Nash Fen

Botanical and vegetation survey report

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Summary

Through the North Buckinghamshire Freshwater Resilience project, Freshwater Habitats Trust is working in partnership with Buckinghamshire Council to identify opportunities to improve the freshwater landscape across multiple North Buckinghamshire river catchments.

This report presents the results of a survey of Nash Fen in Buckinghamshire carried out by Freshwater Habitats Trust in 2022 as part of this project. The purpose of the survey was to:

- record the botanical diversity of the site;
- classify and map its vegetation and habitats; and
- identify habitat enhancements that could be undertaken through the North Buckinghamshire Freshwater Resilience project.

The survey found a total of 220 plant species, including 67 wetland plants and nine species of conservation concern. These included a new population of Distant Sedge (*Carex distans*), a scarce plant in Buckinghamshire, and fen species such as Blunt-flowered Rush (*Juncus subnodulosus*), Marsh Valerian (*Valeriana dioica*) and Ragged-Robin (*Silene flos-cuculi*).

Extensive areas of fen habitat were recorded across the site, in low-lying valley bottom areas and areas of groundwater seepage. A total area of 2.84 ha of lowland fen priority habitat was recorded, including approximately 1 ha of Blunt-flowered Rush dominated fen, an uncommon type of fen found around springs and seepages. Nash Fen supports the largest concentration of this type of fen in Buckinghamshire and is the only site known from the North Buckinghamshire Freshwater Resilience project area.

Although areas of fen habitat did not appear to be declining in condition, the survey found that the main factor influencing the condition of fen habitats across Nash Fen is the intensity of grazing, with all areas of fen under-grazed. Based on the survey findings, to proceed with habitat enhancements at Nash Fen, it is recommended that the project:

- discuss the value of the site with the landowner, areas where it is currently declining or failing to achieve good condition, and the options for remedying this;
- discuss grazing by cattle with the landowner and potential graziers, explaining its objectives and benefits for wildlife; and
- formalise agreed management areas, methods, objectives and timescales in a site management plan.

An initial target could be to bring the valley head at the southern end of the site, together with some of the surrounding grassland, into management within 1-2 years, with the whole area grazed appropriately each year by a grazier over an agreement period of 5-10 years.

Contents

1 Introduction

1.1 North Buckinghamshire Freshwater Resilience project

Through the North Buckinghamshire Freshwater Resilience project, Freshwater Habitats Trust is working in partnership with Buckinghamshire Council to identify opportunities to improve the freshwater landscape across multiple North Buckinghamshire river catchments. The project seeks to deliver biodiversity enhancements through wetland habitat creation, combined with flood risk reduction through the implementation of natural flood management (NFM) measures.

The project is spilt into two phases. Phase 1 began in 2020 and was completed by Freshwater Habitats Trust in March 2022. Phase 1 of the project included undertaking baseline ecological monitoring, hydrological flood modelling, landowner engagement and scoping of opportunities in the project's catchment. The types of NFM measures proposed included leaky dams, flood storage areas and tree planting; biodiversity enhancements will include species re-introduction and pond creation.

In May 2022 the Strategic Flood Management Team prioritised the proposed locations where NFM measures could be implemented. Phase 2 of the project will focus on the implementation and construction of the measures along with continuation of landowner engagement and monitoring of measures once implemented.

1.2 North Buckinghamshire fens

North Buckinghamshire is not well noted for its fen ecosystems. However, several fen sites occur within the region, which while small make an important contribution to biodiversity.

From the 1970s Brian Wheeler of the University of Sheffield began studying base-rich fens[1] across England and Wales and, recognising the occurrence of an important series of fen sites across North Buckinghamshire, carried out surveys in the region. In 1996, 19 of the North Buckinghamshire fen sites were re-surveyed by Wheeler and their condition assessed (Wheeler, 1997). Of the sites Wheeler assessed in 1996, two lie within the North Buckinghamshire Freshwater Resilience project area, Nash Fen and Singleborough, of which it is thought only Nash Fen survives. The site and its location in Buckinghamshire are shown in Figure 1 below.

Wheeler described Nash Fen as representing a good example of a fen complex, though not very rich in species, and with some damage. The site was ranked third for its diversity of wetland plant species, and fifth for its number of locally rare wetland plant species. Wheeler considered it to be the site supporting the largest area of fen in North Buckinghamshire.

1.3 Purpose of this report

This report presents the results of a survey of Nash Fen carried out by Freshwater Habitats Trust in 2022. The purpose of the survey was to:

- record the botanical diversity of the site;
- classify and map its vegetation and habitats; and
- identify habitat restoration and management interventions that could be undertaken through the North Buckinghamshire Freshwater Resilience project.

The survey focused on fen and other wetland habitats, but surrounding habitat was covered.

[1] Such fens, also termed rich-fens, are simply be referred to as 'fens' in this report

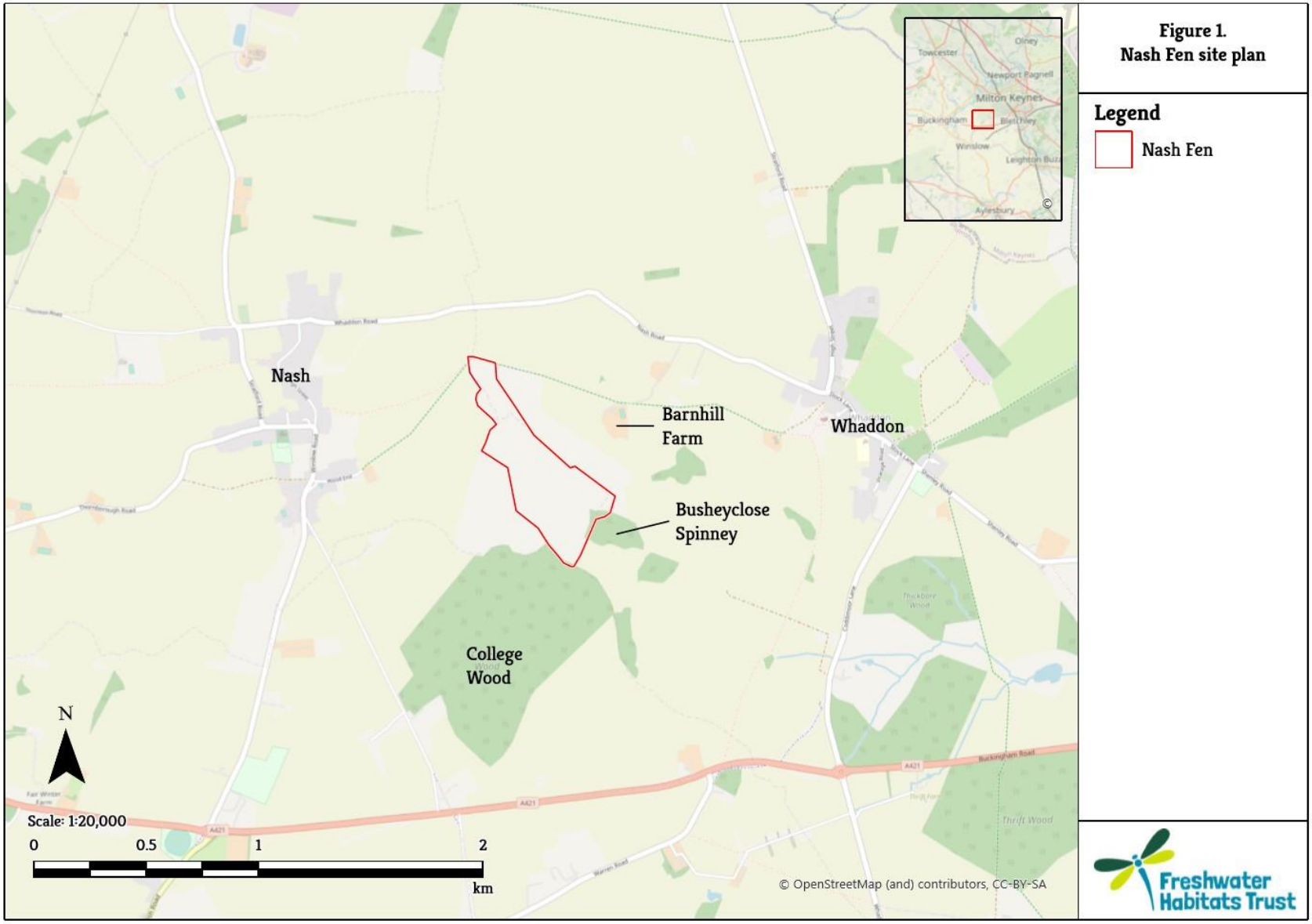


Figure 1.
Nash Fen site plan

2 Methods

2.1 Overview

The survey was carried out from the 14th to 16th June 2022, led by Freshwater Habitats Trust's Senior Plant Ecologist David Morris MCIEEM, with assistance from Catchment Officer Adam Bows. The survey covered the whole of the valley north from College Wood and northwest from Busheyclose Spinney, within the area of Barn Hill Farm used as a motocross course (Figure 1); the smaller tributary valley to the west was not covered. The survey focused on areas of open herbaceous fen vegetation, covering all low-lying parts of the valley; other areas that could potentially support fen habitat were identified from satellite imagery or vantage points around the site and were also covered.

Methods for the botanical and vegetation surveys are described below.

2.2 Botanical survey

A list of all stonewort, bryophyte (liverworts, hornworts and mosses) and vascular plant species[2] encountered during the survey was compiled. The survey largely focused on vascular plants, as the timing of survey was not favourable to recording bryophytes generally and a more complete list would have required intensive searching in habitats of peripheral interest to the survey (e.g. on trees, in disturbed ground). As the vegetation was very heterogenous across the site, species abundance was not recorded. Nomenclature for species followed Bryant *et al.* (2002) for stoneworts, Blockeel *et al*. (2020) for bryophytes and Stace (2019) for vascular plants.

If encountered, further information was recorded about the following vascular plant species:

- legally protected species listed on Schedule 8 of the Wildlife and Countryside Act 1981 (as amended); and
- plants of local or national conservation concern, i.e.
  - species of principal importance, listed in accordance with Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006;
  - Nationally Rare or Nationally Scarce taxa (BSBI, 2020);
  - species listed as Near Threatened, Vulnerable, Endangered or Critically Endangered on the vascular plant red lists for Great Britain (Cheffings et al., 2005) or England (Stroh et al., 2014); or
  - species listed as rare or scarce in the vice county of Buckinghamshire (BSBI, 2012).
- Invasive non-native plant species, such as those listed on Schedule 9 of the Wildlife and Countryside Act 1981 (as amended), or other invasive or potentially invasive non-native plants.

Where such species occurred in a discrete population then a ten-figure grid reference of its location was recorded using a Garmin eTrex® 10 handheld GPS unit (horizontal accuracy approximately 5m) and ecological notes were recorded.

2.3 Vegetation survey

The methodology of the National Vegetation Classification (NVC) was followed to classify the vegetation of the project area (Rodwell, 2006). Homogenous stands of vegetation were mapped and assigned to units of the NVC, to sub-community where possible. Assignment of units of the NVC was made in the field. Some vegetation could not be assigned to units of

[2] In this report, 'species' refers to any taxon at or below the level of taxonomic species, including hybrids and infraspecific taxa.

the NVC and was assigned to *ad hoc* units, e.g. disturbed, early successional or artificial habitats or stands of single species not included in the NVC. The woodland along the valley bottom in the north-west of the site was not investigated in detail and stand types were not mapped.

Vegetation types were assigned primary and secondary habitat codes of the UK Habitat Classification (Butcher *et al*., 2020). Primary habitats were classified to level four of the hierarchy. For ease of display and discussion in this report, the UK Habitat Classification types were grouped into simpler, more easily understandable broad habitat types. These are described in section 3.3.

Vegetation mapping was detailed, with herbaceous vegetation mapped at a scale of approximately 1:1,500, with stands resolved as polygon features if having an area greater than approximately 4m^2. Woodland was mapped at a larger arbitrary scale.

Mapping was undertaken using field survey maps produced in ArcGIS Pro, comprising Bing satellite imagery at 1:1,000 scale and overlain with 100m and 10m grids. The survey maps were printed and annotated in the field, using a Garmin eTrex® 10 handheld GPS unit to locate position (horizontal accuracy approximately 5m). Completed field survey maps were scanned, and georeferenced and digitised in ArcGIS Pro.

To provide a record of the fen vegetation, five 1m x 1m quadrats were recorded along a transect across the valley head in the south-east of the site. The positions of the quadrats were chosen to be representative of the types of fen vegetation that formed zones around this valley head system. For each quadrat, a list of all vascular plant and bryophyte species present were recorded, and their abundance was scored using the Domin scale (Table 2.1). In addition, the average height of the vegetation within the quadrat and the percentage cover of litter were recorded, together with ecological notes.

In addition, target notes were recorded to describe vegetation structure and other habitat features. Hydrological features such as watercourses, springs and seepages, and artificial drainage, were also recorded.

Table 2.1 Domin scale of abundance

Domin score	Abundance	Domin score	Abundance
1	<4% cover, few plants	6	26-33% cover
2	<4% cover, several plants	7	34-50% cover
3	<4% cover, many plants	8	51-75% cover
4	4-10% cover	9	76-90% cover
5	11-25% cover	10	91-100% cover

2.4 Limitations

As a large and complex site, it is possible that small areas of fen habitat were not covered by the survey, particularly toward the site's western boundary. However, the results of the survey are considered to include all significant areas of fen and provide an accurate representation of the site's botanical diversity.

3 Results

3.1 Overview

Nash Fen was found to comprise a large and complex site situated along a deep valley oriented south-east to north-west, drained by a small unnamed stream, a headwater of the River Great Ouse. The valley is set within a landscape of broad, gently rolling hills. Most of the site is used as a motorcross course, with numerous tracks cutting down from the plateau above the valley into the valley bottom. The site appeared to be grazed at low intensity by sheep, although sheep were not seen within the survey area at the time of the survey. Within the surveyed area were two small tributary valley heads, located on the west side of the main valley toward its south-east end and oriented south-west to north-east.

A total of 220 plant species were recorded, comprising one stonewort, one liverwort, seven moss and 211 vascular plant species. A full list of species recorded is given in Table A2.1, Appendix 2. Further results of the botanical survey are described in section 3.2.

Fen habitat was present within the main valley in low-lying areas along its stream, and around small areas of groundwater seepage perched above the valley bottom. There were more extensive areas of the latter type of fen in the tributary valleys, particularly the southernmost valley. Plans of vegetation and habitats recorded are shown in figures 2 and 3 in Appendix 1. Target notes and photographs are provided in Table A3.1, Appendix 3, and their locations shown in figures 2 and 3. Figure 3 also shows hydrological features recorded (streams, springs etc.). Results of the sample of quadrats are provided in tables A2.3 and A2.4. Further results of the vegetation survey are described in section 3.3.

3.2 Botanical survey

3.2.1 Wetland species

Following Freshwater Habitats Trust's list of wetland plants[3], the survey recorded three submerged aquatic plant species, one floating-leaved aquatic plant species, and 63 emergent plant species (see Table 2.1, Appendix 2). This represents approximately 30% of the total number of plants recorded, the other species being largely associated with non-wetland habitats, such as grassland and ruderal vegetation.

Following Wheeler's list of fen species published in Fojt (1993), the survey found 43 principal fen species and four rare fen species (see Table A2.1, Appendix 2). The rare species were the liverwort Endive Pellia (*Pellia endiviifolia*), and the vascular plants Blunt-flowered Rush (*Juncus subnodulosus*), Bristle Club-rush (*Isolepis setacea*) and Distant Sedge (*Carex distans*). Endive Pellia was present in a few areas of wet open ground, but as a small species may have been overlooked in rank fen vegetation. Blunt-flowered Rush was the main dominant species in stands of soligenous fen vegetation (see subsection 3.3.1). Bristle Club-rush was recorded from the edge of a pond formed in part of the motorcross track in the south-east of the site (target note 48). Distant Sedge is described in subsection 3.2.2, together with details of other species of conservation concern.

Other wetland species of note include Whorl-grass (*Catabrosa aquatica*), a local species in Buckinghamshire and the midlands. It was recorded from three areas of wet muddy ground disturbed by the motorcross track or associated drainage works.

[3] https://freshwaterhabitats.org.uk/wp-content/uploads/2015/03/34-WETLAND-PLANTS-ENGLISH-RECORDING-FORM-FINAL.pdf

There was a good diversity of sedges, with 13 species recorded. Sedges associated with good quality fen were rare, however. Greater Tussock-sedge (*Carex paniculata*) was found in an area of partially drained fen south of the pond (target note 21). Carnation Sedge (*C. panicea*) and Common Sedge (*C. nigra*), small species of shorter, more open fen vegetation, were found in the tributary valley in the south-east of the site, around quadrat 1.

3.2.2 Species of conservation concern

Nine species of conservation concern were recorded, listed in Table 3.1. Grid references and other details of records are provided in Table A2.2.

Six of the species of conservation concern were wetland species. Three small populations of Common Valerian (*Valeriana officinalis*) were recorded from the extensive area of fen within the valley head in the south-east of the site. The record of Distant Sedge was a new site for Buckinghamshire (A. McVeigh, pers. com.); the single population was found in the smaller of the two tributary valleys, where it was growing abundantly in an area of fen disturbed by an old motorcross track (target note 31). Grey Club-rush (*Schoenoplectus tabernaemontani*) was recorded from around the pond in the centre of the site. Marsh Valerian (*Valeriana dioica*) was found in several areas of fen dominated by Blunt-flowered Rush, and was frequent in the valley head in the south-east of the site. Ragged-Robin (*Silene flos-cuculi*) was scattered across the site and locally frequent, such that the locations of populations were not recorded. Tormentil (*Potentilla erecta*) was found in a narrow zone of fen and grassland in the south-east of the site.

The other species of conservation concern were recorded from grassland. Corn Mint (*Mentha arvensis*) was recorded from damp grassland in the north of the site, though only vegetative material was present so the possibility of the hybrid with Water Mint (*M. aquatica*) could not be ruled out. Field Scabious (*Knautia arvensis*) and Quaking-grass (*Briza media*) were recorded from small areas of more diverse grassland.

Table 3.1 Species of conservation concern recorded. Species in bold font are wetland species.

Scientific name	Common name	Conservation status
Briza media	Quaking-grass	England Near Threatened
Carex distans	Distant Sedge	Bucks Scarce
Knautia arvensis	Field Scabious	England Near Threatened
Mentha arvensis	Corn Mint	England Near Threatened
Potentilla erecta	Tormentil	England Near Threatened
Schoenoplectus tabernaemontani	Grey Club-rush	Bucks Rare
Silene flos-cuculi	Ragged-Robin	England Near Threatened
Valeriana dioica	Marsh Valerian	England Near Threatened
Valeriana officinalis	Common Valerian	England Near Threatened

3.2.3 Invasive non-native species

One invasive non-native species was recorded, Goat's-rue (*Galega officinalis*), a terrestrial species found on the bank of a ditch in the north of the site (target note 2). Though not legally controlled like species such as Japanese Knotweed (*Reynoutria japonica*), it is potentially invasive, particularly of disturbed ground.

3.3 Vegetation survey

3.3.1 Fen

Fen habitat comprised two types: topogenous fen along the bottom of the main valley, and soligenous fen associated with areas of groundwater seepage perched above the valley bottom and in tributary valley heads. The extent of these two types are shown in Figure 3.

Topogenous fen was largely dominated by Lesser Pond-sedge (*Carex acutiformis*), with stands of such vegetation referred to the NVC plant community S7 *Carex acutiformis* swamp. In some areas, Great Horsetail (*Equisetum telmateia*) was also frequent to abundant, but there were few other associates and the extensive stands of this type of fen were very species-poor and uniform. At the time of the survey, the ground beneath such vegetation was dry and firm.

At the northern end of the main valley were stands of S7 *Carex acutiformis* swamp situated above the valley bottom (target notes 6 and 7). These may occur in locations of intermittent seepage or be remnants of areas of soligenous fen that have been drained.

The main type of soligenous fen was characterised by Blunt-flowered Rush, which usually formed the dominant species. Although more diverse than stands of topogenous fen vegetation, this type of fen was also rank and unmanaged, dominated by rushes and other coarse vegetation. Associates included wetland tall herb species such as Hemp Agrimony (*Eupatorium cannabinum*), Lesser Pond-sedge, Marsh Thistle (*Cirsium palustre*), Meadowsweet (*Filipendula ulmaria*), Purple Loosestrife (*Lythrum salicaria*) and Water Mint (*Mentha aquatica*), together with a range of smaller wetland herbs such as Marsh Valerian, Ragged-Robin and Tufted Vetch (*Vicia cracca*). In some areas Great Horsetail was also abundant. This type of vegetation was referred to M22a *Juncus subnodulosus-Cirsium palustre* fen meadow, typical community. Three stands that were instead dominated by Hard Rush were classified as forms of M22, which although not accommodated by the NVC is within Wheeler's original concept of this type of fen vegetation (Wheeler, 1980).

Along the main valley, stands of M22a occurred as small areas on wetter ground above the drier valley bottom (target notes 3, 4, 8, 12, 15 and 33). These stands were species-poor and rank, often with abundant Hard Rush (*Juncus inflexus*) or ruderal species such as Common Nettle (*Urtica dioica*), Cleavers (*Galium aparine*) and Great Willowherb (*Epilobium hirsutum*), especially where disturbed by motorcross tracks.

On the west side of the main valley, there appeared to be two zones of seepage supporting stands of M22a, one toward the bottom of the valley along a ditch (target note 21) and one higher up to the west (target note 28). Both were associated with adjacent stands of S7, interpreted as indicating less permeable substrates with weak or intermittent groundwater seepage or flushing. The fen along the ditch was the only location where Greater Tussock-sedge was recorded; the calcareous grassland on the downslope side of the ditch suggests that fen may have extended further to the east but has been drained.

The most extensive areas of fen were in the two tributary valleys in the south of the site. Both comprised bowl-shaped valley heads with vegetation extending in zones around and across the valleys. The smaller northern valley (target notes 29-32) was shallower and the vegetation simpler, with a wet central area of Blunt-flowered Rush dominated fen, grading into drier tall herb fen upslope, and a zone of dry grassland below.

The southernmost valley head supported the most extensive and complex fen vegetation, with vegetation zoned around seepages on its western and eastern slopes. The valley profile was asymmetrical, with a low western slope and longer eastern slope, with a small stream

running along the foot of the former. The eastern slope was dominated by an extensive seepage face supporting M22a (target note 39), extending from the valley bottom to the break in slope running around the valley head. This eastern face was the only area where a spring and tufa were found (target notes 40 and 41). On the western slope, the zone of strongest groundwater seepage supporting M22a (target note 46; quadrats 2 and 3) was much more restricted, with much of the slope occupied by dry grassland. At the foot of both slopes were well-marked flow tracks (target notes 42 and 43; quadrat 4), where seepage from the slopes above must collect before flowing into the valley's stream.

Zonation around these seepage faces were mirrored on each side of the valley. At the top of the valley below the steep break in slope there, were narrow zones of diverse wet grassland referred to M22b *Juncus subnodulosus-Cirsium palustre* fen meadow, *Briza media-Trifolium* spp. sub-community (target note 44 and 47; quadrat 1). Toward the head of the valley, Blunt-flowered Rush dominated fen graded into tall herb fen with abundant Meadowsweet and frequent False Oat-grass (*Arrhenatherum elatius*), Sharp-flowered Rush (*Juncus acutiflorus*) and Tufted Vetch (target notes 43 and 47; quadrat 5), vegetation referred to M27b *Filipendula ulmaria-Angelica sylvestris* mire, *Urtica dioica-Vicia cracca* sub-community. This vegetation likely indicates areas of weaker seepage lying over more permeable superficial deposits, where groundwater discharged from zones of Blunt-flowered Rush fen above can drain away. Further away from the seepage zones, tall herb fen graded into damp grassland referred to MG1c *Arrhenatherum elatius* grassland, *Filipendula ulmaria* sub-community, dominated by False Oat-grass with frequent Meadowsweet.

Finally, while Great Horsetail was a frequent element of both topogenous and soligenous fen vegetation, intermediate areas and areas where fen graded into grassland were marked out by the abundance, sometimes dominance, of this species (e.g. target notes 13, 30 and 49). Great Horsetail was also found as emergent vegetation along a stream (target note 23) and in ruderal situations where earth had been moved. This type of vegetation does not correspond to any NVC plant community, but it is widespread in the region, as described by Wheeler (1997).

3.3.2 Other habitats

Most of the site was dominated by grassland, predominantly MG1 *Arrhenatherum elatius* grassland, dominated by False Oat-grass and other coarse grasses and tall herbs, scattered across which were numerous mature and veteran trees of Ash (*Fraxinus excelsior*), Pedunculate Oak (*Quercus robur*) and Black Poplar (*Populus nigra* subsp. *nigra*). Locally, grassland supported ant hills and a small number of plant species of better quality grassland such as Lady's Bedstraw (*Galium verum*), but such areas were small and scattered. In areas of heavy disturbance were stands of ruderal vegetation dominated by Common Nettle and Creeping Thistle (*Cirsium arvense*).

The most diverse area of grassland was south of the pond, which supported a range of calcicolous species, including three small stands referred to the calcareous grassland type CG6 *Avenula pubescens* grassland (target note 20). However, the NVC affinities of this vegetation were unclear. There was also a small area of more diverse grassland above the valleyhead in the south-east of the site, the only area where Pignut (*Conopodium majus*) and Tormentil were recorded (near quadrat 1), and on two former motorcross tracks in the north of the site (target notes 4 and 5).

Wooded habitats were not surveyed in detail. The most extensive wooded habitat within the survey area was the wet woodland along the northern half of the main valley. Within this, the banks of the stream were dominated by trees, mostly Ash, Crack Willow (*Salix x fragilis*), Pedunculate Oak and White Willow (*Salix alba*), with occasional Black Poplar. A low canopy of dense Grey Willow (*Salix cinerea*) extended out into the valley bottom over an

understorey of Great Horsetail and Lesser Pond-sedge. Scattered willow trees within fen to the south had similar associated vegetation and were referred to W2a *Salix cinerea-Betula pubescens-Phragmites australis* woodland, *Alnus glutinosa-Filipendula ulmaria* sub-community. There was also open scrubby vegetation of Blackthorn (*Prunus spinosa*), Bramble (*Rubus fruticosus* agg.), Elder (*Sambucus nigra*) and Hawthorn (*Crataegus monogyna*) scattered across summer dry areas of valley bottom and surrounding grassland, and along field boundaries.

Finally, there were several freshwater habitats created as part of the motorcross course. The largest feature was the pond in the centre of the main valley, which supported extensive stands of emergent Reedmace (*Typha latifolia*), and submerged vegetation of Common Water-starwort (*Callitriche stagnalis*) and Horned Pondweed (*Zannichellia palustris*). There were also small ponds in ruts and excavations as part of the course (e.g. target notes 25, 27, 29, 31 and 48). Where these cut down below the water table they were filled with clear water supporting beds of Common Stonewort (*Chara vulgaris*) and emergent vegetation.

4 Discussion and recommendations

4.1 Nature conservation value

4.1.1 Fen

Based on the results of the survey, Nash Fen supports a total of 2.84 ha of lowland fen priority habitat, comprising topogenous fen (1.34 ha) and soligenous fen (1.49 ha). The latter includes approximately 1 ha of Blunt-flowered Rush dominated fen vegetation, over half of which (0.55 ha) is concentrated within the tributary valley head in the south of the site.

In the context of the North Buckinghamshire Freshwater Resilience project area, Nash Fen represents a very significant extent of lowland fen habitat, with likely the only remaining area of soligenous fen habitat. The Blunt-flowered Rush dominated fen has the greatest value, being rare across much of the UK and supporting populations of several plant species that are rare or threatened in the project area and the region, including Blunt-flowered Rush itself, as well as Distant Sedge, Greater Tussock Sedge, Ragged-Robin and Marsh Valerian. Based on Wheeler (1997), Nash Fen supports the largest concentration of Blunt-flowered Rush fen in Buckinghamshire. The zonation of Blunt-flowered Rush fen with other types of soligenous fen vegetation as well as grassland in the south-eastern valley head is also of value, representing natural vegetation responses to hydrogeological processes. The topogenous fen vegetation in the valley bottom is of lower botanical value and is more widespread in the region.

The larger areas of Blunt-flowered Rush fen were in remarkably good condition given that there appeared to have been little grazing or other management for many years. Although rank, this type of vegetation is often not very species-rich and there were areas which retained many of the characteristic smaller fen plant species that are sensitive to neglect of management. Localised disturbance by motocross, although potentially temporarily damaging, appeared to be positive, promoting the regeneration of smaller plant species and creating small ponds. The small stands of Blunt-flowered Rush fen along the eastern side of the valley appeared more heavily disturbed and were in poorer condition.

Actively managed drainage features were very localised and appeared to have little impact on extant fen habitats. In some areas, the motocross track acted as a drain, e.g. along the boundary of Busheyclose Spinney. The ditch through the fen south of the pond is shown on the Ordnance Survey 25 inch to the mile map series (surveyed 1880; National Library of Scotland, 2022), so any fen that may have existed on its eastern side is unlikely to have been lost recently.

Historic satellite imagery (available through Google Earth Pro) suggests that the pond in the centre of the main valley was created after 2018 by enlarging a track that crossed the stream through a smaller area of standing water. This would have reduced the extent of fen there.

4.1.2 Other habitats

Grassland surveyed was not diverse enough to qualify as priority habitat, although there were populations of a small number of indicator species of grassland priority habitat types across the site. The veteran trees scattered across the grassland are irreplaceable habitat features of great nature conservation value.

Willow dominated woodland qualifies as wet woodland priority habitat, of which there was a total of 1.89 ha, mostly along the northern half of the main valley. Based on the size of trees and structure of the vegetation, most of this tree cover, which is largely dominated by Grey Willow, appeared to be of recent origin, probably 30-40 years old. Aerial photography from

c.1945 shows trees only along the course of the valley's main stream, not the wider valley bottom.

Two boundary hedgerows included within the survey area also qualify as priority habitat. Some stands of scattered scrub within the site are likely remnants of former hedgerows.

Finally, some of the standing waterbodies could qualify as ponds priority habitat but further survey would be needed to determine this (e.g. if they supported Common Toad (*Bufo bufo*) or important plant and invertebrate assemblages).

4.2 Comparison with Wheeler's survey

Wheeler's survey (Wheeler, 1997) provides a baseline against which the results of the present surveyed can be compared.

Wheeler did not estimate the extent of fen at Nash Fen, as he did for some other North Buckinghamshire sites. Wheeler seems to have covered much of the same ground as the present survey, referring to the extensive area of soligenous fen in the valley head west of Busheyclose Spinney, and along both sides of the valley. He also refers to an area of calcareous grassland at Ordnance Survey grid reference SP 794 338, presumably that found south of the pond (actually within the grid square SP 793 338), and describes much of the main valley bottom as rank Lesser Pond-sedge dominated fen. His description makes no reference to scrub, which therefore was presumably limited, and remarks on the minor impact of drainage and motocross on fen habitats. From his description, therefore, the extent and condition of the different types of fen across the site appear comparable across the two surveys.

The present survey recorded 43 principal fen species and four rare fen species, while Wheeler recorded 28 principal fen species and two rare fen species[4]. Two of Wheeler's principal fen species were not recorded, Marsh Arrowgrass (*Triglochin palustris*) and Marsh Willowherb (*Epilobium palustre*). Marsh Arrowgrass is listed as Near Threatened in England. Wheeler found this species in a quadrat he recorded in 'seepage slope at S end of complex, below Busheyclose Spinney'. As a small plant, it could have been present but overlooked during the present survey in the rank vegetation in this area. Wheeler found Marsh Willowherb in a quadrat in a 'linear strip of fen meadow along the contour of the shoulder of the valley'; again, it could have been overlooked in the rank vegetation here.

The present survey recorded 16 principal fen species and two rare fen species which Wheeler did not. The principal fen species included Brown Sedge, Common Sedge, Common Spotted-orchid and Greater Tussock Sedge; the rare fen species were Bristle Club-rush and Distant Sedge. Most of these species were rare within the site and could have been overlooked by Wheeler, though his survey appears to have covered all the areas where these species were found (see above).

The total number of principal and rare fen species recorded by the present survey is greater than any other sites Wheeler recorded in North Buckinghamshire – the highest total he recorded was 37, from Drayton Parslow Fen. Only one of Wheeler's sites had more than four rare fen species, Longwick Bog. However, given the number of sites to cover, it is likely that Wheeler's spent much less time at each site than the present survey of Nash Fen, so that comparison with his species totals may not be reliable.

[4] In his ranking of sites, Wheeler gives the total as 31 'wetland species', so he may have been using a different list of principal fen species, or there is an error in the report.

4.3 Habitat restoration and management recommendations

The main factor influencing the condition of fen habitats across Nash Fen is the level of grazing and other disturbance regulating the production of plant biomass. Other factors such as drainage and disturbance from motocross appear to have a much more limited impact on the site, and motocross appears to be largely neutral or positive in its impact. It is difficult to assess the impact of historic drainage as there were few visible drainage features; however, the fen south of the pond may once have been more extensive before the construction of the ditch there.

Grazing, mowing etc. is an important regulating factor in wetland ecosystems as it reduces the growth of larger, competitive plants, preventing them from dominating the vegetation, and removing nutrients from the ecosystem, allowing smaller uncompetitive species to thrive. At Nash Fen, more competitive plants include Blunt-flowered Rush, Lesser Pond-sedge and tree species, while smaller species include most of those of greater conservation value, such as Distant Sedge, Marsh Arrowgrass, Marsh Valerian and Ragged-Robin.

The ideal management of fen habitats would be by light extensive grazing by cattle (McBride *et al.*, 2011), using traditional breeds such as Belted Galloway or Dexter. While the current level of grazing appears to be sufficient to maintain its botanical interest, the structure of the fen vegetation is very uniform due to under-grazing and populations of most fen species of greater conservation value are small. There is also little botanical value in the surrounding grassland, at least in part likely because of under-grazing. Grazing by animals better suited to the site and its nature conservation interest would create a more diverse vegetation structure, enabling a wider range of plants and animals to thrive.

Habitat enhancement interventions by the North Buckinghamshire Freshwater Resilience project should target the wetland features of greatest value, i.e. soligenous fen characterised by Blunt-flowered Rush. Most of this vegetation is concentrated along the west side of the valley, mostly in the valley head west of Busheyclose Spinney. As the largest extent of this habitat and as a self-contained area of the site, this valley head area would be the most suitable place to target interventions. The small, scattered stands along the east side of the valley would be difficult to manage individually, positive responses in vegetation condition would likely be limited and would make a minor contribution to the condition of the whole site.

Finally, management interventions need to be long-term if they are to be successful. Sporadic management may be damaging, e.g. one-off mowing of rank Blunt-flowered Rush dominated fen may facilitate colonisation by willow trees, accelerating the loss of open fen habitat.

Based on the above, to proceed with habitat enhancements at Nash Fen, it is recommended that the project:

- discuss the value of the site with the landowner, areas where it is currently declining or failing to achieve good condition, and the options for remedying this;
- discuss grazing by cattle with the landowner and potential graziers, explaining its objectives and benefits for wildlife; and
- formalise agreed management areas, methods, objectives and timescales in a site management plan.

An initial target could be to bring the valley head west of Busheyclose Spinney together with some of the surrounding grassland into management within 1-2 years, with the whole area grazed appropriately each year by a grazier over an agreement period of 5-10 years.

Once agreed, the project can look to secure funds for the infrastructure needed to support management, e.g. watering and fences, and any other work to support this e.g. cutting rank vegetation to provide attractive forage for grazing animals.

5 Conclusion

This report has presented the results of a survey of Nash Fen in to record its botanical diversity, vegetation and habitats.

The survey found a total of 220 plant species, including 67 wetland plants and nine species of conservation concern. These included a new population of Distant Sedge, a scarce plant in Buckinghamshire, and fen species such as Blunt-flowered Rush, Marsh Valerian and Ragged-Robin.

Extensive areas of fen habitat were recorded across the site, in low-lying valley bottom areas and areas of groundwater seepage. A total area of 2.84 ha of lowland fen priority habitat was recorded, including approximately 1 ha of Blunt-flowered Rush dominated fen, an uncommon type of fen found around springs and seepages. Nash Fen supports the largest concentration of this type of fen in Buckinghamshire and is the only site known from the North Buckinghamshire Freshwater Resilience project area.

Although areas of fen habitat did not appear to be declining in condition, the survey found that the main factor influencing the condition of fen habitats across Nash Fen is the intensity of grazing, with all areas of fen under-grazed. Based on the survey findings, to proceed with habitat enhancements at Nash Fen, it is recommended that the project discuss management options with the landowner, explore the potential for grazing, and develop a site management plan.

6 References

Bryant, J.A., Stewart, N.F., Stace, C.A. 2002. A checklist of Characeae of the British Isles. *Watsonia,* vol. 24 pp. 203-208.

BSBI 2012. *VC24 Buckinghamshire Rare Plant Register*. Available at: https://database.bsbi.org/object.php?objectid=2cd4p9h.ech4xr&class=ChecklistInstance (Accessed September 2022)

BSBI 2017. *Rare and scarce taxa - GB 2020*. Available at: https://database.bsbi.org/object.php?objectid=2cd4p9h.vgrtw1&class=ChecklistInstance (Accessed September 2022).

Blockeel, T.L., Hodgetts, N.G., Pilkington, S.L. and Pescott, O.L., 2021. *A Census Catalogue of British and Irish Bryophytes*. British Bryological Society.

Butcher, B., Carey, P., Edmonds, R., Norton, L., Treweek, J. 2020. *The UK Habitat Classification User Manual Version 1.1.* Available at: https://ukhab.org/

Cheffings, C. M., Farrel, L., Dines, T.D., Jones, R.A., Leach, S.J., McKean, D.R., Pearman, D.A., Preston, C.D., Rumsey, F.J., Taylor, I., 2005. The Vascular Plant Red Data List for Great Britain. Species Status 7: 1-116, Peterborough: Joint Nature Conservation Committee.

Fojt, W.J. 1993. Update to Quick Reference to Fens. English Nature Research Report No. 21.

McBride, A., Diack, I., Droy, N., Hamill, B., Jones, P., Schutten, J., Skinner, A., Street, M. 2011. *The Fen Management Handbook*. Scottish Natural Heritage, Perth.

National Library of Scotland 2022. *Ordnance Survey Maps - 25 inch England and Wales, 1841-1952*. Available at: https://maps.nls.uk/os/25inch-england-and-wales/buckinghamshire.html

Rodwell, J.S. 2006. *National Vegetation Classification: Users' handbook.* Joint Nature Conservation Committee, Peterborough.

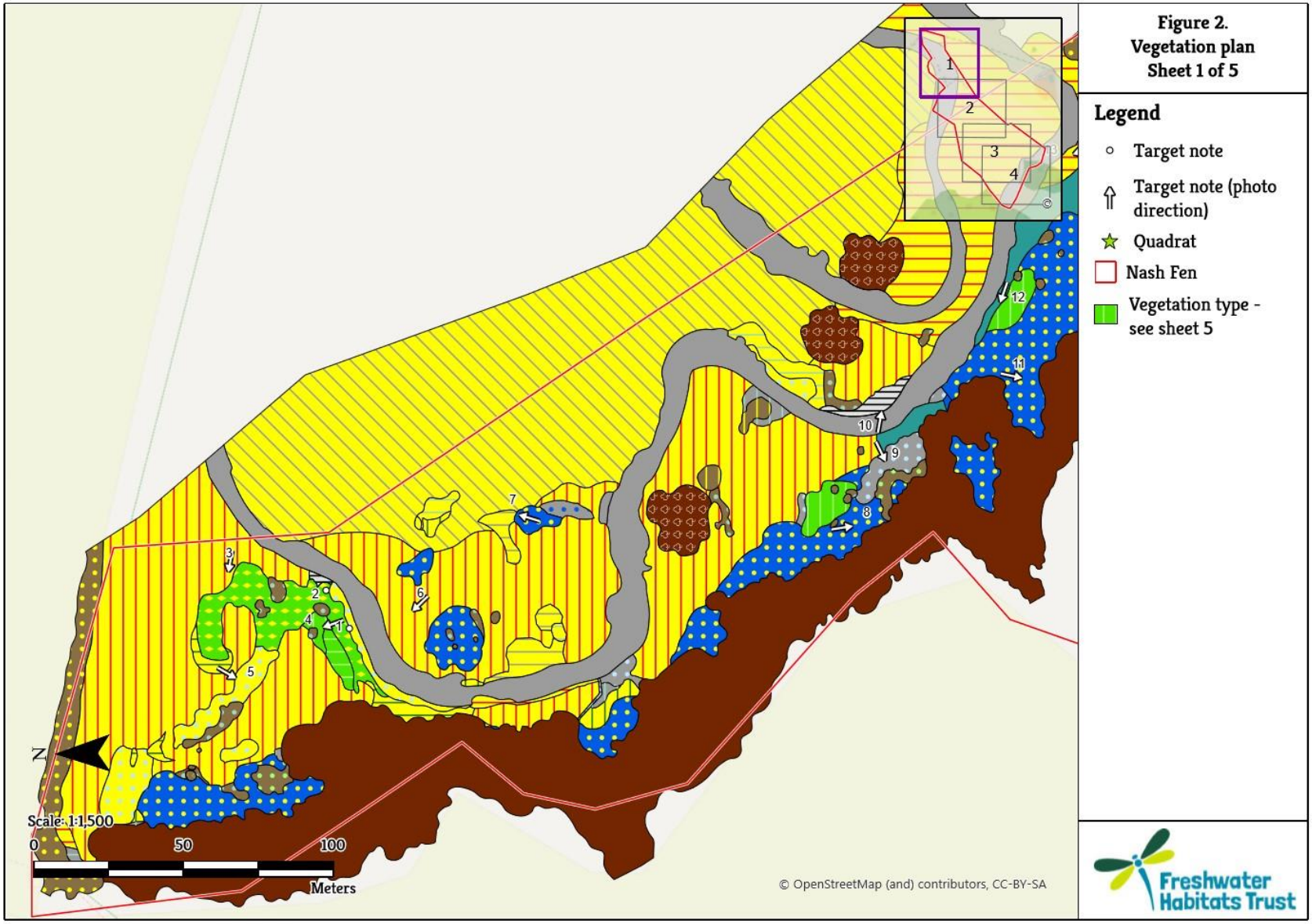
Stace, C.A. 2019. *A New Flora of the British Isles*. 3rd edition. Cambridge University Press, Cambridge.

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

Wheeler, B.D. 1980. Plant Communities of Rich-Fen Systems in England and Wales: III. Fen Meadow, Fen Grassland and Fen Woodland Communities, and Contact Communities. *Journal of Ecology*, vol. 68, no. 3, pp. 761-788.

Wheeler, B.B. 1997. Valleyhead Fens in North Buckinghamshire. A Comparative Survey 1996. Report to English Nature Thames and Chilterns Team.

Appendix 1 Vegetation and habitat plans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Legend
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Target note (photo direction)
Quadrat
Nash Fen
Vegetation type - see sheet 5
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Meters
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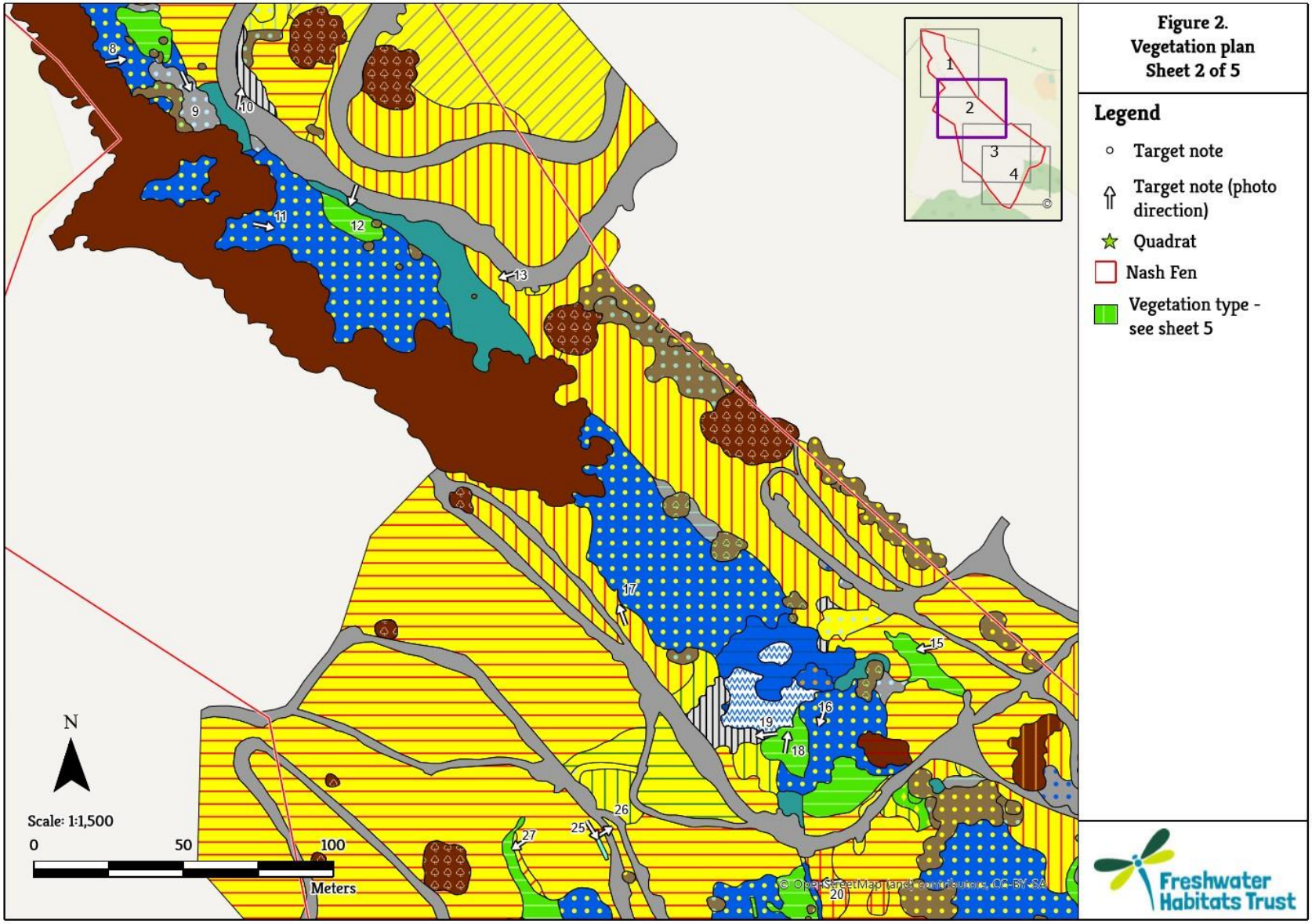
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Sheet 2 of 5
Legend
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Target note (photo direction)
Quadrat
Nash Fen
Vegetation type - see sheet 5
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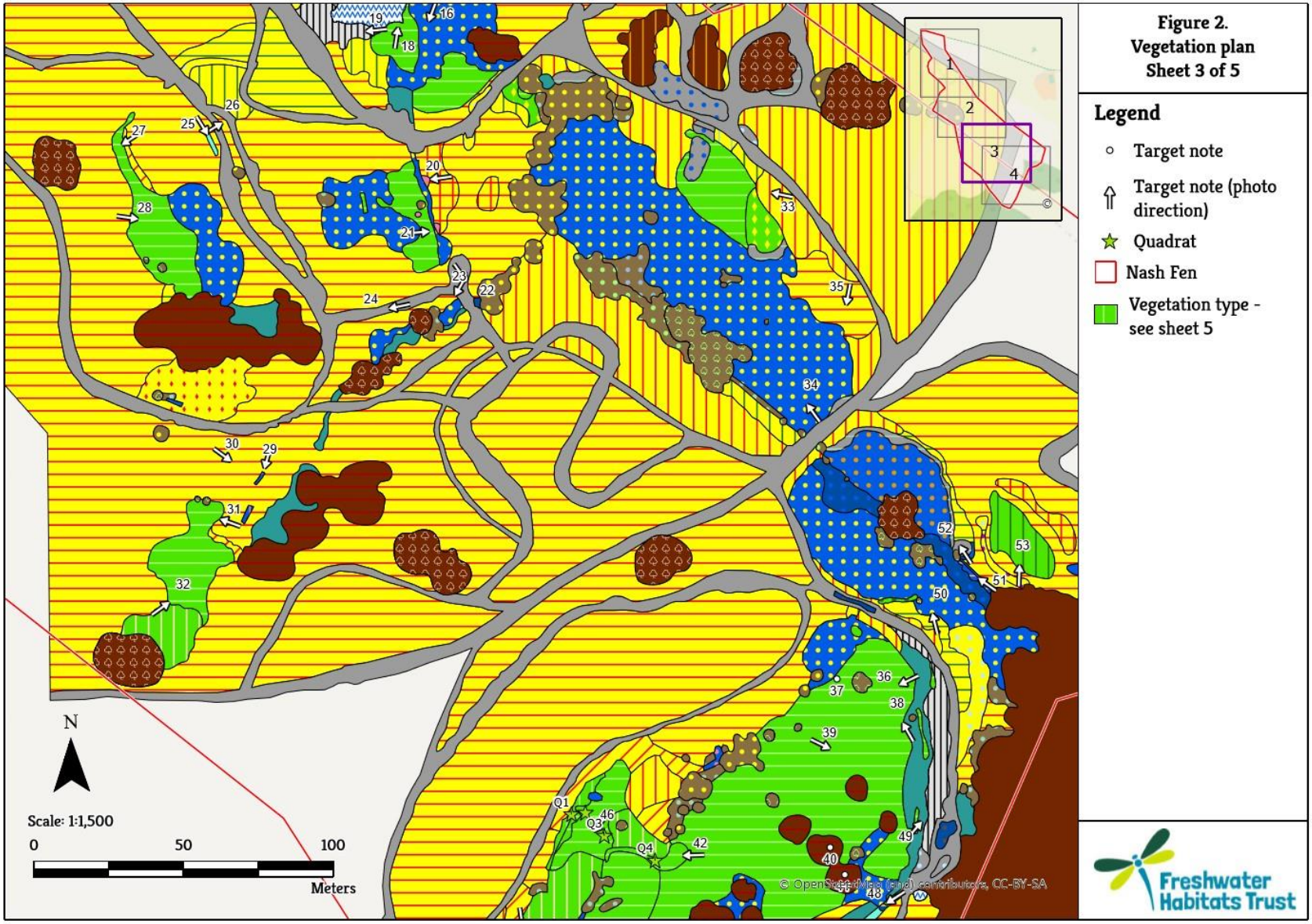
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Vegetation plan
Sheet 3 of 5
Legend
Target note
Target note (photo direction)
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Nash Fen
Vegetation type - see sheet 5
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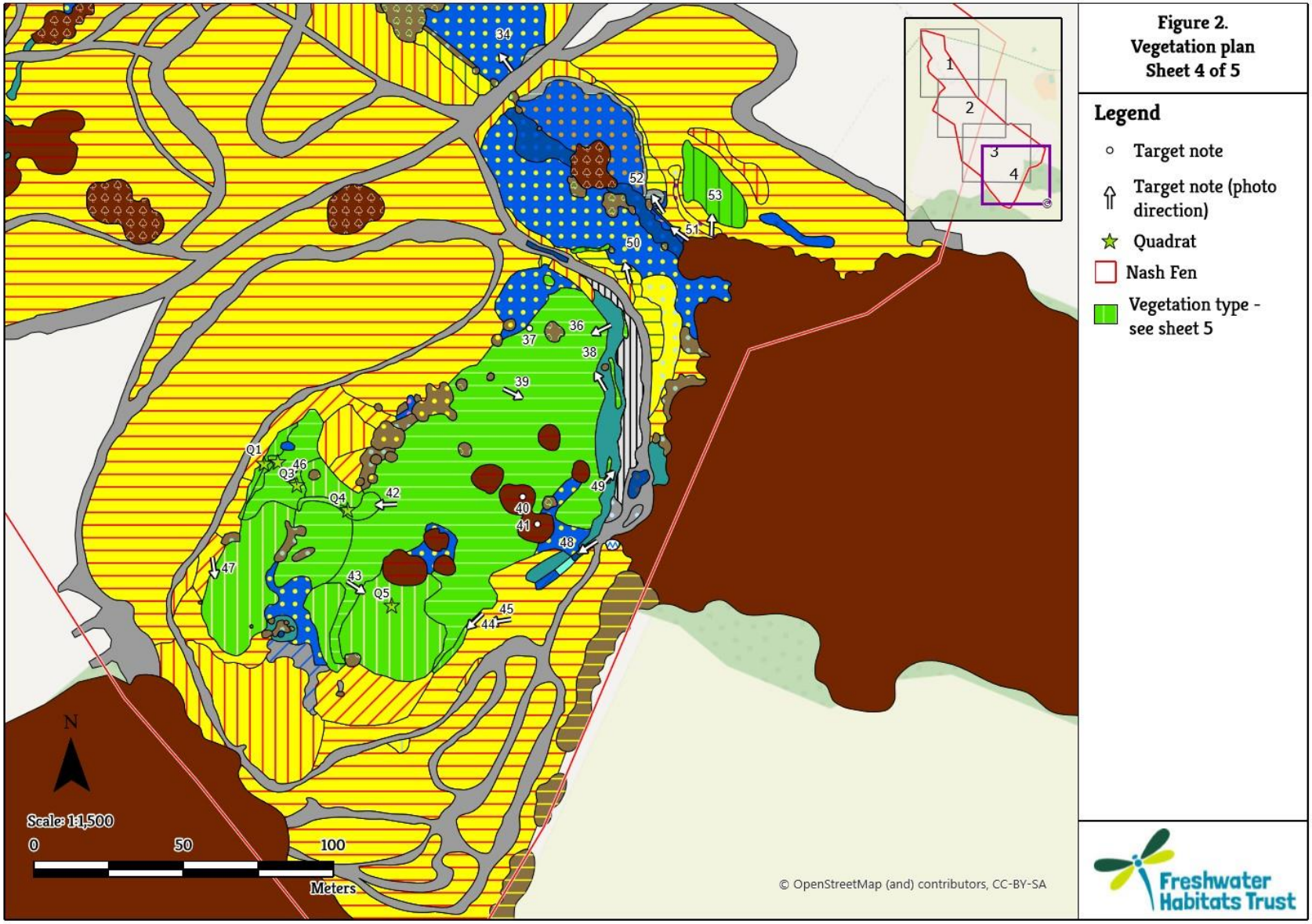
Freshwater Habitats Trust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Vegetation plan
Sheet 4 of 5
Legend
Target note
Target note (photo direction)
Quadrat
Nash Fen
Vegetation type - see sheet 5
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Meters
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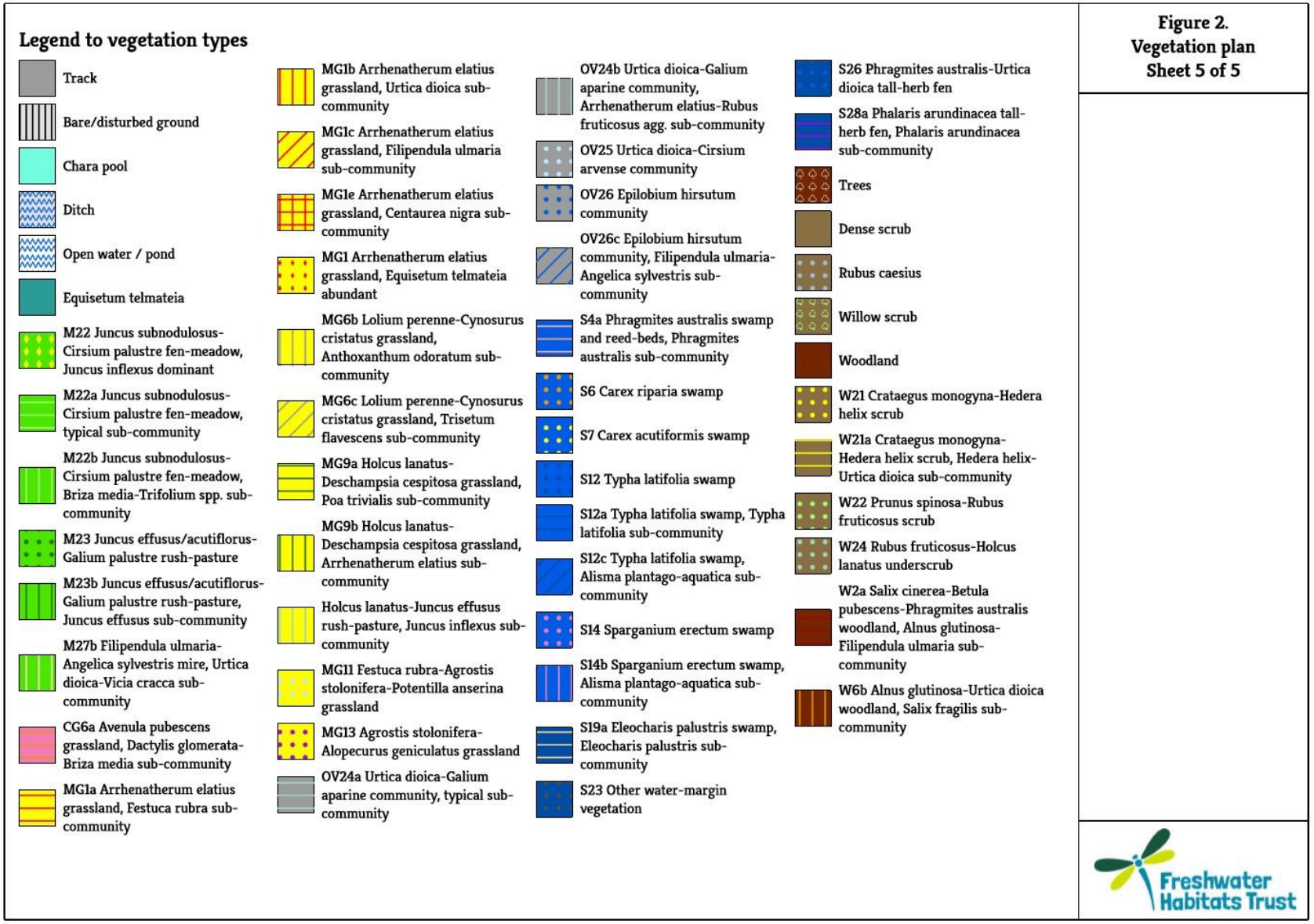
Legend to vegetation types
Track
Bare/disturbed ground
Chara pool
Ditch
Open water / pond
Equisetum telmateia
M22 Juncus subnodulosus-Cirsium palustre fen-meadow, Juncus inflexus dominant
M22a Juncus subnodulosus-Cirsium palustre fen-meadow, typical sub-community
M22b Juncus subnodulosus-Cirsium palustre fen-meadow, Briza media-Trifolium spp. sub-community
M23 Juncus effusus/acutiflorus-Galium palustre rush-pasture
M23b Juncus effusus/acutiflorus-Galium palustre rush-pasture, Juncus effusus sub-community
M27b Filipendula ulmaria-Angelica sylvestris mire, Urtica dioica-Vicia cracca sub-community
CG6a Avenula pubescens grassland, Dactylis glomerata-Briza media sub-community
MG1a Arrhenatherum elatius grassland, Festuca rubra sub-community
MG1b Arrhenatherum elatius grassland, Urtica dioica sub-community
MG1c Arrhenatherum elatius grassland, Filipendula ulmaria sub-community
MG1e Arrhenatherum elatius grassland, Centaurea nigra sub-community
MG1 Arrhenatherum elatius grassland, Equisetum telmateia abundant
MG6b Lolium perenne-Cynosurus cristatus grassland, Anthoxanthum odoratum sub-community
MG6c Lolium perenne-Cynosurus cristatus grassland, Trisetum flavescens sub-community
MG9a Holcus lanatus-Deschampsia cespitosa grassland, Poa trivialis sub-community
MG9b Holcus lanatus-Deschampsia cespitosa grassland, Arrhenatherum elatius sub-community
Holcus lanatus-Juncus effusus rush-pasture, Juncus inflexus sub-community
MG11 Festuca rubra-Agrostis stolonifera-Potentilla anserina grassland
MG13 Agrostis stolonifera-Alopecurus geniculatus grassland
OV24a Urtica dioica-Galium aparine community, typical sub-community
OV24b Urtica dioica-Galium aparine community, Arrhenatherum elatius-Rubus fruticosus agg. sub-community
OV25 Urtica dioica-Cirsium arvense community
OV26 Epilobium hirsutum community
OV26c Epilobium hirsutum community, Filipendula ulmaria-Angelica sylvestris sub-community
S4a Phragmites australis swamp and reed-beds, Phragmites australis sub-community
S6 Carex riparia swamp
S7 Carex acutiformis swamp
S12 Typha latifolia swamp
S12a Typha latifolia swamp, Typha latifolia sub-community
S12c Typha latifolia swamp, Alisma plantago-aquatica sub-community
S14 Sparganium erectum swamp
S14b Sparganium erectum swamp, Alisma plantago-aquatica sub-community
S19a Eleocharis palustris swamp, Eleocharis palustris sub-community
S23 Other water-margin vegetation
S26 Phragmites australis-Urtica dioica tall-herb fen
S28a Phalaris arundinacea tall-herb fen, Phalaris arundinacea sub-community
Trees
Dense scrub
Rubus caesius
Willow scrub
Woodland
W21 Crataegus monogyna-Hedera helix scrub
W21a Crataegus monogyna-Hedera helix scrub, Hedera helix-Urtica dioica sub-community
W22 Prunus spinosa-Rubus fruticosus scrub
W24 Rubus fruticosus-Holcus lanatus underscrub
W2a Salix cinerea-Betula pubescens-Phragmites australis woodland, Alnus glutinosa-Filipendula ulmaria sub-community
W6b Alnus glutinosa-Urtica dioica woodland, Salix fragilis sub-community
Figure 2.
Vegetation plan
Sheet 5 of 5
Freshwater Habitats Trust

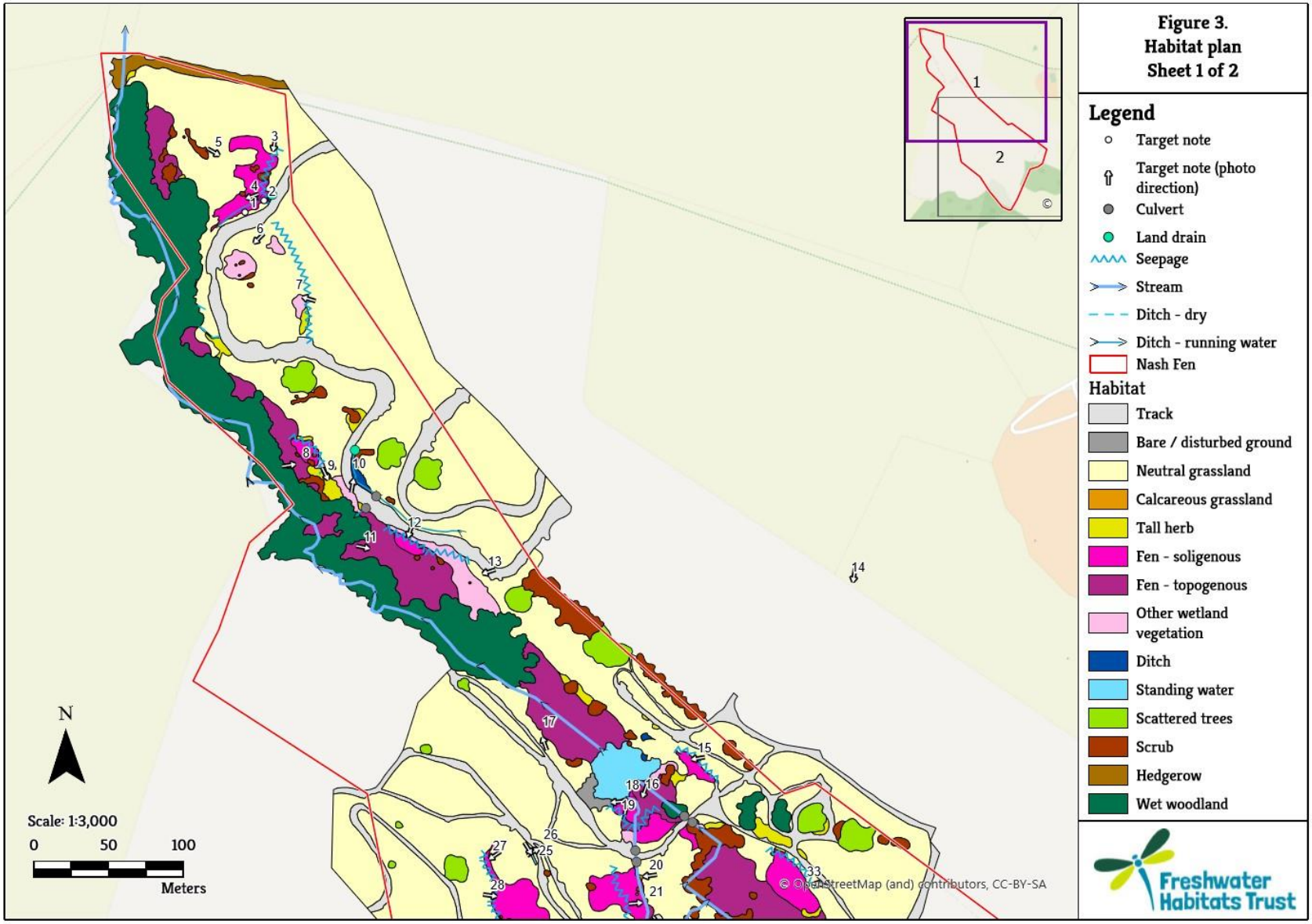
Figure 3.
Habitat plan
Sheet 1 of 2
Legend
Target note
Target note (photo direction)
Culvert
Land drain
Seepage
Stream
Ditch - dry
Ditch - running water
Nash Fen
Habitat
Track
Bare / disturbed ground
Neutral grassland
Calcareous grassland
Tall herb
Fen - soligenous
Fen - topogenous
Other wetland vegetation
Ditch
Standing water
Scattered trees
Scrub
Hedgerow
Wet woodland
N
Scale: 1:3,000
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Meters
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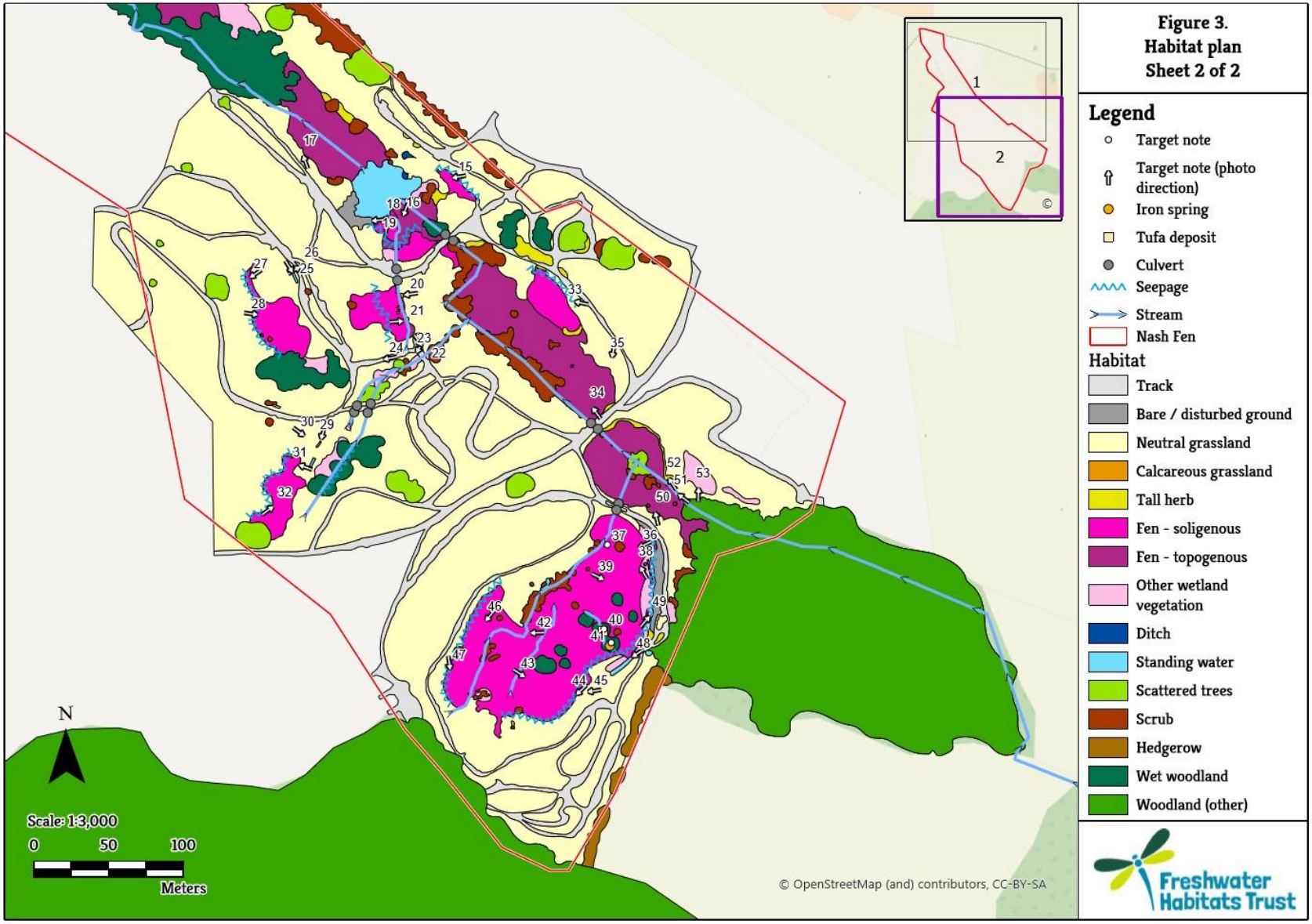
Figure 3.
Habitat plan
Sheet 2 of 2
Legend
Target note
Target note (photo direction)
Iron spring
Tufa deposit
Culvert
Seepage
Stream
Nash Fen
Habitat
Track
Bare / disturbed ground
Neutral grassland
Calcareous grassland
Tall herb
Fen - soligenous
Fen - topogenous
Other wetland vegetation
Ditch
Standing water
Scattered trees
Scrub
Hedgerow
Wet woodland
Woodland (other)
N
Scale: 1:3,000
0 50 100
Meters
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Appendix 2 Plant records

Table A2.1 List of plant species recorded

Scientific name	Common name	Conservation status	Principal (P) / rare (R) fen species	Submerged (S) / Floating (F) / Emergent (E) species
Stoneworts				
Chara vulgaris	Common Stonewort	-	P	S
Liverworts				
Pellia endiviifolia	Endive Pellia	-	R	-
Mosses				
Brachythecium rivulare	River Feathermoss	-	-	-
Brachythecium rutabulum	Rough-stalked Feathermoss	-	-	-
Calliergonella cuspidata	Pointed Spearmoss	-	P	-
Campylium protensum	Dull Starry Feathermoss	-	P *	-
Cratoneuron filicinum	Fern-leaved Hookmoss	-	-	-
Dicranella varia	Variable Forklet-moss	-	-	-
Pseudoscleropodium purum	Neat Feathermoss	-	-	-
Ferns and horsetails				
Dryopteris filix-mas	Male-fern	-	-	-
Equisetum arvense	Field Horsetail	-	-	-
Equisetum fluviatile	Water Horsetail	-	P	E
Equisetum palustre	Marsh Horsetail	-	P	E

* Listed in Fojt (1993) as *Campylium stellatum*, but at the time this report was published this taxon included *C. stellatum* var. *protensum*, which is synonymous with *C. protensum*

Scientific name	Common name	Conservation status	Principal (P) / rare (R) fen species	Submerged (S) / Floating (F) / Emergent (E) species
Equisetum telmateia	Great Horsetail	-	P	E
Flowering plants				
Acer campestre	Field Maple	-	-	-
Achillea millefolium	Yarrow	-	-	-
Agrimonia eupatoria	Agrimony	-	-	-
Agrostis capillaris	Common Bent	-	-	-
Agrostis stolonifera	Creeping Bent	-	-	E
Ajuga reptans	Bugle	-	-	-
Alisma plantago-aquatica	Water-plantain	-	-	E
Alliaria petiolata	Garlic Mustard	-	-	-
Alopecurus geniculatus	Marsh Foxtail	-	-	E
Alopecurus pratensis	Meadow Foxtail	-	-	-
Angelica sylvestris	Wild Angelica	-	P	E
Anisantha sterilis	Barren Brome	-	-	-
Anthoxanthum odoratum	Sweet Vernal-grass	-	-	-
Arctium minus	Lesser Burdock	-	-	-
Arenaria serpyllifolia subsp. *serpyllifolia*	Thyme-leaved Sandwort	-	-	-
Arrhenatherum elatius	False Oat-grass	-	-	-
Artemisia vulgaris	Mugwort	-	-	-
Avenula pubescens	Downy Oat-grass	-	-	-

Scientific name	Common name	Conservation status	Principal (P) / rare (R) fen species	Submerged (S) / Floating (F) / Emergent (E) species
Bellis perennis	Daisy	-	-	-
Brachypodium sylvaticum	False Brome	-	-	-
Briza media	Quaking-grass	England Near Threatened	-	-
Bromus hordeaceus	Soft-brome	-	-	-
Bromus racemosus	Smooth Brome	-	-	-
Callitriche stagnalis	Common Water-starwort	-	-	S
Calystegia sepium	Hedge Bindweed	-	-	-
Capsella bursa-pastoris	Shepherd's-purse	-	-	-
Carduus crispus	Welted Thistle	-	-	-
Carex acutiformis	Lesser Pond-sedge	-	P	E
Carex distans	Distant Sedge	Bucks Scarce	R	E
Carex disticha	Brown Sedge	-	P	E
Carex flacca	Glaucous Sedge	-	-	E
Carex hirta	Hairy Sedge	-	-	-
Carex nigra	Common Sedge	-	P	E
Carex otrubae	False Fox-sedge	-	P	E
Carex panicea	Carnation Sedge	-	P	E
Carex paniculata	Greater Tussock-sedge	-	P	E
Carex pendula	Pendulous Sedge	-	-	E
Carex remota	Remote Sedge	-	-	-

Scientific name	Common name	Conservation status	Principal (P) / rare (R) fen species	Submerged (S) / Floating (F) / Emergent (E) species
Carex riparia	Greater Pond-sedge	-	P	E
Carex spicata	Spiked Sedge	-	-	E
Catabrosa aquatica	Whorl-grass	-	-	E
Centaurea nigra s.l.	A Knapweed	-	-	-
Cerastium fontanum	Common Mouse-ear	-	-	-
Cerastium glomeratum	Sticky Mouse-ear	-	-	-
Chelidonium majus	Greater Celandine	-	-	-
Cirsium acaule	Dwarf Thistle	-	-	-
Cirsium arvense	Creeping Thistle	-	-	-
Cirsium palustre	Marsh Thistle	-	P	E
Cirsium vulgare	Spear Thistle	-	-	-
Conopodium majus	Pignut	-	-	-
Convolvulus arvensis	Field Bindweed	-	-	-
Cornus sanguinea	Dogwood	-	-	-
Corylus avellana	Hazel	-	-	-
Crataegus monogyna	Hawthorn	-	-	-
Crepis capillaris	Smooth Hawk's-beard	-	-	-
Cynosurus cristatus	Crested Dog's-tail	-	-	-
Dactylis glomerata	Cock's-foot	-	-	-
Dactylorhiza fuchsii	Common Spotted-orchid	-	P	E

Scientific name	Common name	Conservation status	Principal (P) / rare (R) fen species	Submerged (S) / Floating (F) / Emergent (E) species
Deschampsia cespitosa	Tufted Hair-grass	-	-	E
Dipsacus fullonum	Teasel	-	-	-
Eleocharis palustris	Common Spike-rush	-	P	E
Elytrigia repens	Common Couch	-	-	-
Epilobium hirsutum	Great Willowherb	-	P	E
Epilobium obscurum	Short-fruited Willowherb	-	P	E
Epilobium parviflorum	Hoary Willowherb	-	P	E
Ervum tetraspermum	Smooth Tare	-	-	-
Eupatorium cannabinum	Hemp-agrimony	-	P	E
Euphorbia helioscopia	Sun Spurge	-	-	-
Festuca rubra	Red Fescue	-	-	-
Filipendula ulmaria	Meadowsweet	-	P	E
Fraxinus excelsior	Ash	-	-	-
Galega officinalis	Goat's-rue	-	-	-
Galium album	Hedge Bedstraw	-	-	-
Galium aparine	Cleavers	-	-	-
Galium palustre	Marsh-bedstraw	-	P	E
Galium uliginosum	Fen Bedstraw	-	P	E
Galium verum	Lady's Bedstraw	-	-	-
Geranium dissectum	Cut-leaved Crane's-bill	-	-	-

Scientific name	Common name	Conservation status	Principal (P) / rare (R) fen species	Submerged (S) / Floating (F) / Emergent (E) species
Geranium endresii x versicolor = G. x oxonianum	Druce's Cranesbill	-	-	-
Geranium pyrenaicum	Hedgerow Crane's-bill	-	-	-
Geranium robertianum	Herb-Robert	-	-	-
Glechoma hederacea	Ground-ivy	-	-	-
Glyceria declinata	Small Sweet-grass	-	-	E
Glyceria notata	Plicate Sweet-grass	-	P	E
Gnaphalium uliginosum	Marsh Cudweed	-	-	E
Hedera helix	Ivy	-	-	-
Helminthotheca echioides	Bristly Oxtongue	-	-	-
Helosciadium nodiflorum	Fool's-water-cress	-	-	-
Heracleum sphondylium	Hogweed	-	-	-
Holcus lanatus	Yorkshire-fog	-	-	-
Hordeum secalinum	Meadow Barley	-	-	-
Hypericum perforatum	Perforate St John's-wort	-	-	-
Hypericum tetrapterum	Square-stalked St John's-wort	-	P	E
Hypochaeris radicata	Cat's-ear	-	-	-
Isolepis setacea	Bristle Club-rush	-	R	E
Jacobaea erucifolius	Hoary Ragwort	-	-	-
Jacobaea vulgaris	Common Ragwort	-	-	-
Juncus acutiflorus	Sharp-flowered Rush	-	P	E

Scientific name	Common name	Conservation status	Principal (P) / rare (R) fen species	Submerged (S) / Floating (F) / Emergent (E) species
Juncus articulatus	Jointed Rush	-	P	E
Juncus bufonius	Toad Rush	-	-	E
Juncus conglomeratus	Compact Rush	-	-	E
Juncus effusus	Soft-rush	-	P	E
Juncus inflexus	Hard Rush	-	-	E
Juncus subnodulosus	Blunt-flowered Rush	-	R	E
Knautia arvensis	Field Scabious	England Near Threatened	-	-
Lathyrus nissolia	Grass Vetchling	-	-	-
Lathyrus pratensis	Meadow Vetchling	-	-	-
Leontodon hispidus	Rough Hawkbit	-	-	-
Leontodon saxatilis	Lesser Hawkbit	-	-	-
Lepidium coronopus	Swine-cress	-	-	-
Leucanthemum vulgare	Oxeye Daisy	-	-	-
Linum catharticum	Fairy Flax	-	-	-
Lolium perenne	Perennial Rye-grass	-	-	-
Lotus corniculatus	Common Bird's-foot-trefoil	-	-	-
Lotus pedunculatus	Greater Bird's-foot-trefoil	-	P	E
Luzula campestris	Field Wood-rush	-	-	-
Lysimachia arvensis	Scarlet Pimpernel	-	-	-
Lysimachia nummularia	Creeping-Jenny	-	-	E

Scientific name	Common name	Conservation status	Principal (P) / rare (R) fen species	Submerged (S) / Floating (F) / Emergent (E) species
Lythrum salicaria	Purple-loosestrife	-	P	E
Malva sylvestris	Common Mallow	-	-	-
Matricaria discoidea	Pineappleweed	-	-	-
Medicago lupulina	Black Medick	-	-	-
Mentha aquatica	Water Mint	-	P	E
Mentha arvensis	Corn Mint	England Near Threatened	-	-
Mercurialis perennis	Dog's Mercury	-	-	-
Myosotis arvensis	Field Forget-me-not	-	-	-
Myosotis discolor	Changing Forget-me-not	-	-	-
Myosotis laxa	Tufted Forget-me-not	-	P	E
Nasturtium officinale	Water-cress	-	-	E
Odontites vernus	Red Bartsia	-	-	-
Ophrys apifera	Bee Orchid	-	-	-
Pastinaca sativa	Parsnip species	-	-	-
Persicaria amphibia	Amphibious Bistort	-	-	F
Persicaria hydropiper	Water-pepper	-	-	E
Persicaria maculosa	Redshank	-	-	-
Phalaris arundinacea	Reed Canary-grass	-	P	E
Phleum bertolonii	Smaller Cat's-tail	-	-	-
Phragmites australis	Common Reed	-	P	E

Scientific name	Common name	Conservation status	Principal (P) / rare (R) fen species	Submerged (S) / Floating (F) / Emergent (E) species
Plantago lanceolata	Ribwort Plantain	-	-	-
Plantago major	Greater Plantain	-	-	-
Poa compressa	Flattened Meadow-grass	-	-	-
Poa humilis	Spreading Meadow-grass	-	-	-
Poa trivialis	Rough Meadow-grass	-	-	-
Polygonum aviculare	Knotgrass	-	-	-
Populus nigra subsp. *betulifolia*	Black-poplar	-	-	-
Potentilla anserina	Silverweed	-	-	-
Potentilla erecta	Tormentil	England Near Threatened	-	E
Potentilla erecta x reptans = P. x mixta	Hybrid Cinquefoil	-	-	-
Potentilla reptans	Creeping Cinquefoil	-	-	-
Prunella vulgaris	Selfheal	-	-	-
Prunus domestica subsp. *insititia*	Bullace	-	-	-
Prunus spinosa	Blackthorn	-	-	-
Pulicaria dysenterica	Common Fleabane	-	P	E
Quercus robur	Pedunculate Oak	-	-	-
Ranunculus acris	Meadow Buttercup	-	-	-
Ranunculus repens	Creeping Buttercup	-	-	-
Reseda luteola	Weld	-	-	-
Rhinanthus minor	Yellow-rattle	-	-	-

Scientific name	Common name	Conservation status	Principal (P) / rare (R) fen species	Submerged (S) / Floating (F) / Emergent (E) species
Rosa arvensis	Field-rose	-	-	-
Rosa canina agg.	A Dog-rose	-	-	-
Rosa squarrosa	Glandular Dog-rose	-	-	-
Rosa squarrosa x tomentella	A Dog-rose hybrid	-	-	-
Rubus caesius	Dewberry	-	-	-
Rubus fruticosus agg.	Bramble	-	-	-
Rumex acetosa	Common Sorrel	-	-	-
Rumex obtusifolius	Broad-leaved Dock	-	-	-
Salix alba	White Willow	-	-	-
Salix caprea	Goat Willow	-	-	-
Salix cinerea	Grey Willow	-	P	-
Salix fragilis	Crack-willow	-	-	-
Schedonorus arundinaceus	Tall Fescue	-	-	-
Schedonorus giganteus	Giant Fescue	-	-	-
Schoenoplectus tabernaemontani	Grey Club-rush	Bucks Rare	-	E
Scorzoneroides autumnalis	Autumn Hawkbit	-	-	-
Scrophularia auriculata	Water Figwort	-	P	E
Scutellaria galericulata	Skullcap	-	P	E
Sherardia arvensis	Field Madder	-	-	-
Silene flos-cuculi	Ragged-Robin	England Near Threatened	P	E

Scientific name	Common name	Conservation status	Principal (P) / rare (R) fen species	Submerged (S) / Floating (F) / Emergent (E) species
Sisymbrium officinale	Hedge Mustard	-	-	-
Solanum dulcamara	Bittersweet	-	-	E
Sonchus arvensis	Perennial Sow-thistle	-	-	-
Sonchus asper	Prickly Sow-thistle	-	-	-
Sparganium erectum	Branched Bur-reed	-	P	E
Stachys sylvatica	Hedge Woundwort	-	-	-
Stellaria graminea	Lesser Stitchwort	-	-	-
Tamus communis	Black Bryony	-	-	-
Taraxacum agg.	A Dandelion	-	-	-
Torilis japonica	Upright Hedge-parsley	-	-	-
Tragopogon pratensis	Goat's-beard	-	-	-
Trifolium dubium	Lesser Trefoil	-	-	-
Trifolium pratense	Red Clover	-	-	-
Trifolium repens	White Clover	-	-	-
Trisetum flavescens	Yellow Oat-grass	-	-	-
Tussilago farfara	Colt's-foot	-	-	-
Typha latifolia	Bulrush	-	P	E
Ulmus procera	English Elm	-	-	-
Urtica dioica	Common Nettle	-	-	-
Valeriana dioica	Marsh Valerian	England Near Threatened	P	E

Scientific name	Common name	Conservation status	Principal (P) / rare (R) fen species	Submerged (S) / Floating (F) / Emergent (E) species
Valeriana officinalis	Common Valerian	England Near Threatened	-	E
Veronica arvensis	Wall Speedwell	-	-	-
Veronica beccabunga	Brooklime	-	-	E
Veronica chamaedrys	Germander Speedwell	-	-	-
Viburnum lantana	Wayfaring-tree	-	-	-
Vicia cracca	Tufted Vetch	-	-	-
Vicia sativa subsp. *segetalis*	Common Vetch	-	-	-
Zannichellia palustris	Horned Pondweed	-	-	S

Table A2.2 Records of notable plant species

Scientific name	Common name	Grid reference	Notes
Avenula pubescens	Downy Oat-grass	SP 79312 33810	Area of more diverse grassland with calcareous grassland indicator species
Briza media	Quaking-grass	SP 79312 33810	Short open vegetation in former track
Briza media	Quaking-grass	SP 79304 33794	Area of more diverse grassland with calcareous grassland indicator species
Carex distans	Distant Sedge	SP 79312 33810	Abundant in area of fen disturbed by motor cross
Carex disticha	Brown Sedge	SP 79312 33810	-

Scientific name	Common name	Grid reference	Notes
Carex nigra	Common Sedge	SP 79304 33794	Dense patch within M22a in hollow below break in slope
Carex panicea	Carnation Sedge	SP 79235 33692	In richer fen and grassland at top of slope
Carex paniculata	Greater Tussock-sedge	SP 79222 33772	Several tussocks in small area of fen near drain
Catabrosa aquatica	Whorl-grass	SP 79362 33610	Scattered along wet parts of track
Catabrosa aquatica	Whorl-grass	SP 79057 34257	In pool collecting land drainage
Catabrosa aquatica	Whorl-grass	SP 79373 33489	Along track
Cirsium acaule	Dwarf Thistle	SP 79356 33599	Area of more diverse grassland with calcareous grassland indicator species
Conopodium majus	Pignut	SP 79305 33787	A few plants along edge of track in area of richer grassland
Glyceria declinata	Small Sweet-grass	SP 79471 33571	-
Isolepis setacea	Bristle Club-rush	SP 79458 33558	North-east end of rut
Knautia arvensis	Field Scabious	SP 79312 33810	-
Leontodon hispidus	Rough Hawkbit	SP 79352 33595	-
Mentha arvensis	Corn Mint	SP 79508 33680	-
Potentilla erecta	Tormentil	SP 79312 33810	In richer grassland at edge of fen
Potentilla erecta x reptans = P. x mixta	Hybrid Cinquefoil	SP 79312 33810	Here and scattered along this valley slope to south
Rhinanthus minor	Yellow-rattle	SP 78987 34346	One plant on track
Valeriana dioica	Marsh Valerian	SP 79356 33596	-
Valeriana dioica	Marsh Valerian	SP 79394 33624	-
Valeriana dioica	Marsh Valerian	SP 79476 33656	-

Scientific name	Common name	Grid reference	Notes
Valeriana dioica	Marsh Valerian	SP 79299 33778	-
Valeriana dioica	Marsh Valerian	SP 79234 33697	-
Valeriana officinalis	Common Valerian	SP 79362 33610	-
Valeriana officinalis	Common Valerian	SP 79471 33600	
Valeriana officinalis	Common Valerian	SP 79305 33787	

Table A2.3 Quadrat results – metadata

Quadrat no.	Grid reference	Vegetation type	Height (cm)	Litter (%)	Note
1	SP 79357 33593	M22b	60	5	Contact community at top of slope at interface between M22a in old catch drain (?) and MG1a above
2	79362 33594	M22a	70	60	Vegetation in linear depression along top of slope - old catch drain?
3	79368 33586	M22a	80	60	Drier grassier vegetation in zone below quadrat 2
4	79385 33578	M22a	80	30	Swampy ferruginous ground in flow track at base of slope
5	79400 33546	M27b	80	10	Drier slope on east side of valley

Table A2.4 Quadrat results – plants recorded

	Quadrat number / Domin				
Scientific name	**1**	**2**	**3**	**4**	**5**
Achillea millefolium	2	-	-	-	-
Agrostis stolonifera	1	-	-	-	-
Ajuga reptans	-	-	-	-	2
Angelica sylvestris	-	-	2	-	-
Anthoxanthum odoratum	3	-	-	-	-
Arrhenatherum elatius	1	-	1	-	1
Brachythecium rivulare	-	-	-	2	-
Brachythecium rutabulum	1	-	-	-	-
Calliergonella cuspidata	1	-	-	1	-
Carex acutiformis	-	-	3	3	-
Carex flacca	4	-	-	-	-
Carex hirta	1	2	-	-	-
Carex panicea	1	-	-	-	-
Cerastium fontanum	1	-	-	-	-
Cirsium arvense	-	-	-	-	3
Cirsium palustre	4	1	1	-	-
Dactylis glomerata	1	-	1	-	-
Dactylorhiza fuchsii	1	-	1	-	-
Deschampsia cespitosa	1	-	-	-	1
Dipsacus fullonum	-	-	-	-	1
Epilobium hirsutum	-	-	-	1	-
Epilobium parviflorum	-	3	-	1	-
Equisetum palustre	1	1	-	1	1
Festuca rubra	4	-	4	-	-
Filipendula ulmaria	-	1	1	4	4
Galium aparine	-	-	-	-	1
Galium palustre	-	-	-	1	-
Galium uliginosum	1	1	1	-	-
Glyceria sp.	-	-	-	1	-
Holcus lanatus	3	-	1	-	1
Hypericum tetrapterum	1	-	-	-	-
Juncus acutiflorus	3	4	-	-	-
Juncus inflexus	1	1	-	1	-
Juncus subnodulosus	-	1	4	4	-
Lathyrus pratensis	3	1	1	-	1
Lotus corniculatus	1	-	-	-	-

	Quadrat number / Domin				
Scientific name	**1**	**2**	**3**	**4**	**5**
Lotus pedunculatus	4	4	1	1	-
Luzula campestris	1	-	-	-	-
Lysimachia nummularia	-	1	1	-	-
Mentha aquatica	1	1	-	1	4
Myosotis laxa	-	-	1	-	-
Plantago lanceolata	2	-	-	-	-
Poa trivialis	1	1	4	-	1
Potentilla anserina	-	1	-	-	-
Potentilla erecta	4	-	-	-	-
Potentilla reptans	-	4	-	-	-
Prunella vulgaris	1	-	-	-	-
Rumex acetosa	-	-	1	-	-
Schedonorus arundinaceus	4	1	-	-	-
Scrophularia auriculata	-	-	-	1	-
Silene flos-cuculi	-	-	-	1	-
Stachys sylvatica	-	-	-	-	1
Veronica chamaedrys	1	-	-	-	-
Vicia cracca	-	-	-	-	1

Appendix 3 Target notes

Table A3.5 List of plant species recorded

Target note no.	Description	Photograph(s)
1	Motorcross track cuts across seepage zone. Seepage visible through track. A ditch to the north of the track drains the seepage area, with vegetation dominated by *Juncus inflexus* with abundant *Lotus pedunculatus* and *Calliergonella*. Flow looks constant, and ground at bottom of slope where drain discharges into vegetation is open, wet and muddy. Seepage zone appears to extend around hillside to north and south, but to the south looks effected by drainage as wetland vegetation comprised of stands of *Carex acutiformis* over dry ground.	 

Target note no.	Description	Photograph(s)
2	Recently excavated depression at break in slope collecting drainage water from track. Blue plastic land drain under track to east discharges into it. Overflow runs into drains by track. Open loose sandy substrate with small gravels. Sparsely vegetated with a tuft of *Catabrosa aquatic.* Small plant of the invasive non-native *Galega officinalis* growing on bank.	 

Target note no.	Description	Photograph(s)
3	Rank *Juncus inflexus* dominated fen, marking furthest north extent of seepage zone. Some small scattered patches of *J. subnodulosus* within this. *Cirsium palustre* frequent.	

Target note no.	Description	Photograph(s)
4	Appears to be former trackway, with short open vegetation comprised of wetland and grassland species, including *Carex flacca*, *Cirsium palustre*, *Lotus pedunculatus*, *Galium uliginosum* and scattered *Juncus subnodulosus*. Vegetation above here very rank rush-dominated fen, with *Juncus subnodulosus* giving way to *J. inflexus* further up slope. Scattered stands of *Rubus*.	 

Target note no.	Description	Photograph(s)
5	Former trackway with short open grassland, similar to old track to south but lacking *Juncus subnodulosus*. *Linum catharticum* occasional.	
6	Clonal stand of *Carex acutiformis* toward bottom of slope. Taken with scattered smaller stands higher up the slope, these may represent relicts of fen vegetation from drained seepage face.	

Target note no.	Description	Photograph(s)
7	Stand of *Carex acutiformis* along break in slope above valley bottom. Species-poor, over dry ground. Intermittent seepage presumed, seepage face perhaps drained.	
8	Very rank species-poor fen in trough-like valley bottom, dominated by *Carex acutiformis*. Soligenous zone around top of trough indicated by stand of *Juncus subnodulosus* below break in slope. The latter is quite rank and being invaded by *Cirsium arvense* and *Galium aparine*, but relatively diverse, with *Angelica sylvestris*, *Carex acutiformis*, *Dactylorhiza fuchsii*, *Eupatorium cannabinum*, *Filipendula ulmaria*, *Galium album*, *G. uliginosum*, *Mentha aquatica*, *Lotus pedunculatus*, *Scutellaria galericulata* and *Vicia cracca*.	

Target note no.	Description	Photograph(s)
9	Area of valley bottom marked with fence posts, perhaps site of some kind of excavation work. Vegetation ruderal, overgrown with tangled mat of *Galium aparine*, with abundant *Cirsium arvense*, and abundant tall herb fen species *Eupatorium cannabinum*, *Mentha aquatica* and *Scrophularia auriculata*.	
10	Ditch and land drain draining area where track crosses seepage zone on midslope	

Target note no.	Description	Photograph(s)
11	Very rank species-poor fen in valley bottom, dominated by *Carex acutiformis* and *Equisetum telmateia*, with abundant *Galium aparine* and frequent *Eupatorium cannabinum*.	
12	Very rank fen in valley bottom. Zone below track dominated by *Equisetum telmateia* with abundant *Juncus subnodulosus*. Not typical M22a, suggesting impact of drainage.	

Target note no.	Description	Photograph(s)
13	Extensive zone of tall herb fen dominated by *Equisetum telmateia*, with few other species present.	
14	View over middle of valley, with western-most seepage system visible on middle of opposite slope	

Target note no.	Description	Photograph(s)
15	Zone of seepage above valley bottom, with *Juncus inflexus* dominating at top of track due to disturbance, with abundant *Juncus subnodulosus* in lower part.	
16	Rank tall herb fen along stream draining into pond, dominated by zones of *Equisetum telmateia* and *Carex acutiformis*. Around where stream discharges into pond is a very open zone of disturbed soligenous fen with abundant *Juncus subnodulosus*, *Equisetum telmateia*, *Mentha aquatica*, *Juncus inflexus*, *Equisetum palustre*.	

Target note no.	Description	Photograph(s)
17	Extensive stand of rank species-poor Carex acutiformis dominated fen in valley bottom	
18	Fen and open water transition, with emergent stands of *Typha latifolia* and *Carex riparia*. Open water with abundant *Callitriche stagnalis* and *Zannichellia palustris*.	

Target note no.	Description	Photograph(s)
19	Trackway running down to splash. Sparsely vegetated, with mix of fen and ephemeral species. Abundant bryophytes, including *Cratoneuron filicinum* and *Calliergonella cuspidatum*.	
20	Small stand of calcareous grassland on east bank of ditch, clearly demarcated from surrounding rank *Arrhenatherum* sward, with shorter more open vegetation with *Leontodon hispidus*, *Cirsium acaule* and *Briza media*. NVC affinities of vegetation unclear.	

Target note no.	Description	Photograph(s)
21	Six tussocks of *Carex paniculata* in rank soligenous fen near west bank of ditch	
22	Wet muddy area where motocross track crosses stream, with stands of dense *Glyceria notata*.	

Target note no.	Description	Photograph(s)
23	Stream with clear running water, overgrown with rank fen vegetation dominated by *Carex acutiformis* and *Equisetum telmateia*	
24	One of numerous mature Black Poplar (*Populus nigra* subsp. *betulifolia*) trees around valley sides and along main stream.	

Target note no.	Description	Photograph(s)
25	Deep splash next to motocross track with standing water. Water clear, presumably groundwater seepage, with abundant submerged *Chara vulgaris*.	
26	View of valley around pond	

Target note no.	Description	Photograph(s)
27	Disturbed area of fen where former motorcross track cuts through seepage zone. Very wet ground, with small area of standing water, dominated by *Juncus subnodulosus*.	
28	Top of seepage face dominated by rank fen vegetation, with zonation of *Juncus subnodulosus* fen extending along contour, and more restricted zone of *Carex acutiformis* downslope.	

Target note no.	Description	Photograph(s)
29	Small ponds in ruts or splashes of old motocross track in bottom of valley	
30	Seepage line indicated by zone of Equisetum telmateia below willow trees. Possibly drained by ditch along top of slope. Valley bottom below is dry grassland.	

Target note no.	Description	Photograph(s)
31	Rut through rank but relatively diverse *Juncus subnodulosus* fen at head of small valley, with *Carex distans*, *Dactylorhiza fuchsii* and *Valeriana dioica*. Rut with standing water, dominated by *J. subnodulosus*, with *Sparganium* and other emergent vegetation.	
32	Small area of rank *Juncus subnodulosus* fen below break in slope, above zone of *Carex acutiformis* fen in valley bottom.	

Target note no.	Description	Photograph(s)
33	Valley head with rank rush-dominated and tall herb fen. Uppermost zone dominated by *Carex acutiformis*, *Filipendula ulmaria* and *Juncus inflexus*, with *Epilobium hirsutum* becoming abundant to south. Lower part dominated by *Juncus subnodulosus*.	
34	Valley bottom along stream, dominated by extensive stand of *Carex acutiformis*, with scattered *Phragmites australis* along stream.	

Target note no.	Description	Photograph(s)
35	View upstream into valley head supporting extensive fen with scattered willow trees.	
36	Valley head with extensive fen covering valley slopes and bottom, mostly comprised of *Juncus subnodulosus*. Very rank and disturbed along edge of motocross track.	

Target note no.	Description	Photograph(s)
37	Fen vegetation becoming coarser toward lower part of valley head, with abundant *Equisetum telmateia* and *Carex acutiformis* around outflow.	
38	View across lower part of valley head, toward main valley	

Target note no.	Description	Photograph(s)
39	Extensive seepage face, dominated by *Juncus subnodulosus* fen.	
40	Tufa concretion under sprawling willow, along small stream draining off spring above	

Target note no.	Description	Photograph(s)
41	Springhead under spreading willow tree, with ferruginous pool	
42	Upper reach of stream draining valley head area. Looks like a natural channel, situated at foot of seepage slope to west and has the look of a natural flow track, being vegetated with *Juncus subnodulosus*. Ill-defined topographically but vegetation distinctly marked from surroundings, with wet, slightly buoyant surface. Ground ferruginous in places.	

Target note no.	Description	Photograph(s)
43	Seepage face on eastern slope of valley head, dominated by tall herb fen of *Filipendula ulmaria*, *Arrhenatherum* elatius and *Juncus acutiflorus*. Seepage collects into ill-defined flow track at foot of slope, dominated by *J. subnodulosus*.	
44	Species-rich grassland / fen contact vegetation along very marked break in slope at top of seepage face. Comprised of coarse grasses such as *Anthoxanthum odoratum*, *Arrhenatherum elatius*, *Dactylis glomerata* and *Festuca rubra*, with elements of neutral grassland such as *Carex hirta*, *Lysimachia nummularia*, *Plantago lanceolata*, *Luzula campestris*, *Rumex acetosa*, *Stellaria graminea*, *Dactylorhiza fuchsii* and *Carex flacca*, with fen species such as *Juncus subnodulosus*, *Cirsium palustre*, *J. inflexus*, *Silene flos-cuculi*, *Lotus pedunculatus*, *Galium uliginosum* and *Filipendula ulmaria*. The zonation of vegetation on the opposite side of the valley mirrors that here.	

Target note no.	Description	Photograph(s)
45	View across upper part of valley head, with rank grassland, tall herb fen and scattered scrub	
46	View along top of seepage slope, with grassland / fen contact vegetation along break in slope (target note 41).	

Target note no.	Description	Photograph(s)
47	Tall herb fen extending across zone of weaker seepage at upper end of valley head, dominated by *Filipendula ulmaria* with abundant *Arrhenatherum elatius* and *Carex acutiformis*, and frequent *Juncus acutiflorus* and *J. inflexus*.	
48	Splash of motorcross track, with standing water, presumed the local groundwater level. Standing water with dense bed of *Chara vulgaris*. Zoning of vegetation around water, with open stand of *Juncus subnodulosus* at highest eastern end, and emergent *Typha latifolia* in deep water at southern end. *Equisetum telmateia* dominant on northern bank, looks like on a spoil heap from excavation of feature.	

Target note no.	Description	Photograph(s)
49	Wet area of motorcross track where it crosses seepage zone. Muddy ground with stands of Glyceria notata and ephemeral species. Groundwater visibly discharging within track and running down its course. *Catabrosa aquatica* is scattered in this area, and ruts with standing water hold *Zannichellia palustris*.	
50	Rank fen vegetation dominated by *Carex acutiformis* in bottom of main valley.	

Target note no.	Description	Photograph(s)
51	Tall herb fen with *Phragmites australis* along stream	
52	Extensive stand of *Carex riparia*	

Target note no.	Description	Photograph(s)
53	Seasonally flooded depression with species-poor *Juncus effusus* dominated vegetation