sp.*
Water vole	*Arvicola amphibius*
White campion	*Silene latifolia*
White clover	*Trifolium repens*
White deadnettle	*Lamium album*
White poplar	*Populus alba*
White willow	*Salix alba*
Wild privet	*Ligustrum vulgare*
Wood avens	*Geum urbanum*
Yarrow	*Achillea millefolium*
Yellow flag	*Iris pseudacorus*
Yew	*Taxus baccata*
Yorkshire fog	*Holcus lanatus*

Appendix 2 Phase 1 Habitat Polygons at Witney Lake and Country Park Nature Reserve.

Reference numbers follow those in the table below.



Ref No	Central Grid Ref	Location	Phase 1 Habitat	Phase 1 Code	Area (Ha)	Description
1	SP 35718 08285	Between footpath and Emma's Dyke	Tall ruderal	C3.1	0.0427	Dominated by common nettle with abundant perennial rye-grass and occasional hogweed, cow parsley, great willowherb and dandelion.
2	SP 35739 08260	Between footpath and Emma's Dyke	Dense Scrub	A2.1	0.0112	Dense scrub dominated by elder and willow with field layer including abundant common nettle, ivy and garlic mustard.
3	SP 35803 08187	Between footpath and Emma's Dyke	Tall Ruderal	C3.1	0.0311	Dominated by common nettle with abundant cleavers, hogweed and hedge bindweed
4	SP 35818 08292	The main lake	Standing water (eutrophic)	G1.1	2.7549	Standing water, mapped as eutrophic following LWVP (2020), though clear evidence of nutrient status was not obtained during the present survey. Submerged aquatic plants include rough hornwort and Nuttall's pondweed.
5	SP 35824 08175	Bordering the main lake to the west and south	Broadleaved Plantation Woodland	A1.1.2	0.6023	Canopy locally dominated by a range of tree species to 20m high, including ash, alder, sycamore, willows and poplar. Dense understory locally dominated by a range of broadleaved trees and shrubs including hawthorn, field maple, hazel, elder and crab apple.
6	SP 35852 08417	Along the peninsular and eastern shore of the main lake	Broadleaved Plantation Woodland	A1.1.2	0.3524	Tree canopy locally dominated by a range of species including ash, alder, sycamore, willows and poplar, all growing to c.10 - 15m. Occasional pedunculate oak. Much of the area has a dense understory, locally dominated by a range of broadleaved tree species including hawthorn, field maple, hazel, elder, crab apple and dog rose. Where the surfaced path passes through the area, and in the densely shaded parts, the field layer is absent. In the less shaded parts, the field layer comprises a range of tall ruderal species including common nettle, hogweed, mugwort, cleavers, hedge bindweed, Himalayan balsam, wood avens and hedge woundwort. Ash saplings in the area showed signs of Chalara ash dieback disease. Towards the southern tip of the site the broadleaved plantation woodland comprises a horseshoe-shaped band of closely planted field maples to c.15 m fringing an area of tall ruderal vegetation (see 10 below), with a shrub

Ref No	Central Grid Ref	Location	Phase 1 Habitat	Phase 1 Code	Area (Ha)	Description
						layer below including hawthorn, hazel and occasional wild privet. The field layer is absent (including the surfaced path) and tall ruderal species including common nettle and garlic mustard.
7	SP 35886 08077	Between footpath and Emma's Dyke	Marginal vegetation	F2.1	0.0213	A 3-4m wide fringe of marginal vegetation dominated by reed sweet-grass towards the water's edge with frequent purple-loosestrife, hedge bindweed, redshank and dense Himalayan balsam. Common hemp nettle occasional.
8	SP 35888 08373	Between Witney Lake and River Windrush	Amenity Grassland	J1.2	0.1957	Mown grassland (cut long) on both sides of the surfaced footpath. Dominated by grasses including perennial rye-grass, cock's-foot and timothy, with a range of herbs tolerant of regular mowing including white clover, dandelion, greater plantain, ribwort plantain and creeping buttercup with occasional tufted vetch, creeping cinquefoil, yarrow, red bartsia and black medic. Around the edges this grassland is being heavily encroached by tall ruderal vegetation growing as a field layer under and around the adjacent woodland. Species include common nettle, common hogweed, broad-leaved dock, Himalayan balsam and angelica.
9	SP 35896 08417	Down the west side of the main meadow and fringing the eastern bank of the western branch of R. Windrush	Tall Ruderal	C3.1	0.2183	A 5-15m band of tall ruderal vegetation fringing the western edge of the meadow and the bank of the River Windrush, locally dominated by common nettle, great willowherb and Himalayan balsam with hogweed and occasional purple-loosestrife, meadowsweet, comfrey and a sedge. The river bank is intermittently lined with crack willows to c.20m (not individually mapped).
10	SP 35897 08094	Adjoining the southern edge of the main lake.	Tall Ruderal	C3.1	0.0876	Dominated by common nettle and Himalayan balsam. Heavily shaded to east, south and west by field maples to c.15m.
11	SP 35901 08218	Between the surfaced footpath and the River Windrush	Tall Ruderal	C3.1	0.0067	Dense stand of Himalayan balsam.

Ref No	Central Grid Ref	Location	Phase 1 Habitat	Phase 1 Code	Area (Ha)	Description
12	SP 35903 08235	Bordering the main lake on its eastern bank.	Broadleaved Semi-natural Woodland	A1.1.1	0.536	Broadleaved semi-natural woodland, much of which has a high water-table and the character of a wet woodland. Canopy locally dominated by alder, white willow and crack willow to c20m. The understory is dense around the fringes and includes a range of co-dominant trees and shrubs including willow (possibly eared willow or a hybrid related to eared willow) together with hawthorn, buckthorn and occasional field maple and elder. Under dense shade the field layer is absent, with bramble and tall ruderal vegetation in more open areas, including common nettle, hogweed and Himalayan balsam. The small area of this woodland between the surfaced path and the River Windrush is drier, comprising mainly willows to c.10m over a field layer locally dominated by common nettle and Himalayan balsam with occasional pendulous sedge on the river bank.
13	SP 35906 08374	Bordering the River Windrush western branch	Broadleaved Plantation Woodland	A1.1.2	0.2293	Broadleaved plantation woodland with a canopy dominated by crack willows to c.20m with occasional mature ash to c.20m and a sparse shrub layer including willows and buckthorn. Field layer is absent in densely shaded parts and tall ruderal in more open areas, locally dominated by common nettle, great willowherb, broadleaved dock and Himalayan balsam plus occasional pendulous sedge, meadowsweet, purple-loosestrife and comfrey.
14	SP 35921 08327	On meadow side of bridge linking Witney Lake to Witney country Park	Amenity Grassland	J1.2	0.0332	Mown grassland dominated by perennial rye-grass and cock's-foot with greater plantain.
15	SP 35929 08308	On meadow side of bridge linking Witney Lake and Witney Country Park	Tall Ruderal	C3.1	0.0202	Tall ruderal vegetation locally dominated by common nettle, hogweed and Himalayan balsam.

Ref No	Central Grid Ref	Location	Phase 1 Habitat	Phase 1 Code	Area (Ha)	Description
16	SP 35933 08284	Between footpath and River Windrush west bank	Tall Ruderal	C3.1	0.1106	Tall ruderal dominated by common nettle with great willowherb, hedge bindweed, hogweed, Himalayan balsam and cocksfoot all locally abundant. Creeping thistle, broad-leaved dock and greater plantain all common.
17	SP 35938 08328	On meadow side of bridge linking Witney Lake and Witney Country Park	Plantation woodland	A1.1.2	0.060	Small area of broadleaved plantation woodland dominated by alder growing to c.15m with a collapsed crack willow. Understory includes co-dominant hazel and dogwood. Field layer is absent where densely shaded and tall ruderals in more open areas including common nettle, hogweed and creeping thistle with cock's-foot and occasional white dead-nettle.
18	SP 35939 08158	Fringing River Windrush between the river and the footpath.	Tall Ruderal	C3.1	0.1073	Tall ruderal locally dominated by common nettle, great willowherb and cock's-foot with frequent dense Himalayan balsam and occasional purple-loosestrife and common reed towards the river bank.
19	SP 35952 08598	North-west corner of Witney Country Park Nature Reserve, near A40 underpass.	Neutral grassland	B2.2	0.1206	Semi-improved neutral grassland outlier to the main meadow dominated by coarse grasses including cock's-foot, perennial rye grass, Yorkshire fog and tufted hair-grass with frequent common nettle, cleavers, broad-leaved dock, creeping buttercup and spear thistle. Occasional cut-leaved cranesbill. The fringes of this area are being encroached by adjacent stands of tall ruderal vegetation.
20	SP 36035 08430	Main meadow on Witney Country Park	Neutral grassland	B2.2	5.9269	Neutral grassland co-dominated by coarse grasses and rush, including tall fescue, tufted hair-grass, cock's-foot, timothy, Yorkshire fog, false oat-grass, creeping bent and hard rush. Wall barley locally common. A range of tall ruderals scattered across the site including common nettle, creeping thistle, hogweed and occasional hemlock and mugwort. Herbs generally localised and occasional or rare. Species include meadowsweet, red clover, creeping cinquefoil, greater plantain and, on disturbed areas of the paths, pineappleweed.

Ref No	Central Grid Ref	Location	Phase 1 Habitat	Phase 1 Code	Area (Ha)	Description
21	SP 36040 08633	Across northern edge of Witney country Park Nature Reserve	Broadleaved Plantation Woodland	A1.1.2	0.8624	Broadleaved plantation woodland screening the Country Park meadow from the A40 to the north. Canopy locally dominated by white willow and poplar to 20m with other canopy tree species including ash, alder, aspen and a pine to over 16m. Dense shrub layer locally dominated by hazel, hawthorn, field maple, ash saplings, occasional wild privet and a yew. Field layer is absent in densely shaded areas with common nettle locally dominant in more open areas and wood avens, ground ivy and garlic mustard locally frequent.
22	SP 36043 08479	Towards centre of main meadow	Standing water (eutrophic)	G1.1	0.0129	Depression in main meadow holding shallow water at time of survey (09 July 2021). Emergent species included locally frequent amphibious bistort and a sweet-grass, with a fringe of silverweed, hard rush and a sedge, with occasional broad-leaved dock
23	SP 36138 08422	Towards eastern side of main meadow	Tall ruderal	C3.1	0.4592	Tall ruderal vegetation invading the main grassland area. Locally dominant species include common nettle and hogweed with grasses including cock's-foot and false oat-grass.