Abbey Fishponds Local Nature Reserve

Site Management Plan 2021-2026

Prepared on behalf of Vale of White Horse District Council

by Earth Trust

Contents

Appendices

All appendices are available as separate documents that can be found by emailing the Earth Trust at admin@earthtrust.org.uk Documents are also available as hard copies on request.

1. Introduction

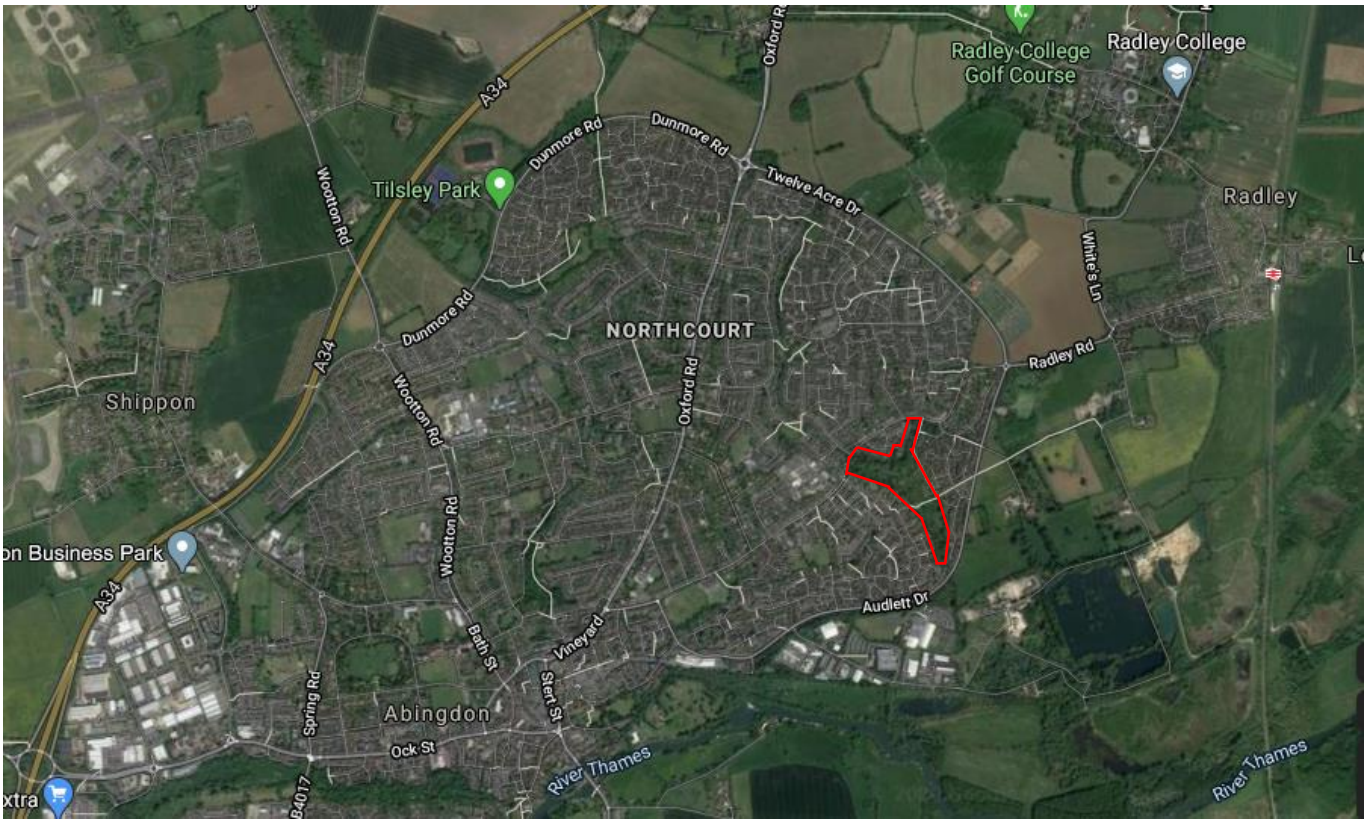
This is the sixth version of the Abbey Fishponds Management Plan now covering the period 2021-2026. This management plan follows five earlier plans (the first four written by the Berkshire, Buckinghamshire and Oxfordshire Wildlife Trust; BBOWT), where the management of the site has evolved through the development of those plans. The aim of this management plan is to set out a framework for the management and use of Abbey Fishponds Local Nature Reserve, over the next five years. It takes into account all of the available information regarding the reserve and attempts to strike a balance between what is desirable and what is achievable within the various restrictions, such as natural e.g. the Radley Brook runs through the reserve and the surrounding land is part of the book's floodplain; and designation as a Local Nature Reserve and Local Wildlife Site, as well as available resources. It will be under continual yearly review during the period of the plan as a dynamic document and has been adapted over the past 20 years. Success will be measured against the management activities with site surveys, ecological monitoring and a review of the completion of the work plan. It will try to strike a balance between what is desirable and what is able to be achieved with the limited budget and volunteer resources available. Additional funding may be required in order to complete some of the works.

The site is an urban fringe wetland reserve, to the eastern edge of Abingdon. It is completely surrounded by housing, with the Radley Brook running through the middle of it. The plan sets out how the Earth Trust will manage Abbey Fishpond Local Nature Reserve, on behalf of the Vale of White Horse District Council (VWHDC), for the benefit of wildlife and people. Detailed annual work programmes have been drawn up based on the recommendations contained in this document (see section 8). The plan will allow operational staff to understand and follow the management and monitoring activities for the site and for stakeholders to understand the management of the site and rational behind it. It also seeks to highlight the importance of community involvement on the site and its contribution to future plans. The structure of the plan is such that the plan should be a working document that is easy to use and refer to.

1.1. Executive summary

Reserve Name:	Abbey Fishponds Local Nature Reserve
OS Grid Reference:	SU 511 980
Total size:	7ha (~17ac)
District:	Vale of White Horse
County:	Oxfordshire
Current Status:	Open Access Local Nature Reserve (designated in 2010 by Natural England) and Local Wildlife Site (designated in 2016 by TVERC)

Map 1. Abbey Fishponds Local Nature Reserve in its landscape context



Owner:	The Estate of Mr William Patrick Rolleston Docker-Drysdale of Wick Hall, Abingdon, Oxon (deceased).
Local Planning Authority:	Vale of White Horse District Council (VWHDC)
District Council contact:	Edward Church, Senior Countryside Officer; Planning, 135 Eastern Avenue, Milton Park, Milton, OX14 4SB Email: planning@southandvale.gov.uk
Works/vehicle access:	Through vehicle gate off Radley Road, SU 509 980

Site context

Abbey Fishponds Local Nature Reserve is an urban fringe wetland reserve comprising of fen, reedbed, ponds, tall-herb, grassland, secondary woodland and scrub within an area of archaeological interest. It is bordered on all sides by housing, with gardens adjoining the nature reserve for most of its boundary. Tarmac paths form the boundary of the site to the south-west and north-east. The far northern tips of the site are bounded by the Radley Road. The reserve itself consists of a shallow valley running north-west to south-east, bisected by the Radley Brook (also called Radley Park Ditch) and crossed by a large medieval earthwork, known locally as Daisybank.

Management constraints

Local Nature Reserve (LNR) designation is a statutory declaration arising out of the 1949 National Parks and Access to the Countryside Act. Under this statutory designation the Council have the

responsibility to manage Abbey Fishponds LNR both for nature conservation and public access objectives. The purpose of the designation was to safeguard, maintain and enhance the ecological interest, and at the same time ensure continued public enjoyment and involvement in the reserve.

2. General description

2.1. Location and Site Boundaries

Abbey Fishponds LNR is located 1 mile from the centre of Abingdon, towards the East of town. Radley road entrance nearest postcode OX14 3YN or SU 509 980, Hadland road entrance nearest postcode OX14 3XW or SU 511 979, Audlett drive entrance SU 513 977 and Eason drive SU 512 979.

2.2. Tenure

The Vale of White Horse District Council (VWHDC) has previously leased the land from the owner, the estate of Mr William Patrick Rolleston Docker-Drysdale of Wick Hall (Abingdon), in order to fulfil their requirements for green space provision within the district. The lease has now ended, but VWHDC has not formally surrendered the lease and will, for the time being, assume responsibility for the management of the land.

2.3. Management/Organisational Infrastructure

As the site lease holder, VWHDC (comprising Councillors and Officers) is the budget-holder and ultimate decision-maker for the site. Within VWHDC the Property Team has overall responsibility for the management of the reserve. The Senior Countryside Officer provides advice and support where necessary.

VWHDC employ the Earth Trust to manage Abbey Fishponds. The period of the initial agreement was for three years from 1st July 2014, ending on the 30th June 2017. Since then we have entered into a rolling three month agreement, which runs from January to March, April to June, July to September and October to December of each year. The contract between Earth Trust and the Council is due to be reviewed at a date yet to be determined.

The Earth Trust employ a Warden within its Land Management Team who has responsibility for the management of Abbey Fishponds LNR including undertaking all aspects of site management contained in this plan.

The warden and the Council have six monthly review meetings to review progress against an agreed set of targets and there is regular communication over all aspects of site management between the Trust and Council. The warden's duties include regular site checks, organisation of voluntary work, employment of contractors and undertaking the majority of management tasks.

2.4. Resources

In order to effectively implement the objectives and actions identified in this plan sufficient resources are required. The massive contribution of the local community in the management of the site through

various forms of volunteering cannot be overstated in its importance and the maintenance of good community relations is key to ensuring the effective long-term management of the site. In addition to these staff and voluntary resources the Council has and continues to invest significantly in the development of the site.

2.5. Associated Groups

Abingdon Green Gym
Abingdon Green Gym are a small community volunteer conservation affiliated with, but run independently of TCV (The Conservation Volunteers) and work at sites around Abingdon. They run sessions weekly on Saturday's from 9:30 till 1pm, and work at Abbey Fishponds once a quarter on average.

2.6. Environmental Information

Soils
Hartford-Kelmscott complex, silty or loamy over peat, gley soil limited by waster wetness. The underlying geology is Kimmeridge Clay. This is overlaid by sand and silt. The reserve is gently sloping to the south-east. (For more information see geological solid and drift maps sheets 253).

Climate
Abbey Fishponds LNR is located in the Thames Basin, which is characterised by a continental climate with high summer temperatures and little wind exposure. Frost occurs on an average of less than 80 days per year. Mean monthly minimum temperatures of around -1°C occur in February. Mean monthly maximum temperatures of around 24-26°C occur in July.

Hydrology
A heavily modified and channelled stream, called Radley Brook or Radley Park Ditch (source just above Radley College) crosses the reserve longitudinally from north-west to south-east, bisecting a mediaeval embankment running from south-west to north-east. The stream from the north has limited flow and it is probable that the level of water in the streams has decreased significantly due to canalisation, which has increased the rate of flow and consequent drainage. The stream is classed as main river and any works will need consent from the Environment Agency.

Ecology
The site has been surveyed by ecologists from the local area, BBOWT, Thames Valley Environmental Records Centre (TVERC) and the Earth Trust over the period of the previous plans. A species list collated from these surveys is included in Appendix 1. The ecological surveys undertaken on site have not been exhaustive but give a good understanding of the nature conservation status of the site, and allow informed decisions to be taken in the management plan. A key part of the monitoring over the coming years will be to undertake regular surveys to build up a comprehensive species list for the site, so that changes brought about by the actions in this plan can be assessed.

Flora

The reserve was first surveyed in 1977, since this time a few surveys have been undertaken on the site combined with casual observations. The variety of habitats includes unimproved neural grassland, tall herb, scrub/willow carr, broadleaved semi-natural woodland, lowland fen, reedbed, and ponds.

There good range of wetland plants on the site typical of lowland fen communities. These include ragged-robin *(Lychnis flos-cuculi)*, watermint *(Mentha aquatic)*, meadowsweet *(Filipendula ulmaria)*, greater pond-sedge *(Carex riparia)*, blunt-flowered rush *(Juncus subnodulosus)*, fen bedstraw *(Galium uliginosum)*, reed sweet-grass *(Glyceria maxima)*, greater bird's-foot-trefoil *(Lotus pedunculatus)*, great willowherb *(Epilobium hirsutum)*, marsh bedstraw *(Galium palustre)*, marsh thistle *(Cirsium palustre)*, hemp-agrimony *(Eupatorium cannabinum)*, wild angelica *(Angelica sylvestris)*, and lesser water-parsnip. There are also records (pre 2003) for marsh valerian *(Valeriana dioica)*, marsh marigold *(Caltha palustris)*, carnation sedge *(Carex panacea)* and long-stalked yellow-sedge *(Carex lepidocarpa)*. There are older records (pre 1985) for species that are less common in Oxfordshire including devil's-bit scabious *(Succisa pratensis)*, and purple moor-grass *(Molinia caerulea)*.

There are also some species typical of unimproved grassland - brown sedge *(Carex brunnescens)*, meadow vetchling *(Lathyrus pratensis)*, common knapweed *(Centaurea nigra)*, lady's bedstraw *(Galium verum)* and oxeye daisy *(Leucanthemum vulgare)*, with previous records for cuckooflower *(Cardamine pratensis)* (1996-8) and common spotted-orchid *(Dactylorhiza fuchsia)* (1985). There are also previous records for species typical of unimproved calcareous grassland - downy oat-grass *(Avenula pubescens)* (1998), spiny restharrow *(Ononis spinosa)* (1985), hoary plantain *(Plantago media)* (1996-8) and cowslip *(Primula veris)* (1985).

During the first botanical surveys (c.1977) and a substantial number of orchids were recorded on the site within the fen areas including southern marsh *(Dactylorhiza praetermissa*) ~500-1000 plants; occasional common spotted x southern marsh *(D.fuchsii* x *praetermissa*) and narrow-leaved marsh *(Dactylorhiza traunsteineri)* in 2 locations each comprising about 10-20 plants each. A survey in 1985 discovered no orchids at all, they had disappeared completely from this site, but were seen once more in 2002. Since then, they have continued to increase by a small fraction in number, although are only within compartment 2 rather than being within compartments 1, 2 and 4 (their previous extent in 1977).

There is a small amount of the Oxfordshire Rare Plant Register species, lesser calamint *(Calamintha nepeta),* in a drier area of grassland towards the centre of the site known as Daisybank. These were first recorded in 1977, again in 1985 and 2015 along with other with interesting calcicoles including vervain *(Verbena officialis)*, hoary plantain, wild clary *(Salvia horminoides)*, field mouse-ear *(Cerastium arvense)* and spiny restharrow.

Fauna

Reptiles and amphibians

Casual observations have been made including common frog *(Rana temporia)* and common toad *(Bufo bufo)*, which have been recorded in various locations across the site. Common newts have also been positively recorded. It is though that it is likely grass snakes *(Natrix natrix)* are also present although they have not yet been positively recorded.

Birds

Periodic bird recording has taken place on site, supplemented by additional records from the site warden, volunteers and others showing the site is rich in bird life with the mosaic of varied habitats boosting the range of bird species, including species such as water rail *(Rallus aquaticus)* reed bunting *(Emberiza schoeniclus)* UK conservation status amber and song thrush *(Turdus philomelos)* UK conservation status red; a summary of the findings is included in Appendix 1. A number of bird boxes were installed in the 1990s to provide additional breeding sites for birds, but sadly these were all vandalised.

Mammals

Two species of bat have been recorded using the site; common pipistrelle *(Pipestrellus pipestrellus)*, and soprano pipistrelle *(Pipestrellus pygmaeus)*. All species of bat are protected under both British and European legislation. It is likely that other species use the site. Further recording will be needed to determine the status of bats on the site and to identify any roosting sites.

A number of other mammalian species have been recorded including woodmouse *(Apodemus sylvaticus),* muntjac deer *(Muntiacus reevesi),* grey squirrel *(Sciurus carolinensis)* and fox *(Vulpes vulpes).* Badgers *(Meles meles)* are known to use the site with one setts known to be on site.

Water vole

During baseline surveys conducted by the Water Vole Recovery Project (run by the BBOWT) between 1998 and 2001 a water vole colony was identified inhabiting Radley Brook in Abingdon. In 2001 the site was designated a Local Key Area for water voles *(Arvicola amphibious)*. Following reported sightings of water voles on the River Thames and Pumney Ditch, a large scale survey of the Abingdon area was undertaken. Water vole records specifically for Abbey Fishponds began in 2000; a survey carried out at Abbey Fishponds as part of the Water Vole Recovery Project states that:

'Water vole burrows were found throughout the central portion, though few active signs were recorded. River bank vegetation is managed well for water vole with wide bands of bramble and nettle fringing the stream at the lower end and sedges adjacent to the stream in the upper half. Some parts are shaded by hedges and brambles. The stream is shallower than is ideal for water voles, which may suffer increased levels of predation as a result. However, the urban context of the site may also deter mink from breeding in the area. It is likely that the water vole population is regularly augmented by animals dispersing from downstream. This is likely to be compromised if management downstream is inappropriate. It is recommended that mink are monitored for'.

In 2004, water voles were recorded along the Radley Brook upstream of Abbey Fishponds. However, immediately north of the nature reserve the habitat is of poor quality and there are no records from this stretch of the water course. To the south of the site the streamside habitat is of reasonable quality and past surveys have found populations of water voles in the ditches near the Thames. It is possible that there is connectivity between the water voles at Abbey Fishponds and those approx. 1km downstream.

A water vole survey along Radley Brook is carried out by BBOWT every 3 years. Following advice from the Water Vole Recovery Project habitat enhancements along the brook have been implemented

during winter months over the duration of the last management plan; knocking back scrub, coppicing or pollarding trees in sections along the brook to let in more light to reach the channel and banks. The most recent water vole surveys found:

- 2017; 8 burrows, 9 latrines and 2 feeding signs (includes grazing signs as well as piles of ripped vegetation) and 1 water vole.
- 2020; 31 burrows, 3 latrines and 16 feeding signs.

Fish

Sticklebacks including the three-spined stickleback have been recorded in the Radley Brook as it runs through the site. There have also been several reports of bullhead in the Radley Brook on site. The bullhead is a relatively adaptable species with a wide distribution in a range of flowing and still waters; however its habitat preferences appear to be quite distinct. Natural gravel-bed streams with appropriate channel structure (e.g. riffle and pool sequences), wooded riparian zones or open chalk streams with abundant macrophytes, offering shade and refuges from predation and flow, lacking obstructions and containing native, un-manipulated populations of fish and crayfish represent ideal habitat.

Invertebrates

Periodic invertebrate recording has taken place on site, supplemented by additional records from the site warden, volunteers; invertebrate findings are included in Appendix 1. A butterfly transect was introduced in 2016, which has since been added to the UK Butterfly Monitoring Scheme (UKBMS) and is undertaken by the warden and volunteers who are located very close to Abbey Fishponds.

2.7. Past management

BBOWT contacted the owner (Docker-Drysdale) in December 1979 to explore the possibility of the site becoming a nature reserve, but it was not until November 1989 the site was opened as a nature reserve. It was leased from owner by the VWHDC, with a 25 year management agreement between VWHDC and BBOWT running until December 2014. By this time the site was surrounded by housing and suffering from a lack of grazing, drying out and the issues that affect urban nature reserves. Sadly during this time the population of southern marsh orchids had declined from over 500 spikes in 1979 to 17 in 1989. An undated document (possibly from the 1980's) within BBOWT's files describes Abbey Fishponds as follows:

"The lush water-meadows sustain many moisture loving plants such as kingcups, milkmaid and a colony of marsh orchids. It is rich in bird life including the water-rail and is the habitat of a rare crested newt. Until recently the whole area was farmland and Daisy Banks provided excellent grazing… It is also a popular picnic spot with its grassy banks covered with daisies and tree shaded paths. The death of the elms along the western boundary has impoverished the scenic value of the site and it has become overgrown and semi-derelict since grazing animals were removed. Contractors have encroached on the west side with illegal dumping of soil and rubble … Considerable damage has also been caused to remaining trees and hedges by local children and serious erosion caused to the west bank by using it as a BMX cycle track."

In 1991 a dam was constructed in the reedbed and the pond behind this dam was dug out by London BTCV in 1993 (BBOWT 1994). The Vale of White Horse Conservation Volunteers re-dug the pond in

compartment 1 in 1994, mowed part of the wet meadow and undertook the start of the reed cutting and bramble coppicing rotation programmes in 1994. They also did 50m of 'dead hedging' (branches arranged to form a barrier) to screen the reedbed from the public footpath to protect the nesting birds from disturbance by passers-by and their dogs. The wet meadow was then reseeded with a wild grass mix (BBOWT 1999).

The main focus of the management from 1994 to 2014 had been to maintain and enhance the mosaic of the fen, reedbed and wet meadow. This was achieved through an annual cut of the meadow, rotational cutting of the reedbed and fen, clearance of encroaching willow and pulling of Himalayan balsam. Three new ponds were dug; in 2004 in compartment 5 and 2006 in compartments 1 and 5. In 2003 the public path was moved from the top of the Daisybank to the side to reduce erosion to the archaeology (BBOWT 2010). In the past, there have been less desirable activities such as motorcycle scrambling on the site although this has not been the case recently.

In 2015 the management agreement changed to Earth Trust. Since taking over the habitat management of the reserve the focus has continued to be to maintain and enhance the mosaic of habitats on the site.

2.8. Map Coverage

The reserve is covered by OS Landranger (1:50 000) no. 164 (Oxford) and OS Explorer (1:25 000) no. 170 (Vale of White Horse)

2.9. Compartments

Map 2 - Abbey Fishponds LNR, compartments

Compartments

- Cpt 1 Grassland/tallherb/scrub mosaic
- Cpt 2a Calcareous fen
- Cpt 2b Reedbed
- Cpt 3 Wet woodland/ reedbed
- Cpt 4 Calcareous fen
- Cpt 5 Grassland/tall herb/ scrub mosaic
- Cpt 6 Daisybank
- Wildflower area
- Radley Brook Ditch

3. People, Stakeholders and Local Community

3.1. Local Communities & Stakeholders

The reserve is well used by residents of Abingdon as well as many visitors to the local town. The reserve is also heavily used by dog walkers in particular, throughout the year.

3.2. Access

The site is open to the public and it is not possible to close the site to those on foot. There are currently four official access points to the site. These are at the entrance/exits of Radley Road and Audlett Drive with pedestrian kissing gates in place between which a permissive path runs north to south through the western side of the reserve. A public footpath runs east to west through the reserve, with non-gated entrances from Hadland Road and Eason Drive. Vehicular access for site management and maintenance is from Radley Road, through a field gate. It is possible to drive the length of the site. The Radley Road kissing gate is intentionally small in order to deter motorbikes.

Dogs are currently allowed on the reserve if kept under control/on a lead. The primary recreational uses of the reserve are for walking, dog walking, and running which do not generally conflict with the interests of the reserve management. Public rights of way exist around the exterior of the reserve. As the reserve is heavily used it is important that the public access routes and facilities are properly maintained. Since the site was designated as a Local Nature Reserve a considerable amount of work has been undertaken to increase the access provision. The Vale have installed a bridge (recently repaired in 2019) across the Radley Brook, and mow along the footpaths through the reserve during the summer months.

3.3. Interpretation Provision

Interpretation on the reserve is a very important means of communication to keep the local community informed about interest on the reserve and to keep them updated on any work being carried out. There is a lockable notice board (originally installed by BBOWT) where temporary notices and posters can be displayed. This gives information on the site, as well as upcoming events on the reserve or at other Earth Trust sites. For more information relating to interpretation please see section 4.5 Visitor enjoyment and public access. There are also four A4 Earth Trust 'Welcome to Abbey Fishponds' signs at the entrances.

3.4. Education Use

Since its acquisition the site has been used on an irregular basis for education purposes. There have been occasions when school groups up to University students have undertaken field visits to the site as part of wider projects. Other groups have also used the reserve including the local guides, scouts and beavers, which have carried out bug hunting and bat walks.

Earth Trust has just launched its new Strategy covering 2018-2023 and as part of this process we are currently reviewing and rewriting our Engagement Strategy, which includes outdoor education on the Community Reserves, including Abbey Fishponds. When this is available it will be available as an appendix.

4. Conservation Features of Interest

In defining the overall features of interest and their management objectives for the site it is important to look at a number of factors:

- Nature conservation interest
- Public interest in and use of the reserve
- Constraints on management such as regular human disturbance and its urban setting
- Available resources

With these factors are taken into account, nine broad areas for the future management of the site have been defined. These are not presented in order of importance.

1. Ponds
2. Reedbed
3. Fen
4. Rough grassland/tall herb/scrub mosaic
5. Stream
6. Woodland & wet woodland
7. Earthwork (Daisybank)
8. Visitor Enjoyment & Public Access
9. Community Engagement

For full summary table of management and monitoring activities please see Section 8.

At Abbey Fishponds the reserve comprises a suite of wetland habitats, set within a rough grassland/tall-herb/scrub mosaic. Each of the wetland habitats – ponds, reedbed, and fen – have intrinsic value for wildlife, but their value for wildlife increases when sited in close proximity to each other and when set within a mosaic of other habitats. Complex sites are of more value to wildlife than simple ones as there are a greater variety of niches for different species to occupy, where habitats grade into each other, and consequently the species diversity of the site is greater.

4.1. Ponds

4.1.1. Evaluation

Ponds are incredibly important for biodiversity and support many rare species. Two thirds of all Britain's freshwater plants and animals can be found in ponds. Ponds can also provide resources for other species with wider ecological requirements; otters *(Lutra lutra)* and reed buntings will both use ponds as part of the larger habitat they occupy.

Because individual ponds vary significantly in their species compositions, overall they often contribute more to regional biodiversity than rivers or other habitats. As well as aquatic species, ponds are also wonderful for our terrestrial wildlife. They provide drinking water during dry weather, a supply of insect and plant-based food, and shelter among the emergent and surrounding plants and trees. This is especially important in environments which are otherwise lacking in places for wildlife; a rich tapestry of ponds across an urban landscape provides a much needed refuge for birds, mammals, amphibians (which will cross roads to get to a pond), reptiles, and flying insects. During the 2007 Biodiversity Action Plan (BAP) review, ponds were added to the UK BAP list in recognition of their importance for wildlife. It is estimated that there are currently 400,000 ponds in the UK and that

approximately 20% (excluding garden ponds) meet one or more of the criteria. However, ponds are a threatened habitat; the number in the UK is estimated to have declined by over a third from the 1940s to the 1980s.

4.1.2. Current Status

The ponds at Abbey Fishponds are an integral part of the wildlife interest on site and are one of a suite of wetland habitats found on the nature reserve. All of the ponds are stand-alone ponds (i.e. not connected directly to the Radley Brook or linked to other ponds) and located on the west side of the brook. The only other examples of standing water are small seasonal or temporary pools/scrapes in low lying areas e.g. small areas in the central reedbed east of the brook. For location details of the ponds at Abbey Fishponds please see Map 3 below.

Pond 1

Pond 1 is recorded as having open water in the 1970's. It was then dug out by mechanical means in 1993/4 by London BTCV. The reed around and in the pond has been cut periodically to stop it in filling the pond. In 2009 approx. 1/3 of the reedmat was removed to maintain an area of open water. Pond 1 has a pond basin that is approximately 10m by 15m, with its long axis running c. north-east to south-west and parallel with the adjacent path. Open water covers an area c.10m by 10m in extent. Mature willow scrub grows along the length of western bank, with some partial willow collapse into the pond. The remaining three banks are dominated by common reed which extends into the permanent water body on all sides. The south-east bank grades into a low lying seasonally flooded area with abundant pond sedge but also other species such as yellow flag iris *(Iris pseudacorus)*, celery-leaved buttercup *(Ranunculus sceleratus)*, meadowsweet and rushes *(Juncaceae sp.)*. Fringed water lily *(Nymphoides peltata)* grows towards the centre of the pond. People/dogs trample and maintain a small viewing spot at the point closest to the path. The water is up to c. 1 metre deep towards the middle of the pond (perhaps deeper in places) grading into shallow water close to the banks; however there are no extensive areas of shallow water that are not full of reeds.

Pond 2

The pond basin, which was first dug in 2004, is a more or less round hole in the ground. The central section is a deep, steep sided hole surrounded by a shallow, gently sloping pond edge, which dries out on a seasonal basis. The central section is more or less free of plants, however plants have colonised the shallower margins including terrestrial and aquatic grasses, and low sprawling plants including a stand of fool's watercress *(Helosciadium nodiflorum)*. The surrounding banks are shaded by willow growing partially within the pond, next to the footpath. To the north and west of the pond are two trees slightly set back from the pond edge, both of which provide very little shade to the pond. The total depth of water is not known, but overall the pond drops away quite steeply and must be at least one metre deep at its central point.

Pond 3

This pond is situated to the north-west of Pond 1 and was dug in 2006. The pond basin is approx. 12m x 19m, with a shallow seasonally inundated area, initially shaded by willow, to the south of the pond, this collapsed in 2017 opening up the canopy above the pond and is now the most open of the ponds. One or two very small plants of the tall emergent plant species are beginning to seed and grow in the pond margin. The pond lies adjacent to the boundary bank, with housing behind, and is

surrounded by willow to the south, with a more open scrubby aspect to the east and north. There is an abundance of dead wood to the east of the pond.

Pond 4

This pond lies to the north of Pond 2, again dug in 2006, its long axis running approx. north-south and is approx. 10m x 15m. Although roughly rectangular in shape, the pond has been dug to incorporate wavy edges, small "islands" and has a varied underwater topography. There are some small willow saplings colonising one of the tiny islands. The pond is situated immediately adjacent to the boundary bank with a tarmac path and housing to the west. This has the most open water of the ponds, surrounded to the north and east by a large stand of bramble and to the west by patchy boundary trees and scrub.

Seasonal ponds/scrapes

There are five seasonal ponds/scrapes located within the reedbed and fen areas to the east of the Radley Brook on the reserve, dug in 2017, 2019 and 2020. All have been dug by hand, to a spades depth and made into irregular shapes. The dug out material has been either dispersed as a thin layer across the reedbed/fen or piled in a suitable location under nearby willow scrub

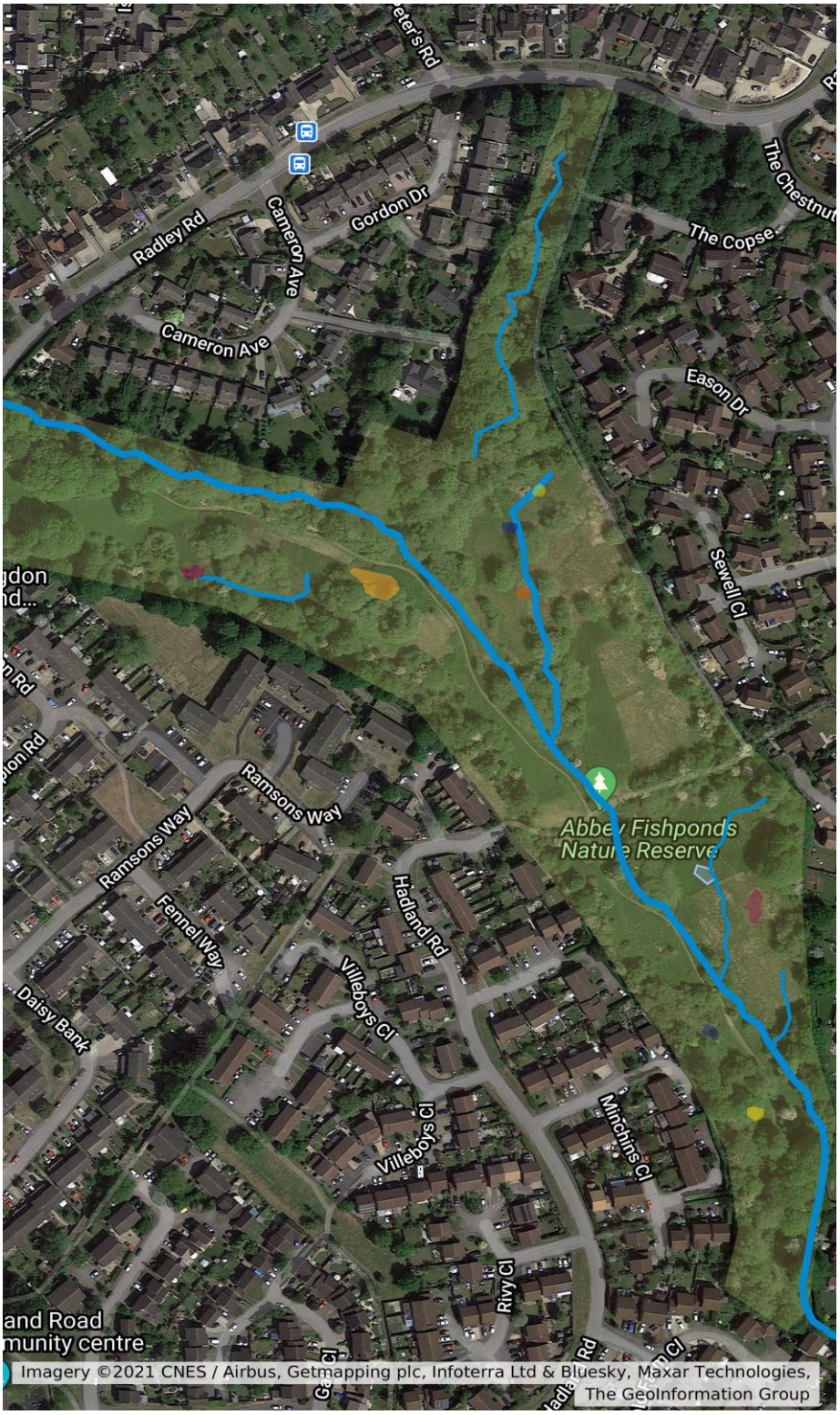
Map 3 – Abbey Fishponds ponds and scrape locations

Abbey Fishponds boundary

Ponds/scrapes/stream

- Radley Brook Ditch
- Pond 1; 1991
- Pond 3; 2006
- North fen scrape 1; 2019
- North fen scrape 2; 2019
- North fen scrape 3; 2019
- North fen stream runnel
- Wet woodland stream runnel
- Small stream runnel

- Pond 2; 2004
- Pond 4; 2006
- South fen stream runnel
- South fen stream runnel
- South fen scrape 1; 2018
- South fen scrape 2; 2020



4.1.3. Factors and Constraints

- Positive factors
    - Ponds and scrapes that are close to other ponds or other wetland habitats have more species than isolated ponds.
    - The complex of four ponds are all in differing stages of succession
    - Space to create new ponds/scrapes
    - Ponds already sustains populations of common frogs, toads, smooth newts and invertebrates and is good feeding ground for some bat spp.
    - Water quality is at least reasonable as the ponds are fed by direct precipitation and groundwater flow from springs on site.
    - Range of bank profiles and as such a range of drawdown zones, good for plant and invertebrate life
    - The ponds are all in partial shade to a greater or lesser degree, with a good source of dead wood in and around ponds.
- Constraints
    - Water quality can be affected by surface run-off from the local catchment which is surrounded by urban development – a likely source of polluted water
    - Fish presence in ponds; the presence of fish has also repeatedly been shown to have a detrimental effect on amphibians, and newts in particular (Joly et al., 2001, Swan and Oldham, 1998).
    - In some years the seasonal ponds have dried out too soon for tadpole to survive
    - Non-native invasive plants
    - Creating new ponds takes time and money

4.1.4. Ponds Objectives

The ponds are able to sustain a balanced aquatic community whilst being maintained in a favourable condition, where:

- A network of ponds in differing stages of succession is maintained

The best way to conserve all species linked to different successional stages is to create new ponds in the vicinity, to allow for all successional stages and associated species to move from pond to pond as conditions change and, therefore, to survive at the landscape scale. However space is not infinite so some management of existing ponds may become necessary.

- Frogs, toads and smooth newts continue to breed in the ponds
- Seasonal ponds/scrapes continue to be so and act as additional habitat for associated species
- Deadwood is present in the pond for invertebrates and structural diversity

Dead wood can be an important component of a pond ecosystem. Some species of dragonfly, e.g. southern hawker *(Aeshna cyanea)* and brown hawker *(Aeshna grandis)*, lay their eggs in dead wood. Some aquatic beetle larvae feed on decaying wood, whilst others eat fungi and algae on the wood surface. Caddisfly larvae *(Trichoptera spp.)* use leaves and tree bark to build their cases.

- At least half of the ponds have approx. 20% to 50% of margins that are shady.

Biggs et al. (2005) have demonstrated that, in unpolluted landscapes, shaded ponds have as many invertebrate and aquatic plant species as unshaded ponds and are just as likely to support uncommon species.

- At least half of ponds on site have approx. 25% of their pond surface covered with aquatic plants

- Aquatic and marginal plants continue to grow around/in the ponds covering at least 60% of pond edge
- At least 5 of the following key marginal plant species are present:

Meadowsweet	Water Mint
Purple Loosestrife	Bogbean
Marsh Marigold	Burr Reed spp.
Water Forget-Me-Not	Pondweed spp.
Brooklime	Duckweed
Ragged Robin	Water Lily spp.
Yellow Flag	Aquatic spp. e.g. starwort/hornwort.
Spearwort spp.	

- Invasive species are removed/controlled e.g. crassula, parrot's feather, Japanese knotweed, Himalayan balsam

4.1.5. Management Rational

The ponds and seasonal ponds will be managed by maintaining a wetland network through:

- Creating new ponds/scrapes
- Maintaining ponds

Creating new ponds/scrapes

The creation of new ponds is a very cost-effective way to increase biodiversity at both site and landscape scales (Williams et al., 2004), provided a few basic rules are followed:

- A wide range of ecological conditions are available. This includes water permanence, depth, size, shading by trees, grazing, etc.
- The drawdown zone is maximised by creating undulating and shallow sloping banks
- Water quality is high, with little pollution risk. Ponds are not connected to polluted adjacent watercourses, and their catchments are managed extensively as semi-natural habitats
- Ponds are located close to other wetland habitats to increase colonisation rates

Therefore, to maximise biodiversity, a mosaic of ponds which are close to each other, within a matrix of other semi-natural wetland habitats is a key objective for this site and further ponds should be created on a regular cycle (depending on funding availability):

- Allow all ponds to develop naturally; ultimately many will infill completely becoming areas of end succession habitat e.g. woodland, rough grass, reedbed etc. according to the specified habitat for that part of the site
- Ultimately when things go full cycle areas may be re-dug out to create a second generation of pond in the same location'

It is proposed that within the 5 years of this management plan another permanent pond/pond complex is created if/when funding becomes available. A large pond will probably require planning permission. Even if this is not the case, if the new pond is located within the floodplain and it is intended that spoil is spread close to the pond, consent will have to be sought from the Environment Agency (Land Drainage Act 1991, Water Resources Act 1991). The next new pond to be created on site should be situated to the north of the two existing ponds (Ponds 2 and 4) in the southern part of the site, in an area where there is already a shallow depression that is seasonally wet. It should

incorporate a wide undulating drawdown zone, areas of exposed mud, good water quality, extensive areas of very shallow water (1-2 cm deep), areas of shallow water (10cm deep), and varied topography within the pond, and be left to colonise naturally.

Areas of open water in the form of seasonal pools or scrapes are an important component of reedbed and fen habitats. Since 2017, as part of a 5 year rotation plan started in the previous management plan, a series (5 so far) of smaller water bodies in Compartments 2 and 4 have been created. Research suggests that pools approx. 1m in diameter and at least 1m deep, with steep sides, reduces the ability of reed to re-colonise so quickly. At the end of the 5 year period, existing re-vegetated pools could be re-dug. If the pools are still partially open, survey work would be required to establish whether it is appropriate to dig out that pool again or if a new one should be created.

It should also be noted that, as the ponds are sited within other features, e.g. reedbed, rough grassland, too many ponds could have an impact upon the ecological integrity of these habitats (of particular concern are the fen and reedbed areas). As such an upper limit has been set. Ponds may be either permanent or seasonal, but no more than:

- 5 ponds in Compartment 1
- 5 ponds in Compartment 5
- 7 ponds in the reedbed (Compartment 2)
- 7 ponds in the fen (Compartments 2 and 4).

Maintaining ponds

Due to the size of the site, it is unlikely that new ponds can be continuously created and the permanent ponds will require some management in the future in order to maintain a variety of successional stages. This will involve maintaining:

- **Clean water** (volume and regularity of supply is less critical)

Clean water is the single most important factor to maximise the ecological potential of an individual pond or series of ponds in a landscape, with water quality being strongly linked to land use within the pond catchment. High levels of phosphorus, potassium, nitrogen and pesticides, and also high levels of suspended solids reducing water clarity, have been shown to strongly reduce the ecological value of ponds (Biggs et al., 1998a; Perrow and Tomlinson, 1998). High levels of nutrients can also trigger blooms of algae (filamentous, floating at the surface or suspended in the water column) that further increase water turbidity.

Across the site, however, the water quality is likely to be at least partly impacted, as it is a narrow low lying site which must collect much of the drainage from the surrounding urban development – a likely source of polluted water. Thus the Radley brook may well have reduced water quality, as could any of the springs (often features of valley wetlands) which could be part sourced from, or influenced by, urban run-off. The ponds at Abbey Fishponds are isolated from both the stream and probably any valley side springs and any surface run off or groundwater is likely to be cleaned up by its movement across or through the ground before it enters the ponds. Therefore their sources of water are likely to be clean most of the time. However, the ponds are within the floodplain and can be at risk if flood waters are polluted. In addition, in such an urban setting, there is the potential for deliberate incidences of pollution by members of the public, such as pouring oil into the water.

In partnership with the citizen science project 'WaterBlitz' run by EarthWatch, water quality testing is carried out twice yearly (April and September) at Abbey Fishponds looking at nitrogen and phosphorus levels, as well as surface conditions (e.g. litter, algae, etc. present), results can be found in Appendix 2.

- **Good (wildlife friendly) surrounds**

Supporting or complementary habitats around ponds provide buffering from any damaging external influences and are extremely important in creating the right kind of conditions to maximise the biodiversity of a pond.

- **Variety of structure/habitat within the pond**,

This variety of structure/habitat is derived from variations in plants, basin shape and depth, bottom substrate, water chemistry, silt type and volume, density of shade or light levels etc.

- **Undesirable weeds and non-native species control**

Some undesirable weeds (e.g. broad-leaved dock, common nettles) or non-native species such as *Crassula*, parrot's feather and *Azolla* can cause major problems if they enter a pond system. These plants can grow extremely vigorously and will completely dominate the pond, often wiping out all native flora. These species can spread vegetatively and as such can 'take over' from even the smallest fragment. Therefore no presence of these species should be tolerated. Being an urban site there is the possibility that people will introduce such plants from their own garden ponds. Undesirable weeds or non-native species should be controlled to prevent spread to the ponds.

- **Pond 1**

There are certain characteristics of pond 1 that would lend it to ongoing maintenance as a pond for the benefit of the public as well as wildlife, rather than letting it go through natural succession as with the other remaining (and any new) ponds on site:

- Lack of open water and limited drawdown zone in its current form

Natural succession including the advance of common reed into the pond has reduced open water significantly. The pond was created by digging in an area of wet ground dominated by common reed *(Phragmites australis)*, and this plant over time is reclaim the hole, in places passing through a succession of other plant types. If this pond rapidly turns back to a reedbed then the site will become ecologically less diverse. If it is deemed desirable to maintain the diversity of wetland habitats on site then it would be important to ensure that the whole of the pond does not revert back to reedbed, but at least in part some open water habitats are maintained.

- Proximity to footpath

Disturbance by dogs can be an issue for this pond as it is very close to the footpath. We are grateful to the many responsible dog owners who do understand that it's important to keep dogs under control at nature reserves, but this does not include everyone that visits the site. The repeated disturbance caused by dogs in ponds can lead to dramatic changes in the water quality and structure of vegetation, and ultimately result in the loss of wildlife. Pond 1 represents an opportunity to raise awareness of the issues with site visitors to help change behaviour. Fencing part of the pond may be another option that may need to be explored if levels of disturbance are not manageable.

- Public perception

For many people, views over open water are a key feature of an aesthetically pleasing pond. As an urban site, there is a strong desire from local people to keep this pond open, as it is the nearest to the footpath that runs through the site. The pond has been there since at least c.1970 and there is a perception that doing nothing is neglecting the pond, rather than being a positive management decision.

- Educational opportunity

If funding was available, pond 1 would be the best placed pond to create a pond dipping platform. A dipping platform would enable us to safely engage school children and other groups with the aquatic life on site; although currently this is the most obvious pond to carry out pond dipping activities, children are unable to reach the water safely.

- **Pond 3**

Pond 3 is in an open, sunny location and would suit an early successional pond (and should be managed as such), which would complement existing ponds. The future management of this pond will be to maintain it as a sunny, early successional pond with no scrub around its edges. There will be open water and 1/3 of the vegetation will be managed on a 5 year rotation.

- **Ponds 2, 4 and 5**

Pond 2, 4 and 5 will be managed by non-intervention; unless a clearly defined problem develops in these ponds they should be left to colonise and mature naturally.

4.1.6. Management Activities

- Create a new pond – subject to planning permission, EA consent and funding
- Manage Pond 1 by cutting reed to the east and south of the pond in the summer
- Consider re-profiling Pond 1 and adding pond dipping platform; subject to funding
- Manage Pond 3 by cutting 1/3 of the vegetation surrounding the pond on a 5 year rotation
- Manage Pond 2, 4 and 5 by non-intervention
- Remove invasive species from ponds as required

4.1.7. Monitoring Activities

- Carry out Freshwater Habitat's Trust National 'Spawn Survey'
- Carry out EarthWatch's 'WaterBlitz', monitoring water quality
- Record pollution incidences and report to the Environment Agency
- Carry out Pond Rapid Assessment's between May and the end of August every 3 years (aims to quickly and simply assess the condition of the pond) to monitor:
    - For presence of non-native invasive plants
    - Bankside vegetation
    - Levels of shade over the ponds and effects on vegetation
    - Amount of dead wood in ponds

4.2. Reedbed

4.2.1. Evaluation

Reedbeds are transitional wetland habitats dominated by stands of common reed *(Phragmites australis)*, almost to the exclusion of other species, where the water table is at or above ground level for most of the year. They tend to incorporate areas of open water and ditches, and small areas of wet grassland and carr woodland may be associated with them.

Despite their lack of floristic diversity reedbeds can support a wide range of wildlife provided a variety of ages and structures are present. They can support a distinctive breeding bird assemblage, including some nationally rare Red Data List Birds including cetti's warbler *(Cettia cetti)*. They also provide roosting and feeding sites for migratory species and are used as roost sites for several raptor species in winter. Damp areas where the litter is not flooded support the greatest number of invertebrate species (although specialist species prefer wetter areas). Forty invertebrate species are known to feed only on reed, with a further 24 insects feeding partly on reed during their life cycle. Five GB Red Data Book invertebrates are closely associated with reedbeds including the red leopard moth *(Phragmataecia castanaea)* and a rove beetle *(Lathrobium rufipenne)*. The drier areas above the winter water level may provide burrowing habitat for water voles and scrubby islands may be used by otters.

Large-scale drainage schemes from the 17th century onwards meant that extensive areas of reedbed were converted to agricultural land. The decline of reed-cutting during the 20th century, combined with pollution from agricultural run-off, has affected the quality of the remaining sites. It is estimated that 40% of reedbeds in the UK have been lost since 1945 (RSPB 2001). Within Oxfordshire, the Biodiversity Action Plan objectives and targets includes rehabilitating and maintaining areas of existing reedbed through active management. The management of reedbeds can be divided into two broad areas: water management (especially water level control) and reed management (cutting):

- To slow, or reverse, the natural succession to scrub and woodland, primarily by reducing the rate of litter accumulation and at the same time stimulating the production of new reed.
- To provide ideal conditions for wildlife through the creation of structure, including open, wet habitat, pools, glades and reedy edges.

4.2.2. Current Status

At Abbey Fishponds the reedbed areas are small and much drier than is desirable with some shallow splashing underfoot during winter, but largely dried out during the summer. The site is now surrounded by housing and the Radley Brook (classed as a main river by the EA) has been canalised. One of the sources of water supplying the reedbed is as stream which flows under Radley Road through the secondary woodland and into the reedbed, draining into Radley Brook. In previous years this stream was dammed, resulting in a small pond forming behind it within the reedbed. This feature is sadly no longer evident. The reedbed National Vegetation Classification (NVC) plant community approximates that of S4 - *Pragmites australis* swamp and reedbeds, but is species poor and has stands of the invasive Himalayan balsam *(Impatiens glandulifera)* present. Vegetation height, species abundance and depth of the litter layer varies across the reedbed in accordance with the rotational cutting of the reedbed. The main block of reedbed is located to the north of Compartment 2, grading into woodland to the north and fen-meadow/swamp vegetation to the south. There is also a small patch of reedbed within the woodland in Compartment 3 and reedbed surrounds Pond 1 in

Compartment 1, extending to the north and south of the pond. There is a small stream flowing north-south through Compartment 2.

Historical maps indicate that the reedbed has spread south in Compartment 2 since the 1970's; it has also increased in extent in and around Pond 1. It would also appear that the woodland in Compartment 3 has increased in extent, spreading south to the detriment of the northern part of the reedbed in Compartment 2.

4.2.3. Factors and Constraints

- Positive factors
    - Dominated by the presence of *Phragmites*, which is of course essential to make the habitat a reedbed.
    - Areas of open water within the reedbeds, and space to create more if the opportunity arises
    - A variety of bird species use the site, some specific to the reedbed
- Constraints
    - Small total area of habitat in an urban environment, restrains ability to expand size
    - The reedbed is small and much drier than is desirable with some shallow splashing underfoot during winter, but largely dried out during the summer
    - Management is very time consuming, lack of management could lead to drying, scrub encroachment and succession to woodland.
    - Invasion by non-native species such as Himalayan balsam
    - As an urban site the reedbed is sometimes subject to disturbance from people trampling the reeds and from vandalism e.g. being set on fire.
    - Lying deadwood provides material for unauthorised fires on site

4.2.4. Reedbed Objectives

To maintain the reedbed habitat in a favourable condition, where:

- No net loss in the current extent of the reedbed; it continues to cover 1.6ha (extent mapped in 2005)

Secondary woodland is encroaching from the north of the reedbed, as are willows and bramble from the edges. A problem because it directly competes with reed for nutrients and space, causes shading, uses large quantities of water, produces large quantities of litter and impedes cutting equipment.

- It continues to be dominated by the presence of *Phragmites*

Reedbeds often support a variety of bird species which are restricted to this type of habitat and as such are relatively uncommon (reed, sedge and cetti's warbler). Warblers also provide the commonest host – reed warbler *(Acrocephalus scirpaceus)* - in British wetlands for cuckoos *(Cuculus canorus)*. As well as breeding sites, reedbeds provide roosting sites for species such as swallow and starling. The maintenance of reed domination is probably the single most important aspect of management for reedbed birds (Burgess and Evans 1989).

- The plant community will approximate that of NVC S4 *Phragmites australis* swamp and reedbeds, where amongst the dense stands of reed there are other species typical of this community including species such as:

Angelica
Bittersweet *(Solanum dulcamara)*
Branched bur-reed *(Sparganium erectum)*
Cuckoo flower

Marsh thistle *(Cirsium palustre)*
Rush species
Sedges *(Carex spp.)*
Water mint *(Mentha aquatic)*
Yellow flag iris *(Iris pseudacorus)*

- Less than 5% Himalayan balsam
- A small amount negative indicator species (e.g. <5%) including:

Common nettle *(Urtica dioica)*
Docks *(Rumex spp.)*
Bramble
Willowherbs *(Epilobium spp.)*
Cleavers *(Galium aparine)*
Bulrush *(Typhur spp.)*

Large amounts of willowherb spp. and nettles indicate that the habitat is drying out. This will of course lead to a reduction of *Phragmites* and eventual loss of the reedbed. This suite of species, therefore, needs careful monitoring.

- There will be some cover of trees/scrub as areas within the reedbed (e.g. approximately 5%)

As a mid-successional habitat, the reedbed is ecologically moving towards scrub and then mature woodland. However scrub/tree islands within the reedbed can be important refuge sites. Many mammals thrive in reedbeds and scrub/trees can provide a refuge from predation. They can also form valuable perching and nesting areas for birds including waterbirds (e.g. herons).

- There will be open water within the reedbed (e.g. approximately 15%)

Open water is an important additional habitat within the reedbed, increasing its diversity and providing refuges for aquatic flora and fauna.

4.2.5. Management Rational

The reedbeds at Abbey Fishponds will be managed by:

- Rotational cutting of the reedbeds
- Water regime:
  - Creating and maintaining a dam or series of bunds
  - Divert spring into reedbed
- Controlling invasive species such as Himalayan balsam
- Controlling scrub encroachment/felling trees
- Maintaining dead hedging/hedge planting

Rotational cutting of the reedbeds

The time of year, frequency and extent of cutting all have an influence on the exact nature of the reedbed and its species complement. Winter cutting of reed will maintain its dominance (assuming water levels are appropriate). Summer cutting of reed reduces its competitive ability, allows a more diverse mix of vegetation and ultimately eliminates it. No management at all will allow natural succession to continue, the speed of which is largely dependent on the water regime. A traditional 'conservation' cutting rotation may be between 6-15 years. This type of management is largely undertaken for sizeable reedbeds under the assumption that it will hold or slow natural succession and for sizeable reedbeds. Cutting can affect small mammal populations, after management but recovery is relatively rapid, especially if refuges are left (Seers et al., 2013), the same for invertebrate communities. Conservation management of reedbeds has therefore tended to steer away from short-term rotational cutting. However, there is much evidence that many reedbed birds favour 'edges', or younger, more open reedbeds, either for feeding or breeding. Cutting on a rotation can create such structural variations. Baldi and Kisbenedek (1999 & 2000) found that certain reedbed passerines bred at greater densities close to reedbed edges, notably reed and sedge warblers. They also showed that

a collection of small reed islands held more species than a large reedbed of the same total area. Reed cutting over the longer rotations dictated by traditional conservation management may therefore not be as effective for biodiversity as claimed, while short rotation cutting may not be as bad as claimed, being a means of increasing structural variation in a reedbed. It further follows that a carefully designed rotational pattern of cutting with areas left can benefit a variety of species, but also have a minimum effect on 'interior' reedbed wildlife, and positive effect on reedbed birds, mammals and key reedbed invertebrates.

The reedbeds at Abbey Fishponds will be cut on a 2 (or up to 4) year rotation to increase structural diversity; ideally ½ every year but this is dependent on resources (i.e. volunteer numbers) so it might be necessary in some years to cut only ¼ during the autumn/winter months. Edge fringes and small areas of un-cut reeds will be left within cut compartments, to increase structural variation in the reedbed compartments. Reed will also be cut annually along the boundary between the fen and reedbeds (also called 'lines in the sand' by the volunteers) at the southern extent of the reedbed in both the eastern and western sides of the reserve to prevent in encroaching any further in the fen areas. Please see map 3 for reedbed cutting rotation regime. Cutting will be done with scythes where possible, as it should be noted that water voles may use this area, and scything a reedbed is the most sensitive management method, as it provides most wildlife with time to move out of the way. However this might not always be possible (relies on scythe trained volunteer group/s) so a walk behind mower (e.g. BCS or trackmaster) or brushcutter/s could also be used for this management task.

It has been shown that phytotoxins released during the decomposition of reed litter have a negative impact on the reedbed, reducing diversity (RSPB 2001). Reedbed health may therefore be promoted by reducing the build-up of organic material, including its own litter. Accumulated litter will be removed by raking, to reduce the likelihood of drying out and succession. Cut reeds will be left in piles at the edge of the reedbed (away from the stream) and will provide a valuable invertebrate habitat in its own right or benefit species such as grass snakes which may use such piles of decaying vegetation to incubate their eggs (Langton 1989). The same piles should be used annually, that is unless reed piles become too large and unmanageable. As reed is slow to decompose, burning cut reeds on a burn platform may be considered; but weather conditions would need to be taken into account and the Abingdon Fire Service informed ahead of burning. In addition, vegetation should be cut annually in July/August, where it is growing within the stream/runnels, to provide open water habitat for species such as dragonflies. Cuttings should be put in areas away from the stream or runnels, in drier floristically impoverished areas or in scallops cut into the bramble/scrub edge.

Map 3: Abbey Fishponds Reedbed cutting regime rotations

Water regime:
A 'natural' water regime cycle with a drawdown in late summer is most likely better for reedbeds than one with stable deep water, which increases the exposure of reeds to the negative effects of litter accumulation. Having seasonally dry littoral zones can aid seed germination, maintaining genetic diversity decreasing the chance of having monoclonal reed stands. In addition, increased winter water levels with a through-put of water assist with the flushing of organic material. The ideal annual water regime may therefore have deeper winter water (50-100 cm within the reeds), dropping to a lower summer level (5-30 cm). However, variation within this, with both deeper and shallower areas will maximise benefits to wildlife. At the driest part of the year it is important to retain some wet reed and pools as refuges areas for fish and invertebrates.

If funding and pending VWHDC Drainage Team permissions allow the water regime in the reedbeds at Abbey Fishponds could benefit from:

- Reinstating and maintaining the dam in cpt.2, which was created in 1991 or installing 'leaky dams'

This would involve installing a water control structure e.g. a drop board sluice or a bund, where the stream runnel exits the reedbed into Radley Brook, in order to hold water back onto the reedbed and fen during the summer. A series of bunds could be installed along the length of the stream, with pools created behind them from digging pools.
Or 'Leaky dams' across the stream runnel, which are barriers made with logs that moderate the flow of water, prevent soil and silt escaping into a stream and allow water to escape but at a very slow rate. There are a few key guidelines to follow when installing leaky dams:

- They must be installed, as a minimum, in a sequence of 3
- The distance between each dam should be 7 times channel width
- The width of the dam should be 1.5 times channel width
- The structure should be set 300mm above base flow level
- Logs should be no more than 400mm in diameter
- Where possible, materials should be sourced locally and not include willow, which will most likely re-shoot and grow in situ
- Structures should be installed 90° to the flow

The VWHDC Drainage Team would need to be consulted about such works either reinstating the old dam or creating leaky dams), and if necessary install other water control structures if the water exits the reedbed at other points once the water level has been raised.

- Divert spring into reedbed

The spring at the rear of Cedar Wood house could be diverted into the reedbed in cpt. 2 from where it currently runs into Radley Brook. This would increase the amount of water entering the reedbed and encourage the wetting up process. Again the VWHDC Drainage Team would need to be consulted about such works.

Control Invasive Species such as Himalayan Balsam
Whilst largely under control, ongoing management of the species is required as seed could be washed downstream onto site via Radley Brook, although extensive pulling of Himalayan balsam has extended north along the length of Radley Brook to prevent this happening in recent years.

Himalayan Balsam is a highly invasive flowering plant, which has spread rapidly throughout the UK since its introduction in 1839. Manual control measures aim to prevent flowering (July – October), and are best carried out during May, June and July for maximum effectiveness. Shallow rooted plants can be pulled up very easily by hand and disposed of by composting unless seeds are present. Pulling on a regular basis for about 3 years will be effective and may even eradicate the plant from isolated locations, as the seeds are only viable for 2 years.

Controlling scrub/woodland encroachment

It is desirable to retain some scrub areas within the reedbed, as refuges, however where it is substantially reducing the dominance of the reedbed, scrub control should be continued. This is a process that has been started during the last 5 year management plan, with cutting scrub (as digging/winching out was not possible). However this does have the effect of promoting thicker re-growth from stumps and may lead to an ever increasing need for more cutting until the willows are weakened. Some of the material can be cut with bowsaws; however chainsaws will also be required for larger limbs and stems, depending on need. Cut material should be stacked to the edge of the reedbed, on the surrounding scrubby banks, in areas of low intrinsic conservation interest. and An alternative would be to ring bark some of the willows within the reedbed to maintain the standing scrub important for a variety of bird species whilst reducing the amount of water taken up by the trees themselves. Finally the use of herbicide to control growth permanently could be considered.

Where there are two areas of woodland encroachment, tree felling is required. The first is along the northern edge of the reedbed where trees (mostly crack willows) are encroaching and reducing the extent of the reedbed. In this area, at a minimum, trees should be cleared from areas where reed is growing beneath them. Again this has been started during the last 5 year management plan and should be continued. The second area is along the small stream which extends from the secondary woodland south into the main body of the reedbed, connecting the smaller isolated reedbed within the woodland to the main body of the reedbed. Trees and shrubs should be cleared at least 2m back from the edge of the water course on each side.

The tree felling should take place over a 5 year period in winter months (October to February), outside of bird breeding season and when the trees are dormant. Felled material should be cut into logs, as large as practically possible and either stacked on site as habitat piles. Piles (2-3m across maximum) should be created back within the woodland, off the reeds and on areas where the flora is least diverse. The richest invertebrate faunas are likely to develop in piles which maintain moist, stable conditions in their interiors. To achieve this, piles are best made in dappled shade. If there are several piles it is best to orientate them in different ways and use different combinations of material. Finer brash should be added to the sections of dead-hedge or piled separately in a few large piles rather than lots of smaller ones. If several piles are created they should be placed in different situations and with different aspects. If piles of brash and timber on site become excessive, or extraction it difficult, controlled burning on a burn platform on site could be considered.

Maintain dead-hedging/hedge planting

To reduce access to the reedbed and minimise disturbance, a natural physical barrier in the form of a dead-hedge (first created in 1994) along the boundary with the footpath on the eastern edge of cpt. 2 in the reserve. Wooden rods are hammered into the ground and lengths of woody material

such as hazel and willow are woven together and the hedge bulked out with brash. As the material decays, it needs to be replaced to maintain the strength and effectiveness of the barrier. This work is best done once the vegetation has died back which allows better access to the dead-hedge and visually it can be seen which lengths need to be replaced. The work should also be timed so that it takes place out of bird nesting season as the dead hedge may be used by birds for nesting.

As an addition to the dead-hedge, where possible, i.e. where space and light levels allow, sections of well broken down dead-hedge should be planted over with a living conservation hedge. Hedgerows provide food and shelter for many species, and along this perimeter it would link small patches of trees along the perimeter to the northern woodland in Compartment 3, creating a living corridor along which wildlife can travel. The dead timber within the remaining sections of dead hedging will continue to provide a rich source of insect food and should be left in situ. The greater the variety of shrubs and trees in the hedge the better, as different species flower and produce fruits at different times, providing nectar and food over a longer period to support a greater range of wildlife. Native species such as dog rose *(Rosa canina)*, spindle *(Euonymus europaeus)*, hawthorn *(Crataegus monogyna)*, hazel *(Corylus avellana)*, crab apple *(Malus sylvestris)*, rowan *(Sorbus aucuparia)* and dogwood *(Cornus sanguinea)* provide nectar, fruits and nuts for wildlife, without running the risk of spreading into the reedbed.

4.2.6. Management Activities

- Cut reedbeds during winter (October – February) as water levels allow: ¼ up to ½ of the reedbed to be cut using scythes on an annual rotation. Remove arisings to the outer edges of the reedbed compartments.
- Cut reeds/vegetation in and adjacent to the stream/runnels in cpt. 2 to create open, flowing water habitat. Cut in July/August and remove arisings to the edges of the reedbed
- Cut reeds along the southern boundaries of the reedbed in cpt. 2 to prevent encroachment into the fen
- Pull Himalayan balsam within the reedbed areas during May/June/July to prevent seeding/spread
- Fell trees along the northern boundary of the reedbed, where reeds are growing and along the stream linking the small patch of reeds in the northern woodland. Pile arisings within the woodland
- Control scrub within the reedbed, re-coppicing where required, cutting scallops into brambles where encroaching
- Create/maintain a dam or series leaky dams along the small stream within the reedbed to control water levels within the reedbed
- Divert northern spring into the main reedbed (subject to EA permission)
- Plant and maintain conservation hedge mix along sections of dead-hedge along eastern side of cpt. 2.
- Maintain remaining sections of dead-hedging along the eastern side of the reserve, using arisings from scrub clearance in the reedbed

4.2.7. Monitoring Activities

- Carry out Reedbed Rapid Assessment's between July and the end of August every 3 years (aims to quickly and simply assess the condition of the reedbed) to monitor for:

    - Presence of non-native invasive plants
    - Presence of positive indicator species for NVC S4 (*Phragmites australis* swamp and reedbeds)
    - Presence of negative species (nettles, bramble, willow herb spp., typhur)
    - Amount of scrub
    - Amount of open water
- Survey bird assemblage; as part of site wide bird survey
- Survey Odonata (dragon and damselflies); as part of site wide Odonata survey
- Record incidences of vandalism

4.3. Fen

4.3.1. Evaluation

The UK is thought to host a large proportion of the alkaline fen surviving in the EU (along with Sweden). As in other parts of Europe alkaline fen vegetation has declined dramatically in the past century. There are no reliable estimates of the overall extent of alkaline fen habitats across the UK. In intensively farmed lowland areas alkaline fens occur less frequently, are smaller in size and more isolated than in other parts of the UK.

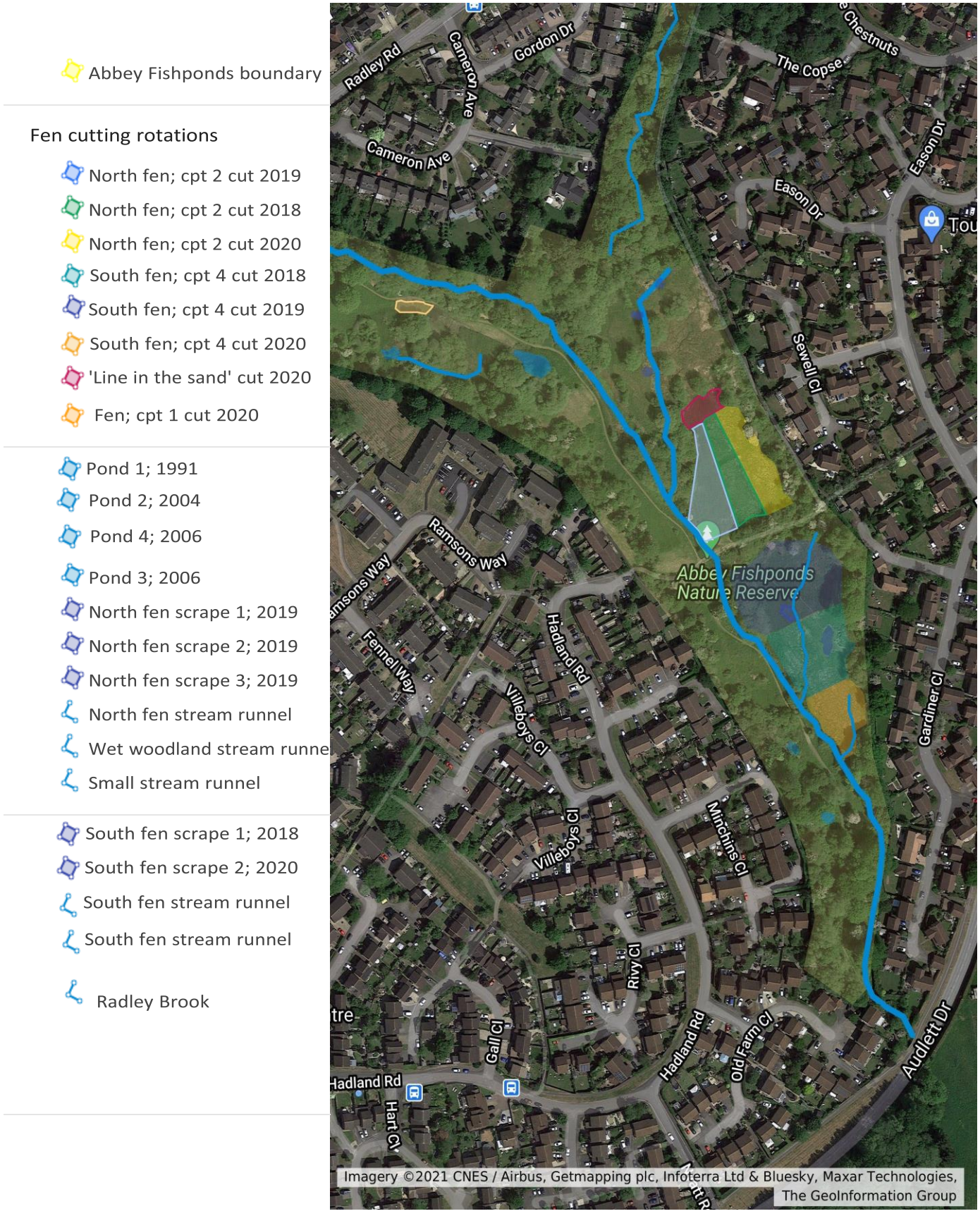
Alkaline fens (from now on referred to a 'fen') are areas which receive water and nutrients from the soil, rock and ground water as well as from rainfall. Base-rich fens are fed by mineral-enriched calcareous waters (pH5 or more) and are mainly confined to the lowlands and where there are localised occurrences of base-rich rocks such as limestone. They consist of a complex assemblage of vegetation types characteristic of sites where there is tufa and/or peat formation with a high water table and a calcareous base-rich water supply. The core vegetation is short sedge mire (mire with low-growing sedge vegetation) and they support a diversity of plant and animal communities (JNCC, 2021). Some can contain up to 550 species of higher plants, a third of our native plant species, up to and occasionally more than half the UK's species of dragonflies, and several thousand other insect species, as well as being an important habitat for a range of aquatic beetles. The drier areas above the winter water level may provide burrowing habitat for water voles and scrubby islands may be used by otters.

4.3.2. Current Status

As with the reedbed at Abbey Fishponds, the fen areas are small and much drier than is desirable with some shallow splashing underfoot during winter, but largely dried out during the summer. The site is now surrounded by housing and the Radley Brook runs through the site (north to south). An extract from the EN Report No 139 (based on data collected in 1990) describes the valley fen, known locally as **Barrow Hills Fen and Daisybanks**, as a mosaic of vegetation types.

Within the fen compartments vegetation height, species abundance and depth of the litter layer varies in accordance with the rotational cutting of the fen. The main block of fen is located to the north of Daisybank, within Compartment 2, grading into reedbed to the north. The second area of fen is to the south of Daisybank, in Compartment 4. Both compartments have small stream runnels flowing north-south through, which are spring fed. In compartment 4 there are two scrapes adjacent to the stream, dug in 2018 and 2020.

Map 5 – Abbey Fishponds Fen cutting rotations



4.3.3. Factors and Constraints

- Positive factors
    - Areas of open water within the fen, and space to create more if the opportunity arises
    - A variety of plant species including positive indicator species e.g. cuckoo flower, *Dactylorhiza* spp., fen/marsh bedstraw, greater birdsfoot trefoil, marsh St. John's wort, and meadow vetchling (to name a few).
- Constraints
    - Small total area of habitat in an urban environment, restrains ability to expand size
    - The fen is small and much drier than is desirable with some shallow splashing underfoot during winter, but largely dried out during the summer
    - Management is very time consuming, lack of management could lead to drying, scrub encroachment and succession to woodland.
    - Invasion by non-native species such as Himalayan balsam
    - As an urban site the reedbed is sometimes subject to disturbance from people trampling the vegetation and from vandalism e.g. being set on fire.
    - Lying deadwood provides material for unauthorised fires on site

4.3.4. Fen Objectives

To maintain the fen habitat in a favourable condition, where:

- The plant community will approximate that of species-rich fen meadow NVC M22 *Juncus subnodulosus - Cirsium palustre.*
    - A good proportion of large sedges *(Carex spp.)* and/or *(Juncus spp.)* (e.g. > half)
    - A good proportion of at least 3 key indicator species (e.g. >30% cover); these include:

Blunt flowering rush *(Juncus subnodulosus)*
Common figwort *(Scrophularia nodosa)*
Water mint
Meadow sweet *(Filipendula ulmaria)*
Marsh thistle
Horsetails *(Equisetum spp)*

- Other positive flowering species that should be present include:

Cuckoo flower *(Cardamine pratensis)*
Fen bedstraw *(Galium uliginosum)*
Marsh marigold *(Caltha palustris)*
Bugel *(Ajuga reptans)*
Self heal *(Prunella vulgaris)*
Ragged robin *(Lychnis flos-cuculi)*

- Amongst the fen will be spikes of southern marsh orchid *(Dactylorhiza praetermissa)* and common spotted orchid *(Dactylorhiza fuchsia)*
- No net loss in the current extent of the fen, measured as 0.78ha in 2005
- A small amount of scrub cover (e.g. no more than 5%)
- Areas of open water within the fen (e.g. approximately 15%)
- A small amount of negative indicator species including (e.g. <5%):

Common nettle
Willowherbs
Docks
Cleavers

- Less than 5% Himalayan balsam

4.3.5. Management Rational

The fen at Abbey Fishponds will be managed by:

- Rotational cutting of the fen

- Creating and maintaining a dam or series of bunds
- Controlling invasive species such as Himalayan balsam
- Controlling scrub encroachment

Rotational cutting of the fen

To control natural succession fens should be cut, especially if this has been the ongoing management and species are adapted to those conditions. It is also important, on drier sites such as Abbey Fishponds, to stop the area being invaded by scrub. It is best to do this on a rotation to avoid significant alteration of the plant and invertebrate assemblages, which can change quite easily (Sutherland and Hill 1995). Kirby (1992) suggests that the bulk of the fen is on an annual late summer cut (e.g. late September/early October), cutting patches only every 2/3 years, leaving some areas uncut where small areas of scrub are allowed to develop. This helps to benefit species intolerant of regular mowing, such as many specialised invertebrates. In addition, vegetation should be cut annually in July/August, where it is growing within the stream runnels, to provide open water habitat for species such as dragonflies. Cut material should be raked off and stacked in areas of low intrinsic value to wildlife, away from the runnels and out of view. It should be noted that water voles may use this area so a strip of 6m should be left uncut adjacent to the Radley Brook bank. Please Map 5 for fen cutting rotations.

If a fen compartment has a high dominance of reeds or willowherbs an early summer cut can reduce their dominance. Both of these species can be controlled on a 3 year cutting programme. Once they are reduced to the desired proportions, then the cutting can take place rather later in the year. Cutting late in the summer should also be sufficient to control scrub. As with cutting the reedbed, scything a fen is the most sensitive management as it provides most wildlife with time to move out of the way. However this might not always be possible (relies on scythe trained volunteer group/s) brushcutter/s or a walk behind mower (e.g. BCS or trackmaster) could be used for this management task. However, it is important that tussocky formations are not damaged when cutting. Mowing can remove some desirable hummock-forming mosses. The tussocks can provide refuges for invertebrates. Using scythes/brushcutters rather than mowers should help to ensure tussocks are avoided and remain undamaged.

Create/maintain dam or series of bunds

In the both sections of fen either side of the Daisybank two springs are the sources of much of the water for the area. From the springs the water crosses through largely swampy vegetation in two runnels, which drain into Radley Brook. To retain water on site for longer a water control structure, such as a leaky dam could be installed where the runnel exits the fen. If necessary, install other water control structures if the water exits the fen at other points once the water level has been raised. Liaise with the Environment Agency if required. See reedbed management (section 4.2.5) for further details on management rationale and for further information concerning leaky dams methodology.

Control Invasive Species, Himalayan balsam

See reedbed management (section 4.2.5) for further details on management rationale and for further information concerning Himalayan balsam pulling methodology.

Control scrub encroachment

Scrub largely comprising willow spp. *(Salix spp.)*, elder *(Sambucus nigra)* and bramble exists mainly around the edges of the fen but is expanding inwards to the detriment of the fen vegetation and needs to be controlled. Bramble can be cut back using hand tools (loppers/pruning saws) or brushcutters and the material raked off and piled in areas of low conservation interest. Two of the most important factors needed for the maintenance of invertebrate interest at a site are habitat continuity and structural variation (Kirby 1992). The creation of scalloped edges in the scrub along the edge of the fen will be of benefit to invertebrates and birds, as will providing scrub of varying height. See section 4.2.5 for further details on management rationale concerning scrub control methodology.

4.3.6. Management Activities

- Cut fen compartments during late summer (September - October) as water levels allow: ⅓ up to ½ of the fen to be cut using scythes on an annual rotation. Remove arisings to the outer edges of the fen compartments (see map 5 for rotation plan).
- Cut vegetation in and adjacent to the stream/runnels in cpt. 2 & 4 to create open, flowing water habitat. Cut in July/August and remove arisings to the edges of the compartment away from the stream and runnel
- Pull Himalayan balsam within the fen areas during May/June/July to prevent seeding/spread
- Control scrub within the reedbed, re-coppicing where required, cutting scallops into brambles where encroaching
- Create/maintain a series leaky dams along the small streams within the fens to help wet-up the fen compartments

4.3.7. Monitoring Activities

- Carry out Fen Rapid Assessment's between July and the end of August every 3 years (aims to quickly and simply assess the condition of the fen) to monitor for:
    - Presence of non-native invasive plants
    - Presence of positive indicator species for NVC M22 *(Juncus subnodulosus - Cirsium palustre)* species-rich fen meadow.
    - Presence of negative species (nettles, bramble etc.)
    - Amount of scrub
    - Amount of open water
- Survey bird assemblage (as part of site wide bird survey)
- Survey Odonata (dragon and damselflies); as part of site wide Odonata survey
- Record incidences of vandalism

4.4. Rough Grassland, Tall Herb and Scrub Mosaic

4.4.1. Evaluation

Rough grassland and tall-herb communities have not been identified as a UK BAP habitat but, nevertheless, tussocky, floristically poor grassland can have a high ecological value; DEFRA has

recognised this value by promoting rough grassland which supports target species within the Environmental Stewardship Scheme.

Scrub is difficult to define but may be loosely described as woody vegetation (dominated by shrubs or bushes) up to 5m tall. It is a transient habitat, tending to develop on uncultivated ground, developing on grassland and other more open vegetation and going on to form secondary woodland. It often also occurs within established woodland areas where it makes a valuable contribution towards the overall structural and biological diversity of the woodland area. It is usually regarded as being of high conservation value only when in association with other important wildlife habitats, rather than when on its own. It is an important component of many of the UK Biodiversity Action Plan (BAP) Habitats. Recent conservative estimates put 10% of terrestrial BAP Priority Species as believed to be associated with scrub.

A rough grassland/tall-herb/scrub mosaic with a diverse mix of vegetation structures, can provide an important habitat for a variety of invertebrate species. For example, bare ground is important as an area where invertebrates can bask, while solitary wasps and bees will use it to dig their burrows and for hunting. Grass tussocks provide a micro-climate that is different to the surrounding vegetation; the centres of tussocks are protected from the extremes of temperature and humidity, and this can be especially important for hibernating invertebrates, while shorter turf areas benefit a different range of species. Long vegetation and scrub forms an important habitat resource providing cover, shelter, nesting and feeding opportunities. A long list of birds, such as garden warbler *(Sylvia borin)*, blackcap *(Sylvia atricapilla)*, whitethroat *(Sylvia communis)*, lesser whitethroat *(Sylvia curruca)*, willow warbler *(Phylloscopus trochilus)*, goldfinch *(Carduelis carduelis)*, and linnet *(Linaria cannabina)*, all rely on various forms of scrub habitat. Increased abundance of invertebrates, such as caterpillars, beetles and grasshoppers, and seeds from species normally considered weeds, such as docks, thistles and teasel will also provide an abundant food source for seed eating birds. Blackthorn scrub, in the right condition, is essential for the black hairstreak *(Satyrium pruni)* butterfly. Scrub stands in close association with woodland and grassland, forming complex mosaics which are particularly valuable for a wide variety of invertebrates including butterflies such as brown argus *(Aricia agestis)*, and grizzled skipper *(Pyrgus malvae)* and dingy skipper *(Erynnis tages).*

4.4.2. Current Status

Whilst the mosaic is not of major botanical significance at Abbey Fishponds, the structural variation it provides creates a wide range of habitats for birds, invertebrates, fungi and lichens and provides a good setting for the wetland habitats found on this nature reserve. The floral make-up and extent of the grassland has dramatically changed since grazing ceased and water levels have declined on site. The floristically diverse wet meadow vegetation described in the 1970's has become rank grassland and scrub. Common reed and sedges have also increased in their dominance in wetter areas.

The mosaic of grassland/tall herb habitat comprises course grasses including false oat grass *(Arrhenatherum elatius)*, cocksfoot *(Dactylis glomerata)*, Yorkshire fog *(Holcus lanatus)* and herbs such as burdocks *(Arctium minus* and *Arctium lappa)*, willowherb, nettle, hedge bindweed *(Calystegia sepium)*, cleavers, cow parsley *(Anthriscus sylvestris)*, and hogweed *(Heracleum sphondylium)*. The scrub is made up of hawthorn, willow species, elder, spindle, elm *(Ulmus procera)* and extensive

patches of bramble and blackthorn *(Prunus spinose)*. Trees and scrub also fringe much of the nature reserve.

4.4.3. Factors and Constraints

- Positive factors
    - Well-managed grassland/scrub and its margins support a range of wildlife
    - Varied age, species and structure supports the widest range of wildlife, as some species depend on specific growth stages of certain plants
    - Occasional records of glow-worms *(Lampyris noctilua)*, especially associated with the earthwork 'Daisybank'
- Constraints
    - Nutrient enrichment on site limits species diversity
    - Continuing state of change where:
        - succession of existing grassland habitats to scrub
        - succession of existing scrub habitats to woodland

4.4.4. Grassland, Tall Herb and Scrub Mosaic Objectives

To maintain the mosaic habitat in a favourable condition, where:

- The grassland, tall-herb and scrub areas across the site will each be a mosaic of varying heights.
- The rough grassland will have approximately 25% cover of at least 2 key species:

Bird's foot trefoil spp.	Creeping cinquefoil	Meadow vetchling
Buttercup spp.	Cuckoo flower	Plantain spp.
Bugle	Cut-leaved crane's-bill	Ragged robin
Common knapweed	Marsh marigold	Silverweed
Oxeye daisy	Marsh thistle	Water mint
Common mouse-ear	Meadowsweet	Yellow flag iris.

- The mosaic will comprise of:
    - 40% shorter grassland with herbs
    - 30% tall-herb community
    - 30% scrub/bramble
    - <5% tall mature trees
    - <5% non-native invasive species (e.g. Himalayan balsam)

4.4.5. Management Rational

The grassland/tall-herb/scrub mosaic will be managed by:

- Cutting the grassland/tall-herb/scrub mosaic
- Managing the scrub
- Controlling garden species

Cut Grassland/Tall-Herb/Scrub Mosaic

In order to support the greatest possible range of invertebrates a grassland must have a good range of successional stages and vegetation structures, from bare ground to scrub, and from short open

turf to tall grass and tussocks (Kirby 2001). In order to achieve this at Abbey Fishponds, areas will be cut at different frequencies and different times of the year and to different heights:

- The path is regularly used and trampling creates and maintains areas of bare ground and very short turf on the path surface.
- The strip of grassland immediately adjacent to the footpath will be cut several times through the growing season April – September, creating a strip of vegetation either side of the path, taller than that of the path surface.
- Scallops are cut into areas adjacent to the footpath, into the tall-herb and scrub behind, to create warm, sheltered areas for invertebrates. Some blocks of rank, tussocky grassland and tall-herb will be left uncut as they grade into the scrub. Flowering umbellifers provide a food source for insects and tussocks provide micro-climates and places for invertebrates to hibernate in sheltered conditions. The tussocky rough grassland in front of the Hadland Road entrance will be cut a number of times a year to encourage wildflowers, present a welcoming access point into the reserve and deter the dumping of brash and garden waste in this area.
- Finally, the three largest blocks of grassland (two either side of the path near the Radley rd entrance in cpt. 1, and one around an including Daisybank cpts. 1&6) will be cut twice a year in early spring, March and then towards the end of the summer in August after the glow-worm breeding season (June & July) is over.

Arisings left in-situ will cause nutrient enrichment, smother plants and prevent seeds from reaching the soil surface and germinating. Therefore, throughout the site, all arisings will be raked into piles, tucked out of sight where possible, and placed in areas of low botanical interest away from water courses and ponds.

Manage Scrub

A certain amount of scrub around or within a grassland site can greatly enhance the invertebrate interest; however a strip of scrub only one or a few bushes wide will support as great an assemblage of invertebrates as a large area (Kirby 2001).

The aim is to maintain a scrubby edge with varied structure around the edge of Abbey Fishponds, with scattered bushes or clumps of scrub/bramble. In winter, out of bird breeding season, the scrub front will be cut back where it is encroaching, to form a series of shallow bays. Structural diversity will be maintained by coppicing or pollarding the outer bushes of the scrub with only a fraction of the margin of the scrub block being managed in any one year. Dead and regenerating elms are a feature of the scrub of this site. Where there is minimal risk of injury to the public or damage to property, standing dead wood will be retained.

Control Garden Escapes

All garden plants escapes should be removed where possible, whether this be hand pulling, digging them up, cutting down or treating with herbicide (glyphosate).

Depending on the species, the arisings may be left on site in such a way as to not be detrimental to the native flora and fauna or removed from site in bags for later disposal. However, many garden plants that get dumped are invasive in nature and may need to be killed off chemically, in which case the native species should be considered when devising a plan to do so. If herbicides are to be used near a water course the Environment Agency should be consulted.

4.4.6 Management Activities

- Cut the grassland/tall-herb at different times of year and to different heights in order to maintain a diverse structure, ideally using scythes (or BCS/Brushcutter may be needed):
    - *Mow the main path between April and September – undertaken by Vale contractor (min. once monthly)*
    - Cut strip along either side of footpath
    - Cut scallops into the vegetation on each side of the path on rotation
    - Cut the three main areas of grassland March & end July/early August and remove all arisings.
- Cut back the scrub around the edge of the reserve during winter to create bays and scallops and prevent encroachment
- Remove garden escapes and non-native plants by hand pulling, digging, cutting or chemical means

4.4.7 Monitoring Activities

- Carry out rough grassland/tall herb/scrub mosaic rapid assessment between May and end of August every 3 years (aims to quickly and simply assess the condition) to monitor for:
    - Structure of the mosaic
    - Presence if non-native invasive plants
    - Presence of positive indicator species
    - Amount of scrub
- Survey bird assemblage (as part of site wide bird survey)
- Survey Odonata (dragon and damselflies); as part of site wide Odonata survey
- Record incidences of vandalism

4.5 Stream

4.5.1 Evaluation

Streams play essential roles within a catchment including providing natural flood control and maintaining biological diversity. However, many of these small water bodies are particularly vulnerable to growing land-use pressures (e.g. housing, agriculture) and environmental change (e.g. flash flooding of increased short high rainfall events). The greatest pressure on the physical processes in these waters has been their extension and modification for agricultural drainage and urban development resulting in highly modified discharge and temperature regimes that have implications for flood and drought control further downstream. The linear nature of a small stream or brook exposes them to a wide range of inputs, including nutrients, pesticides, heavy metals, sediment and emerging contaminants. Small water bodies are also very vulnerable to invasions of non-native species, which along with the physical and chemical pressures, will affected many groups of organisms with consequent implications for the wider biodiversity within the catchment (Riley et al., 2018). Significant areas of adjoining priority habitats (such as fen, woodland, grassland) may also form an integral component of riverine systems for the purposes of conservation and management. Both the water itself and the banks and nearby land will support a range of communities of flora and fauna.

There are three native mammal species that are particularly associated with water courses in the UK: the otter, water shrew and water vole. A number of bat species regularly feed over streams and

several other mammals use them for foraging and drinking. More than 20 bird species are regularly found breeding or feeding along watercourses. Streams are important habitats for the UK's native freshwater fish fauna. Many amphibians and reptiles also depend on streams as they are an integral part of the floodplain system. Invertebrate assemblages are associated with particular types of steam. Local variations in current speed and substrate determine their precise distribution. It is thought 1000 species of invertebrates exploit the water-edge habitat and more than 3500 species spend all or part of their life cycles in fresh water.

4.5.2 Current Status

Radley Brook is classed as a main river by the EA, flows north to south bisecting Abbey Fishponds local nature reserve, and was canalised sometime around 1979 (mentioned in a letter to BBOWT), but since then the stretch through Abbey Fishponds has been maintained as far as possible by natural processes. Most years there is a good year round flow of water, which flows over a variety of bottom substrates such as silts and stones, however it is not always clean or well oxygenated, as a number of road run-off drains run into the brook at various points along it course. It is a shallow stream less than 1m wide and approx. 10cm deep. The banks are predominantly steep. The northern half of its length is wooded in nature; this mostly willow scrub with 6 old willow pollards; (there used to be 2 more but these have since collapsed) these used to be managed by the Environment Agency who pollarded them in 1991, 1998, 2007/8. Since then they have been re-pollarded in 2020/21. The willow scrub then thins out and becomes increasingly scattered towards the bridge in the centre of the site. South of the bridge there are extensive patches of bramble, scrub and trees including oak, ash, horse chestnut and poplars, which shade the stream. Some of the shrubs in this area are non-native and of garden origin. It is then more open to the south of the site. In addition to willows, the scrub along the length of the stream includes occasional elder, hawthorn, ash, rose, spindle, hazel and sycamore *(Acer pseudoplatanus).*

There are water plants such as watercress *(Nasturtium officinale)* and fool's watercress, feature along the toe of the bank, and a water vole colony uses the stream a various points throughout the year feeding on the diverse streamside vegetation. For more information on water voles at the site please refer to section 2.6 Environmental Information – Water Voles. Grasses are interspersed with yellow flag, brooklime, watermint, flote grass *(Glyceria fluitans)*, water forget-me-not, angelica and water figwort. Further up the sloping banks garlic mustard *(Alliaria petiolate)*, willowherbs, and cow parsley grow.

The bankside is a mixture of open patches, willow pollards and patches of bramble and overhanging willow or alder *(Alnus glutinose)* scrub providing shade for bullheads and variation in the streamside habitat, increasing the niches available for invertebrates. Trees and scrub also provide dead wood in and around the stream, providing structural diversity and being of benefit to fungi and aquatic invertebrates.

4.5.3 Factors and Constraints

- Positive factors
    - Remedial action to increase the amount of marginal vegetation is relatively straight forward.

    - Streams that are close to other wetland habitats have more species than isolated streams.
- Constraints
    - Water quality and species diversity can be affected by surface run-off from the local catchment
        - Site is surrounded by urban development - a likely source of polluted water
    - No ability to control water levels
    - Scrub shading stream reduces the amount of aquatic and marginal vegetation
    - Invasive non-native species – although none are present in the ditches only himalayan balsam present is small amounts currently, seeds can be easily brought onto site especially during flooding events. Some species are also easily transferred on animals (e.g. Australian swap stonecrop on wetland bird feet).
    - Weed control is expensive and time consuming.

4.5.4 Stream Objectives

To maintain the stream in a favourable condition, where:

- Shade from bankside vegetation/scrub/trees is managed whereby differing stages of succession is maintained. The target is to have:
    - 30% shady (at the northern end of the stream where houses back onto the water course);
    - 30% open (from south of the bridge);
    - and 40% partly shady, managed on a rotational coppicing/scrub clearance regime to create a varied structure of amounts of shade and deadwood (over the middle section of the watercourse).
- The substrate of the stream where:
    - ½ of the stream with ~50% (or more) cover of gravel
    - ⅓ of the stream with ~ 25% (or more) cover of silt

Different substrates are of benefit to different aquatic species.

- Dead wood present within the stream (e.g. >20% of stream)

Dead wood found within the stream plays an important role in stream ecology. It is important for many invertebrates such as caddis flies, can provide a perch for both *odonata* and bird species and also provides structural diversity within the stream, so adding to the available habitat niches.

- A good proportion of the stream with marginal vegetation coverage (e.g. ⅔rds)

The aquatic and marginal vegetation is a very important component of the stream habitat. Not only is the flora important in its own right, both in abundance and diversity, but this vegetation provides a habitat for many other species. For example water voles exhibit strong habitat preferences amongst riparian vegetation, selecting sites with grass tussocks and emergent plants, while avoiding sites heavily grazed/closely cut, trampled or over shaded by dense scrub/trees (Strachan and Moorhouse 2006).

- ½ the stream and bankside to have with 3 or more key species, which are:
    - Meadow Sweet
    - Purple Loosestrife
    - Marsh Marigold
    - Water Forget-Me-Not
    - Brooklime
    - Ragged Robin
    - Yellow Flag
    - Spearwort spp.
    - Water Mint
    - Bogbean

    - Burr Reed spp.
    - Pondweed spp.
    - Duckweed
    - Starwort/hornwort
- No invasive plant species, these include *Crassula*/Parrot's feather/Japanese knotweed/ Himalayan balsam
- No more than 25% cover of nettles/cleavers/bramble along stream bankside

Some naturally occurring species, such as nettles, brambles and cleavers, can have similar effects as invasive plants by dominating the habitat.

- A good number of water vole signs (burrows, latrines and feeding) found along Radley Brook

4.5.5 Management Rational

The stream edge will be managed by:

- Managing scrub
- Cutting bankside vegetation
- Pollarding willows

Managing Scrub

If left uncontrolled scrub (including bramble) and tree species will start to grow and dominate the stream banks, increasing levels of shade to the detriment of bankside vegetation and its dependent flora and fauna, in particular water voles. Shade can have mixed benefits. Some species such as bullheads actually require some shade and these and other species, such as many aquatic invertebrates, benefit from the structure and food resource (in the form of submerged leaf litter and deadwood), provided by the over-hanging trees. Additionally, shade cast by trees can help to prevent extremes of temperature in a small stream and waterside trees such as willow and alder are of value in their own right, as both support rich invertebrate fauna. However, waterside trees are not always beneficial; too much shade can inhibit the growth of aquatic and marginal vegetation, which can result in a loss of aquatic plant biodiversity and impact upon oxygen levels within the water, as well as indirectly negatively impacting on species such as water voles. It can also make the site unsuitable for warmth loving invertebrates.

Most water vole activity occurs around and to south of the bridge. When undertaking work in this area, care must be taken not to damage the burrows. Above ground, the water vole's activity is largely confined to runs in dense vegetation within 2-5m of the water's edge (Strachan and Moorhouse 2006). Ideally most work along the bankside should be carried out during the winter as water voles spend much of their time underground during this period. The rotational removal of the scrub cover will encourage better bankside grass cover for water voles. This can be split into 3 sections, roughly 3rds along the stream:

a) Southern section; Audlett Drive end to the bridge:

Scrub will be removed from the southern ⅓ of the stream on a rotational basis; this section is already relatively clear so small sections, where scrub exists, will be coppiced on a yearly basis, during the winter (out of bird breeding season), from within 2m of the water's edge. Only scrub on one side of the bank will be removed in each section. Mature trees will be felled or pollarded as appropriate (pollarding will be subject to appropriate funding for contractors to undertake the works). Scrub and trees should be removed as low to the ground as possible. Some of the arisings can be placed under any remaining trees outside of the 2m cutting zone, or to create a dead hedge along either bank, to

create an informal barrier to prevent access across the stream, and to reduce disturbance to the stream flora and fauna, for example from people and dogs.

b) Middle section; from the bridge traveling upstream to where the housing begins/reedbed ends:

Scrub will be removed from the central ⅓ of the stream, north of the bridge, again on a rotational basis. This 140m section has been divided into 8 sections and, working north from the bridge, 2 non-consecutive sections, on opposite sides of the stream, are to be cut on a yearly basis, during the winter. (Since 2015 four sections have been cut.) Only scrub on one side of the bank will be removed in each section. Mature trees will be coppiced or pollarded as appropriate. All cut stumps will be left to regenerate creating a varied structure of bankside vegetation from new growth, with lush bankside vegetation, through to 8 year old willow coppice (before the rotation starts again), with stands of bramble dotted throughout. Some of the arisings can be placed under any remaining trees outside of the 2m cutting zone, or to create a dead hedge along either bank (as with the above section).

c) Northern section; from the end of the reedbed to the Radley Road inflow of the stream:

The northern ⅓ of the stream, where the housing begins, will mostly be managed by non-intervention apart from the 6 mature willow pollards, see pollarding willows section below for more detail.

Cut Bankside Vegetation

To encourage a flush of fresh new growth, a late cut every 1-2 years would stimulate a rich grassy sward in non-scrubby/bramble patches along the stream bankside, providing plenty of food and cover for water voles. Cutting should not take place during April, May and June inclusive. Bankside vegetation is best undertaken in late summer (mid-July to mid-September). Cutting height should be set to retain 10-15cm of vegetation. Small sections should be cut at any one time especially around the main area of activity. Cut only one bank in any one year and leave a strip of vegetation at the toe of the bank and in the water. Rake off arisings and pile away from burrows or areas of more diverse vegetation.

Pollard Willows

Managed pollards should always be kept in management even if they have not been managed for many years. Old willow pollards readily fall apart and consequently a valuable dead wood habitat is lost; however, it is important not to re-pollard a line of willows all at the same time. Pollarding should take place on a rotational basis, approximately every 10 years, so that any invertebrates associated exclusively with branches and twigs are not completely lost from the reserve. At the Radley Road end of the stream there are 6 mature willow pollards which will be pollarded every 10 years with no more than 2 being cut in any one year.

Trees are ready to pollard when the stems or branches are 100 -150mm in diameter. Pollarding is similar to coppicing, with the branches of the tree being cut off and removed at a height, originally to prevent grazing of any regrowth by stock. All cut material should be stacked at the base of the tree as a habitat pile. Pollarding should take place using bowsaws/polesaws, if the poles are sufficiently small enough, otherwise, due to the health and safety issues, this work should be done by contractors. As of 2021 out of the 6 remaining pollards; 2 willow pollards were done during winter

2019/20, and a further 2 during winter 2020/21. The remaining 2 pollards have collapsed but could be pollarded to some extent.

4.5.6 Management Activities

- Control scrub along the stream on a rotational basis during winter months (Oct-Feb)
- Cut bankside vegetation, where it exists, on a 2 yearly rotation, remove all arisings (late summer)
- Pollard the 6 mature willows on the northern section of the stream on a 10 yearly rotation, during winter months (Oct-Feb)
- Control mink if they are found to be present on the stream, in partnership with BBOWT Water Vole Recovery Project

4.5.7 Monitoring Activities

- Carry out stream rapid assessment between May and end of August every 3 years (aims to quickly and simply assess the condition) to monitor for:
    - amount of scrub along the stream banks
    - substrate make-up of the stream bed
    - stream banks for positive and negative indicator vegetation
    - amounts of dead wood within the stream
    - stream for aquatic/marginal vegetation
- Survey bird assemblage (as part of site wide bird survey)
- Carry out Water vole survey (every 3 years coordinated by BBOWT)
- Check mink raft for the presence of mink footprints
- Record any pollution incidences & report to the EA

4.6 Woodland & wet woodland

4.6.1 Evaluation

Mixed Deciduous Woodland

Lowland mixed deciduous woodland includes woodland growing on the full range of soil conditions, from very acidic to base-rich, and takes in most semi-natural woodland in southern and eastern England, and in parts of lowland Wales and Scotland. The woods tend to be small, less than 20 ha. Often there is evidence of past coppicing. There is often a great variety in the species composition of the canopy layer and the ground flora, and this is reflected in the range of associated National Vegetation Classification (NVC) and Stand Types of which under the grouping of 'mixed deciduous and oak/birch (*Quercus spp/Betula spp*) woodlands' there are 7 sub-communities but all with the following species present:

Field Maple *(Acer campestre)*
Hazel *(Corylus avellana)*
Ash *(Fraxinus excelsior)*
Dog's-mercury *(Mercurialis perennis)*
Bramble *(Rubus fruticosus agg.)*
Common Feather-moss *(Eurhynchium praelongum)*

Quercus robur is generally the commoner oak (although *Quercus petraea* may be abundant locally) and may occur with virtually all combinations of other locally native tree species. Locally, it may form

a mosaic with other types, including patches of beech woodland and small wet areas. Rides and edges may grade into grassland and scrub types.

There are no precise data on the total extent of lowland mixed deciduous woodland in the UK, but in the late 1980s the Nature Conservancy Council estimated the total extent of this type to be about 250,000ha. There is, however, no doubt that the area of this priority type on ancient woodland sites has declined in area by clearance, overgrazing and replanting with non-native species, by about 30-40% over the last 50 years.

Wet Woodland

The conservation value and importance of wet woodland is recognised by its designation as a Biodiversity Action Plan habitat. Wet woodland occurs on poorly drained or seasonally wet soils, usually with alder, birch and willows as the predominant tree species, but sometimes including other species such as ash and oak on the drier riparian areas. It is found in areas such as on floodplains, as successional habitat on fens, mires and bogs and along streams. The boundaries with dry woodland may be sharp or gradual and may (but not always) change with time through succession, depending on the hydrological conditions and the treatment of the wood and its surrounding land. Therefore wet woods frequently occur in a mosaic with other woodland key habitat types and with open key habitats such as fens.

Wet woodland combines elements of many other ecosystems and as such is important for many taxa. The high humidity favours bryophyte growth. A number of invertebrates are associated with alder, birch and willows including BAP priority species such as the sallow guest beetle *(Melanopion minimum)* and the jumping weevil *(Rhynchaenus testaceus)*. Even quite small seepages may support craneflies such as *Lipsothrix errans* and the endemic *Lipsothrix nervosa*. Dead wood within the sites can be frequent, and its association with water provides specialised habitats not found in dry woodland types - the fly *Lipsothrix nigristigma* for example is associated with log jams in streams. Wet woodland provides cover and breeding sites for otters. While few rare plant species depend on wet woodland per se, there may be relict species from the former open wetlands on the site such as the marsh fern *Thelypteris palustris* (Natural England, 2014).

4.6.2 Current Status

The woodland at Abbey Fishponds is small, secondary woodland, subjected to disturbance in the form of dumping of garden waste and rubbish. The ground flora is not very diverse or abundant, but is in keeping with this type of woodland and could be improved. A survey report c.1977 describes the wood as mainly elm (dead) with conifers and scrub e.g. elder. In 1993 the woodland was described as a small area of sycamore dominated woodland with ash and some suckering elm (as many mature elms had been lost to Dutch elm disease). Work took place in 1996 to fell an area of trees approx. 30m x 8m on the eastern boundary of the wood, comprising potentially dangerous dead elms and declining squirrel damaged small and medium sized sycamores. This opened up the canopy for reed growth and alder buckthorn. On the drier slopes, elms have died and sycamore is regenerating in its place. Sycamore and ash dominates the canopy today, with an understorey of willows, elder, rose, field maple and hawthorn. There is a patch of reed within the woodland and trees have been cleared along the length of the stream in previous years to connect this area of reed with the main reedbed. The small stream is culverted under the road and is the main source of water for the reedbed and northern part of the fen.

4.6.3 Factors and Constraints

- Positive factors
    - Succession

Over time the trees within the woodland and wet woodland will continue to mature, growing older and eventually dying. This leads to a natural processes of gap creation and tree regeneration. If however this does not occur, then the woodland will become very dense, the ground flora will be shaded out and the structure lost. The affect that succession may be having on the woodlands ecological integrity can be monitored by looking at the attributes of the wood.

- Constraints
    - Development, e.g. urban growth.
    - Overgrazing, through expansion of populations of deer in southern regions.
    - Reduction in structural diversity within the woods though the cessation of traditional management practices, such as coppicing.
    - Climate change is likely to affect the distribution of various species and increase of existing and new tree diseases e.g. ash dieback *(Hymenoscyphus fraxineus).*

In previous iterations of this management plan it was felt that some sycamore was acceptable as a component of this woodland (especially the larger, mature specimens) but it was actively targeted for felling in an attempt to control its spread – because of its shady canopy which can limit the rich ground flora associated with ash. However, recent research has shown that sycamore has similarities to ash in some respects, in terms of the species it supports (nearly half of those associated with ash can also use sycamore) and some of its other ecological functions (nutrient cycling) and qualities (such as its similar bark pH – important for some lichens). In European ash forests sycamore is a native component, and it has now naturalised itself into many UK woodlands. As a veteran tree, sycamore can provide an excellent habitat for bats in its flaky bark, and heart rot qualities similar to ash (white rot) (Forestry Commission, 2019). Therefore controlling sycamore is no longer a feature of this management plan.

4.6.4 Woodland Objectives

To maintain the woodland and wet woodland in a favourable condition, where:

- A good coverage of typical woodland ground flora species (e.g. at least 20% cover)

The more diverse and abundant the woodland flora, the better the woodland will be for biodiversity.

- Species such as nettles/bramble/ivy/invasive garden species are not allowed to dominate (e.g. Less than 20% cover of these species)

Small urban pieces of woodland can often become dominated by species such as nettles and ivy or garden escapes. While these species can provide valuable hibernation areas and nectar sources etc., once they start to dominate they may 'take over' the more vulnerable and important woodland flora species.

- A good coverage of native tree seedlings/saplings (e.g. at least 10% cover)

Because Abbey Fishponds is an urban site, garden shrubs and plants have become established on the nature reserve, either because they have been planted deliberately or have naturally regenerated. Whilst it is acknowledged that garden plants can have benefits for wildlife, Abbey Fishponds is a nature reserve and should comprise mostly of native species, however the urban location and difficulty of getting rid of some garden plants is recognised.

- A healthy understory (e.g. sparse but wide spread understory with approx. 50% understory cover **or** dense but less wide spread understory with approx. 25% understorey cover and 70% canopy cover)

Woodland/wet woodland in good condition should have a complex structure of tree seedlings ready to grow into trees, an understory layer of tree saplings, and a canopy layer of mature trees. This structure provides the mix of habitats and conditions that woodland species need to thrive. Understory requirements have been split into two categories to take into account understory which is widespread and less dense, or understory which has a more patchy distribution but is more dense.

- A good amount of dead wood left on site (e.g. at least 20%)

Dead wood provides a very important habitat for many invertebrates and fungi, and is an integral part of any healthy woodland and wet woodland.

4.6.5 Management Rational

The woodland will be managed by:

- Tree safety works
- Tree planting
- Non-Intervention
- Maintaining Woodland Structure and Composition through:
    - Controlling garden escapes
    - Pollard/coppice willows and hazels

Tree safety works

As much of the woodland at Abbey fishponds is alongside rights of way these should be kept clear and monitored for unsafe trees; tree safety survey is undertaken by VWHDC Tree Officer.

Tree planting

Following any tree felling works replacements of native tree and scrub/understory species will be replanted, in order to perpetuate the survival of the woodland areas, and to ensure a varied age structure. Where necessary young trees have been protected with tree guards/tree corrals to prevent damage from grazing deer.

Retaining deadwood

Several trees that have been felled for safety reasons have been left on site compensate for the standing deadwood habitats that were lost. The majority of the other logs are left on site to provide other deadwood habitat. Where possible dead branches have been left on trees as they unlikely to affect the health of the tree.

Non-Intervention

Much of the woodland and wet woodland will be managed through non-intervention. Allowing woodlands to develop naturally without any human management input can have multiple benefits and often non-intervention is the only viable option for small pockets of woodland, such as those at Abbey Fishponds, which are simply not large enough to sustain the slow rotation required by coppicing.

Maintain Woodland Structure and Composition:

Control Garden Escapes

All garden plants should be removed by whatever means necessary, whether this be digging them up, cutting down or treating with herbicide (glyphosate). Depending on the species, the arisings may be left on site in such a way as to not be detrimental to the native flora and fauna or removed from site in bags for later disposal. However, many garden plants that get dumped are invasive in nature and may need to be killed off chemically, in which case the native species should be considered when devising a plan to do so. If herbicides are to be used near a water course the Environment Agency should be consulted.

Pollard/coppice willows

A small area of willows was pollarded/coppiced in Compartment 5, in order to develop an area of thicker scrub. This will need to be repeated on rotation in the future as the coppice matures and develops into more leggy scrub.

4.6.6 Management Activities

- Vale Tree Officer to undertake tree safety survey on site, and organise tree safety works as appropriate
- Tree planting following and tree felling works on site at a ratio or 1 'standard' to 5 'understory' native tree species
- Create habitat piles with fallen/felled timber on site
- Control garden escapes by digging, cutting or treating with herbicide
- Pollard/coppice sections of willow in Compartment 5 on a 5 year rotation

4.6.7 Monitoring Activities

- Carry out woodland/wet woodland rapid assessment between April and May every 5 years (aims to quickly and simply assess the condition) to monitor for:
    - succession and structure within the woodland
    - composition of ground flora
    - composition of tree species
    - amount of dead wood within the woodland
    - amount of canopy cover
- Survey bird assemblage (as part of site wide bird survey)

4.7 Earthwork (Daisybank)

4.7.1 Evaluation

Earthworks such as the Daisybank and other archaeological features are important because they provide us with a tangible link to our ancestors. Information locked up inside such features can tell us about how people lived, who they were and what they believed in. Such monuments are very vulnerable as, once lost, they can never be replaced. If an earthwork is recognised as being nationally important, it is designated as a Scheduled Ancient Monument. Daisybank is not currently classed as this.

4.7.2 Current Status

The Daisybank is divided into two halves by the Radley Brook – the eastern half and the western half. The eastern half has predominantly blackthorn scrub on its top and northern slope (which has been retained but not allowed to spread any further) with a footpath on its southern slope. The mixed scrub has scalloped edges to provide sheltered area for invertebrates. Where the scrub is absent on the eastern edge of the Daisybank, more uncommon plants such as lesser calamint, vervain and spiny restharrow thrive on the open sunny banks. The western slope and section nearest the bridge is predominantly short turf protecting the earthwork from erosion. As Daisybank is the highest point on the nature reserve, it affords good views across the fen and the remainder of the site and it is sometimes used for picnicking and as a viewpoint, this is however leads to some trampling of the vegetation by visitors and. The western half is rough tussocky grassland with a few nettles and brambles. Whilst people are not actively encouraged to walk and sit on the Daisybank it is accepted that people will do so as long as they are not significantly damaging the structure and its vegetation. As more information is discovered about its origins there is the possibility to erect interpretation panels will be erected to inform local people.

4.7.3 Factors and Constraints

- Positive factors
    - Presence of more uncommon plants such as lesser calamint and vervain
    - Archaeology – if there is an opportunity to investigate the archaeology of this site it should be taken.
    - Presence of a cover of low growing vegetation is beneficial as it prevents soil erosion, which can damage the archaeological interest.
- Constraints
    - Vandalism
    - Visitor Pressure
    - Succession

4.7.4 Daisybank Objectives

To maintain the earthwork in a favourable condition, where:

- Less than 3 vandalism incidents a year

Periodically there are incidents whereby people dig holes in the Daisybank, damaging the structure and ground flora.

- Less than 5% bare ground

People enjoy the good views across the fen and the remainder of the site from Daisybank, which can cause trampling and potential damage to the sward. The fact that the footpath that crosses the nature reserve runs along the side of the Daisybank, makes it very easy for people to climb on to the grassy top. The path itself has an impact on the feature, as it is well used and subject to erosion. However, some minor trampling of the Daisybank may not be of concern and may in fact be beneficial to the biodiversity of this site, especially for invertebrates. In order to support the greatest possible range of invertebrates, a site must provide variation in terms of its vegetation height and topography and have areas of bare or disturbed ground (Kirby 1992). But too much visitor pressure can become detrimental by damaging the physical integrity of the structure or damaging populations of uncommon plants that are growing on the bank.

- Less than 20% cover of trees/scrub

Like all habitats, archaeological features have a tendency to succumb to succession and become overgrown with taller vegetation and eventually scrub and mature trees. This vegetation can cause a huge amount of damage to the biodiversity and the archaeology, especially trees with large root systems when they start to lean or completely fall over, damaging the structure.

- Greater than 75% cover of grassy sward
- Lesser calamint and vervain present

4.7.5 Management Rational

The Daisybank earthwork will be managed by:

- Maintaining the structural integrity
- Cutting the grassland (for details see section 4.4 Grassland/Tall herb/Scrub)
- Controlling the scrub

Maintain Structural Integrity

Repair damage as required. If possible, backfill any holes with the material taken from it. Alternatively, material could be sourced from elsewhere on site e.g. through hand digging a small pool in the neighbouring fen. Whilst the soil is not going to be the same as that of the Daisybank, the source is nearby and it would be of benefit to the fen.

Control Scrub

If necessary, mature trees should be felled and small scrub removed by hand using tools. Work should take place outside bird nesting season. Cut small scallops into existing scrub to benefit invertebrates.

4.7.6 Management Activities

- Maintain structural integrity by repairing as required
- Cut grassland on the banks spring (March) & summer (August)
- Control scrub on the Daisybanks by cutting back encroaching scrub during winter by 0.5-1m to reduce further encroachment on a rotational basis every 2 to 3 years.
- Create scallops in the existing scrub
- Consider interpretation panel/s to inform public about Daisybank, especially if more archaeological information is discovered through archaeological investigations and if funding allows

4.7.7 Monitoring Activities

- Record incidences of vandalism
- Monitor effects of visitor pressure and physical integrity of the banks
- Survey Daisybanks for positive indicator species and levels of scrub - as part of grassland rapid assessment
- Undertake archaeological investigation if the opportunity arises

4.8 Visitor Enjoyments and Public Access

4.8.1 Current Status

Interpretation

There is currently no formal interpretation on site. There are 4 welcome notices, with the Earth Trust 'Countryside Code' on them at each of the 4 entrances to the site. There is a notice board at the Radley Road entrance where posters advertising Earth Trust events or visitor information e.g. wildlife of interest, are placed. Waymarker discs to indicate certain behaviours e.g. dogs on leads, are used at the entrances in additional to the welcome sign.

Visitor Access

Access to Abbey Fishponds should meet the Countryside for All Accessibility Standards. This document provides standard specification for types of access and advocates "least restrictive option" as best practice for access at countryside sites. Current access points may not achieve the required standards however, if they are to be replaced, upgrading should be considered only if it is appropriate. There is currently a small triangular kissing gate on the northern entrance to the reserve; this access is intentionally small in order to prevent motorbikes and cyclists from entering the reserve. A larger kissing gate is installed at the southern entrance of the reserve, again for similar reasons. The eastern and western entrances, on the public footpath, are not gated; however both are situated at the top of steep slopes leading into the reserve and the footpath crosses the stream via a bridge and a set of steps.

Abbey Fishponds has a permissive north to south footpath running through the reserve, mostly parallel to the Radley Brook. It is surfaced with woodchip during the winter months, with some section having hardcore or rubble added underneath the surface to assist with drainage, however much of the path and becomes boggy. Hoggin could be added to the surface of these areas to improve the path surface or a boardwalk installed which allows visitors to avoid the boggy areas completely; this project would be subject to additional funding.

There is an area of path to the south of the reserve which is quite often completely underwater during the winter; at the moment a diversionary path is cut each autumn which allows visitors to avoid this area but involves them walking very close to the backs of the houses in Gardiner Close. This solution works very well but an alternative could be to install a length of boardwalk in this area, again subject to additional funding.

There is also a public footpath/right of way running east to west through the reserve. The responsibility for maintaining the public right of way at Abbey Fishponds are shared between the Highway Authority VWHDC and Earth Trust. Earth Trust is responsible for ensuring that the public right of way is kept free of obstruction. It must:

- Cut back vegetation growth e.g. hedges, alongside a right of way

The Vale must:

- Maintain the bridge the crosses a right of way

And the Earth Trust or the Vale must not:

- Erect new fences, requiring stiles or gates, across rights of way without the prior permission of the highway authority
- Erect misleading signs likely to deter use of rights of way
- Remove or alter the direction of rights of way signs and waymarks
- Allow barbed wire or electric fencing to interfere with the public's use of a right of way

Visitor Surveys

The site is well used by residents of Abingdon and visitors to the area. To date no visitor surveys have been carried out at Abbey Fishponds, but we are hoping to carry out some surveys in the coming year along with those being carried out at the other sites that Earth Trust manages. The visitor surveys that we have used on other sites have been used to find out more about people were using the site, where they travelled from and asking for their comments and suggestions on site management. The results of past surveys at other sites have helped us to make improvements to that site, plan interpretation and find out what the visitors really think about the site as a whole, including access and accessibility. They also help us to monitor and report on visitor numbers and visitor satisfaction, with our aim being that visitors are happy with the site management in at least 90% of interviews. Access points should be checked and maintained regularly.

General Attractiveness

Regular litter picks are carried out at Abbey Fishponds. The welcome signs are checked and cleaned regularly. Two dog bins are provided for people's convenience at the Radley Road entrance into the site and near the bridge which crosses Radley Brook next to Daisybank (these are emptied by VWHDC). Footpaths are mown between April and September by Vale contractors.

4.8.1 Visitor Enjoyment and Public Access Objectives

To allow informal public use and enjoyment of Abbey Fishponds LNR, where:

- Interest from the local community in wildlife and the reserve is encouraged
- All visitors to the site have a positive experience.
- Interpretation posters of the site and its wildlife in the notice board will be clear and concise in a language that is accessible to all, content will be kept up to date and the notice board maintained.
- Directions to the site are clear on the Earth Trust and VWHDC websites.
- Reserve infrastructure is maintained in good condition e.g. bridge, gates etc.
- Interpretation panels to be considered for all 4 entrances, if funding allows, erected lectern style, so that they can be easily viewed by people of all sizes, whether standing or in wheelchairs and should include:
    - The name of the reserve and Earth Trust branding should be prominent
    - A welcome message, key information, and contact details for further information about the Trust.
        - Contact information for the Trust should include website, phone, address and charity number.
    - Information about how to get around, with a map and any paths clearly identified.
    - Interesting features of the reserve should be highlighted with pictures and text.
    - All boards should be visually attractive, lively and engaging.
- Consideration given to potential footpath improvement project e.g. through installing boardwalk or adding hoggin to sections; would need to seek funding.

4.8.2 Factors and Constraints

- Positive
    - General attractiveness of site
    - Potential for a good range of quality habitats on the site to engage visitors.

- Constraints
    - Some forms of interpretation could be visually intrusive and conflict with the landscape and setting.
    - Vandalism to expensive interpretation panels etc.

4.8.3 Management Activities

Public Access and Interpretation at Abbey Fishponds will be managed by:

- Dog owners using the site will be encouraged to exercise control over their dogs to prevent conflicts with other site users and to reduce dog-fouling problems by the provision of two dog bins.
- Maintenance of access points and access furniture (e.g. gates) as and when required
- Maintenance of visitor furniture e.g. gates as and when required
- The preferred paths across the site mown throughout the summer months.
- Maintenance of notice board and waymarker discs as and when required.
- Regular litter picks, removing rubbish off site
- Maintain the network of Volunteer Community Wardens (see section 4.9.3 for more information)
- Site risk assessment carried out every 6 months, see section 5.2 for further information and Appendix 3.
- Consideration given to design of and installation of interpretation panels at entrance ways/near Daisybank; would need to seek funding.
- Consideration given to potential footpath improvement project e.g. through installing boardwalk or adding hoggin to sections; would need to seek funding.

4.9 Community Involvement

4.9.1 Current Status

The site is managed in a way that safeguards, maintains and enhances the ecological interest, and at the same time ensures continued public enjoyment and involvement in the reserve.

The main objectives of management are to:

- Promote nature conservation
- Provide informal public access and enjoyment

The management of Abbey Fishponds directly contributes to two of the Council's Strategic Objectives:

- To maintain and enhance the environment
- To improve health and well-being

In addition, it indirectly contributes to the Councils strategic objective to maintain and improve the economy by helping to boost the local tourist industry.

The Earth Trust's mission statement is:
"To give people access to and experience of the environment through the natural green spaces we manage and together understand what we should do to care for the planet."

This will be achieved by:

- Engaging and inspiring the public
- Demonstrate and communicate sustainable management and the public benefits of land
- Care for, improve and communicate about the natural green spaces we manage
- Being financially sustainable

In order to ensure that the management of Abbey Fishponds fits with VWHDC and Earth Trust's strategic objectives it is crucial the site is used to engage with the visiting communities.

Abbey Fishponds has an active community group, Abingdon Green Gym who understand the importance of the reserve for wildlife. They are committed to enabling other people to visit, enjoy the site and learn about the natural history of the site. Members of the community group keep an eye on the site and inform staff of any issues that arise. The group also undertakes general maintenance of the site with the site warden. The community Green Gym group is a mutually beneficial partnership between local residents and Earth Trust.

4.9.2 Factors and Constraints

The factors and constraints affecting community engagement are:

- Anti-Social Behaviour and Vandalism
- Barriers to Engagement

Vandalism and anti-social behaviour

Abbey Fishponds has had problems with anti-social behaviour in the past. However, compared to many areas, the problems encountered were relatively trivial involving minor vandalism of the bird boxes, fires associated with parties on summer evenings, littering and dog fouling.

Barriers to Engagement

There are a number of barriers which may stop people engaging with a green space, such as Abbey Fishponds. These can be availability (proximity to), accessibility (such as walkability and connectivity to) and attractiveness (whether they would want to visit e.g. a place subject to antisocial behaviour or vandalism is not likely to be frequently visited by most members of the local community. For many people, safety fears (whether real or perceived) are a concern which may preclude people from going to a site.). There may also be cultural barriers or people may not perceive the place as being relevant to them.

Community work at Abbey Fishponds aims to identify, understand and reduce such barriers. We will work to develop an inclusive culture providing opportunities for people to get involved.

Most of our Community Nature Reserves are surrounded by housing. At the very least there is a centre of population near to the site. Community Nature Reserves provide a focus for a variety of community engagement activities, through which we can communicate our messages about the importance of the natural world and encourage people to consider their actions, working together to benefit wildlife.

4.9.3 Community Engagement Objectives

Local residents have been involved in the reserve from early on with one Volunteer Warden being involved with the site since it open as a nature reserve and it is therefore important to keep the

link going. It is our wish that the community near to and regular users of the site (e.g. families, walkers, dog walkers) will respect the site and understand and uphold any restrictions that may apply. They will know that there is an active community group (Green Gym, Earth Trust volunteers) and understand how to become involved if they wanted to. They will be engaged with the Earth Trust and the work that we do, in general terms.

People who attend events at Abbey Fishponds will continue to have an enjoyable experience providing them with a better understanding of wildlife, the site and its management. They will leave the event with an understanding of the work of Earth Trust. Attendees are inspired to take action for green spaces. They will be able to participate further with the organisation and make changes to their lifestyle, such that it becomes more sustainable and lessens its impact on the natural world.

4.9.4 Management Activities

- Carry out at least one event on the reserve each year involving the local community
- Support community group and encourage local community members to get involved in the volunteer work parties on the reserve
- Continue to recruit, train and manage the team of volunteer wardens
- Keep the notice board regularly updated with relevant information
- Establish/maintain good relationships with neighbours

Community event

The main format for events on Community Nature Reserves is likely to be a Wildlife Wednesday. They are small scale, fun family, drop-in events for local people encouraging them to discover the wonders of the site. It may or may not have a theme. It is likely to include a series of family friendly environmental education activities, relevant to the site and season, designed to help people to get closer to nature and find out about what makes the place special. The activities should be spread around the nature reserve, to encourage people to move around the site and feel confident doing so on a subsequent visit. By keeping the activities simple it reduces the resources required and the activities may be replicated at other sites where appropriate.

Other events appropriate for Abbey Fishponds include guided walks (staff or volunteer led) showing people around the site, explaining certain aspects of the site in detail e.g. Bat Walk. Other recent community events have included:

- bug hunting and bug hotel building arranged for the cubs and brownies .
- Night Safari's arranged for families (includes checking small mammal traps, using bat detectors, and checking moth traps).

Supporting community groups

Abingdon Green Gym has been in existence for several years. Their main interest has been and continues to be practical management of the reserve. They are also keen to encourage other members of the community to visit the site and get involved with its management. The main focus for staff is to continue to utilise the Green Gym (and Earth Trust) volunteers for reserve management and support the group in their current activities on the site.

Maintain the network of volunteer wardens
In 2018 a team of Volunteer Community Wardens was established. They act as site wardens during the year. The wardens talk to the visiting public, carry out litter clearance and report problems, incidents or health and safety issues directly to the site warden so they can be acted on.

5 Legal Responsibilities and Obligations

5.1 Legal Responsibilities at Abbey Fishponds LNR

Local Nature Reserve Designation
Local Nature Reserve (LNR) designation was given to Abbey Fishponds in 2010 by Natural England The LNR is a statutory declaration arising out of the 1949 National Parks and Access to the Countryside Act. Under this statutory designation the Council have the responsibility to manage Abbey Fishponds LNR both for nature conservation and public access objectives. The purpose of the designation was to safeguard, maintain and enhance the ecological interest, and at the same time ensure the continual public enjoyment and involvement in the site.
SODC are responsible for ensuring that the primary purpose of the fill pond as a flood alleviation scheme for East Hagbourne is maintained. No work undertaken as part of the management of the fill pond should adversely affect its functioning and safety.

Local Wildlife Site Designation
Local Wildlife Site (LWS) designation was given to Abbey Fishponds in 2016 by Thames Valley Environmental Record Centre (TVERC). LWS are sites with 'substantive nature conservation value'. They are defined areas, identified and selected for their nature conservation value, based on important, distinctive and threatened habitats and species with a national, region. They support both locally and nationally threatened wildlife, and many sites will contain habitats and species that are priorities under the county or UK Biodiversity Action Plans (BAP). Collectively they play a critical role in the conservation of the UK's natural heritage by providing essential wildlife refuges in their own right and by acting as stepping stones, corridors and buffer zones to link and protect other site networks and the open spaces of our towns and countryside. LWS is a non-statutory designation, which are defined in local plans under the Town and Country Planning system and the National Planning Policy Framework and are a material consideration when planning applications are being determined.

Wildlife and Countryside Act (1981)
The Wildlife and Countryside Act 1981 prohibits:

- the killing, injuring or taking by any method of those wild mammals listed on Schedule 5 of the Act.
- the damage, destruction, or obstruction of access to any structure or place which any wild mammal listed on Schedule 5 uses for shelter or protection and the disturbance of any such mammal while it is occupying a structure or place which it uses for that purpose.

The following Schedule 5 species have been found or are likely to be present at WCM:

- water vole
- common frog
- common toad
- bats
- otter

Trees
As set out in the 1975 regulations (amendments to the Town and Country Planning Act regarding Trees in Conservation Areas) the Council is exempt from the regulations "for work on trees on land occupied by the Local Planning Authority and carried out with the Local Planning Authority's consent". Clearly, the Council's Parks Officer for Trees would be closely involved in any works necessary.

Occupier's Liability Act
This Act imposes an obligation on all occupiers of the land, to ensure that every reasonable care is taken to remove any risk both to visitors and trespassers.

Health and Safety at Work Act 1974
All operations carried out on site must be undertaken by trained personnel using methods and equipment approved by the Health and Safety Executive, and also in compliance with national and local safety procedures. This obligation is extended to ensuring compliance by contractors working on the site.

5.2 Health and Safety Responsibilities

Review site risk assessment
A site risk assessment is required to ensure compliance with statutory and organisational health and safety procedures. In the UK all organisations which employ staff on sites, or provide public access to sites, must complete a detailed risk assessment or audit of the site. All potential dangers or threats on the site must be identified. All the implications for the health and safety of visitors are considered, and then controls, if necessary, are established and applied. Access to any site may be restricted by the presence of hazards. In extreme circumstances, there may be an obligation to close parts of sites, or even entire sites. Of course, in most instances, it will be possible to take remedial action to remove or isolate the risk and ensure visitor safety.

A site risk assessment should be reviewed at least on a six month basis and also whenever a new hazard is known to be present. A date for review should be set and adhered to – these can be staggered to avoid the need to review lots of sites at the same time but should not be allowed to run on beyond the year for any individual site. An earlier visit and review will be prompted if a likely cause of new hazards is known to have occurred, e.g. exceptional winds or flooding. Site risk assessments are freely available for anyone who requests them. In addition, they should be sent out to visiting groups or contractors before activities and used by anyone planning a project on a nature reserve to inform their 'on the day' risk assessment.

The Abbey Fishponds site risk assessments is the responsibility of the site manager (e.g. Senior Warden (Community Reserves)) but the task of reviewing can be delegated to any person with competence to carry out a risk assessment. A formal risk assessment process has been adopted following the Council's corporate procedure, a copy of the risk assessment form used can be found in Appendix 3.

Site safety inspections are carried out regularly by the warden; any issues are noted and actions taken noted on the site risk assessment form. In addition, the volunteer wardens and members of the public are encouraged to report any issues to the site warden. The warden will deal with issues

that pose a threat to public health and safety immediately or the area is cordoned off with appropriate warning signs and the council are then notified. If the problem does not require immediate action then it is scheduled into the quarterly work plan or the council informed and appropriate contractors appointed.

The warden or the council are contactable at all times in the event of an emergency.

Risk assessment process:

- Risk identified – assess level and severity of risk.
- Warden/volunteer removes/reduces risk immediately where possible.
- If immediate removal is not possible then reduce level of risk to an acceptable level and plan work to remedy situation as soon as reasonable.
- If this is not possible and there is a significant risk to site users then the site can be closed until level of risk is made acceptable.

Carry out tree safety work

The condition of trees on the reserve in relation to health and safety should be regularly reviewed and any safety work identified carried out. VWHDC has a Tree Officer who carries out an annual tree safety survey and any works with additional works being undertaken as and when necessary to maintain the safety of the site, undertaken by VWHDC arboriculture contractors.

Once the need for safety work has been identified there are decisions to be made about carrying out remedial work. Safety work tends to involve much higher potential for serious outcomes than tree work in a general nature reserve surrounding where the public can be kept at a safe distance. A risk assessment must be carried out, looking at the factors around each individual tree and the VWHDC Tree Officer organises an approved arborist contractor (e.g. Arboricultural Association registration).

5.3 Legal Responsibilities

Comply with Protected Species Legislation

A large number of different species are protected under law through various pieces of legislation. In general this does not pose a problem for conservation work, which is aimed at protecting habitats and species. However, it is essential that VWHDC and Earth Trust remains both legal and also demonstrates best practice. The majority of species are legally protected from standard activities including: being disturbed; injured; killed; sold; up-rooted; or having their 'shelter/home' disturbed or damaged.

The main pieces of legislation which protect species are:

- The Birds Directive 1979
- The Wildlife and Countryside Act 1981 (as amended)
- The Badger Act 1992
- Wild Mammals (Protection) Act 1996
- European Habitats Directive 1992 (The Conservation of Habitats and Species Regulations 2017 (as amended))

As otters are widespread across Oxfordshire the potential presence of otters should be considered as there ditches/stream connected to the Thames on site. Similarly, it is assumed that as there is woodland on site and trees are considered as potential bat roosts, appropriate bat best practice guidance should be adhered to.

5.4 Site Infrastructure and Administration

Site boundaries are important to maintain in their exact positions so that there is no chance of boundary disputes with neighbours. If fences or hedges are removed, the exact position of the boundary should be recorded. It is recommended that the boundaries of the reserve be properly registered to prevent garden encroachment and it is not known whether this has been done.

Roadside and public footpath hedges should be maintained in such a way that the growth does not interfere with passing vehicles or pedestrians. Boundaries which border roads, footpaths or private properties should be checked for dangerous trees by the VWHDC Tree Officer.

Gaps are constantly being created in the woodland/scrub barrier around the boundary of the reserve and it is important that these be gapped up either with dead hedging, fencing or tree saplings in order to maintain the integrity of the boundary and prevent access into more sensitive areas of the reserve.

Establish/maintain good relationships with neighbours

Abbey Fishponds is not an isolated patch of land but are bordered on all sides by neighbouring land owners, most of these are private home owners.

Periodic liaison or contact with our neighbours is important for several reasons. Work that we carry out may have impacts outside our boundaries, most often these will be visual, but there may also be practical implications such as noise, alteration to drainage, access, bonfire smoke, or increased traffic and public presence. Without warning or discussion with our neighbours, these could become negatives and lead to a poor opinion of VWHDC and Earth Trust being created. Good communication of our objectives may also help to protect green spaces, if our neighbours can be persuaded to adopt sympathetic land management on their boundaries, to buffer the habitats on our land. Good lines of communication with neighbours will also help in the speedy resolution of problems if they arise.

Liaison with neighbours should take place when we are planning works or events likely to have any of the impacts listed above, or when any work needs to happen on common boundaries such as fencing or tree safety work. It may also be appropriate if practices are observed or reported on neighbouring land likely to have an impact on a Trust reserve. More general regular contact could also be useful, even if there is no specific issue to discuss, just for the purposes of maintaining lines of communication.

Liaison with neighbours may take various forms, namely phone call, email, or letter; it could even be chatting over a fence. Records of communication should be noted on the Earth Trust database, and if appropriate, copies of letters or emails retained in the database. Contact details for key neighbours should also be retained by the Senior Warden (Community Reserves). VWHDC/Earth Trust signage

should always be visible, so that it is clear to new neighbours (or members of the public) who we are as landowner or leaseholder, and so they can contact us.

6 Environmental Sustainability

VWHDC & the Earth Trust seek to manage Abbey Fishponds in the most sustainable way. The key issues relevant to the sustainable management of the site are:

- Biodiversity protection and enhancement
- Sustainable procurement
- Carbon reduction
- Waste management Pollution reduction

6.1 Biodiversity Protections and Enhancement

One of the key aims of site management is the protection and enhancement of biodiversity. Section 4 of the management plan sets out how this, along with the other key objectives, will be achieved.

6.2 Sustainability Procurement

The management of the site does not require large scale or regular procurement of goods or services however; we will always seek to obtain goods and services from local, sustainable sources. Examples of this include the purchase of timber products from local suppliers, the use of wood chip from the council's tree works contracts for path surfacing and mulching of trees, the printing of posters for the interpretation/notice board on chlorine free paper and the purchase of log benches from local forestry contractors.

6.3 Carbon Reduction

The main factors contributing to carbon emissions are the use of contractors for regular maintenance such as the mowing of paths and travel to and from the site by site managers, volunteers and visitors. Contractors are used to mow the preferred paths. The contractors visit the site six times annually in the summer months and combine visits with other work on sites in Abingdon. The level of carbon emissions from contractors is therefore relatively low. Site managers are based either in nearby Little Wittenham (warden). Travel to and from the site is therefore minimal in carbon terms. Regular volunteers are encouraged to car share where necessary and the Earth Trust provides transport for volunteers to the site from Little Wittenham. The majority of regular volunteers are local and either walk or cycle to the site.

In order to reduce the carbon footprint we seek to reduce emissions where this is possible. The District Council is currently developing its new strategy on this since declaring a Climate Emergency. Part of the work within this strategy is identifying suitable locations for tree planting of appropriate tree species. As Abbey Fishponds is part of their land portfolio it is included within this new strategy, but currently we do not have the detail as the strategy hasn't yet been published. When it is available this management plan will be updated to reflect any changes, e.g. additional tree planting.

6.4 Waste Management

Rubbish dumping and dog fouling has been a problem on the reserve in the past. Two dog bins have been installed and the welcome signage asks people to use them. These measures have helped to reduce dog-fouling problems. Currently no litter bins are provided on site. This is a deliberate stance to encourage site users to act responsibly and take their litter home to recycle it. Experience over the management of the site suggests that this policy works very well as the level of littering is generally very low. Where problems have occurred this is as a result of unauthorised parties, in this case it is unlikely that the presence of bins would make any material difference. The litter situation is continually monitored and if there is any significant change then this policy will be reviewed. Any litter that is left on the site is collected either by the warden, volunteer wardens or volunteers. The Earth Trust offices have recycling facilities that deal with any recyclables. Non-recyclable waste is also disposed of at the Earth Trust offices. Relatively little waste is produced on the site from management operations.

6.5 Pollution Reduction

The only potential source of pollution which arises from the management of the site would be through the use of herbicides. The use of herbicides on the site is strictly controlled and avoided when possible, in favour of non-chemical control (manual removal/ hand pulling) unwanted/invasive plant species. All herbicide applications are carefully controlled and undertaken by licensed members of Earth Trust staff/contractors so that the likelihood of pollution occurring is minimised.

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8 Table of Management and Monitoring Activities

NB. Tasks that are *greyed out in italics* are not included within the management contract between VWHDC and the Earth Trust but are tasks carried out by VWHDC or their sub-contractor.

Management tasks					**Month/s to be carried out**											
Cpt	**Location**	**Task**	**One off, Annual, Continuous VWHDC task**	**Detail**	**January**	**February**	**March**	**April**	**May**	**June**	**July**	**August**	**September**	**October**	**November**	**December**
1 & 5	Stream margin	Pollard willows – Nr bridge (southern side) -2 willows to pollard Radley Rd end - NOT needed again until 2026/27 at; 6 in total but 2 have collapsed (2 done by RJR Tree Works in 2020; 2 done in 2021 also by RJR Tree works)	A	Contact Vale Trees Officer to discuss what can be added to winter programme. VWHDC often don't have sufficient funds as habitat works - we've booked with RJR Trees contractor if budget allows	✓	✓								✓	✓	✓
1	Radley Road end	Cut main areas of meadow/nettle and rake up all arisings. Early spring cut & late summer cut.	A	Using scythes (can use brushcutter/BCS) Remove all arisings to designated piles away from watercourses			✓	✓				✓				
1		Cut scallops along footpath incl. cutting scallops into scrub and brambles encroaching into grassland	A	Scallops to be cut in variety of areas. Scything. Main north south path and path from bridge to Hadland Road			✓					✓				
1	Pond 1	Clear reed around footpath edge of pond 1	A	Cut reed to the south and east below the first node where possible to prevent regrowth. Hand pull reed from centre of pond where it is reducing open water										✓	✓	

1	Stream margin	Clear willow/scrub/trees on middle section of stream on 8yr rotation. Coppice two 17.5m sections per year - sections should not be next to each other or on the same bank.	A	Section from north of the bridge to the beginning of the Cameron Avenue houses. Commencing 2016 annually. (Whole section of 140m is divided into eight 17.5m)	✓									✓	✓	✓
1	Pond 3	Cut vegetation/scrub/willows from 1/3 of area around Pond 3	A	Cut one third of vegetation on rotation	✓	✓								✓	✓	✓
1	Hadland Road houses	Cut and rake grassland area in front of Hadland Road houses	A	VoWHDC Contractor - but no rhyme or reason to when they do it so sometimes we can go for it with volunteers during the summer months.				✓	✓	✓	✓	✓	✓			
1	Reedbed	Either reedbed cut or cut the "lines in the sand" between reedbed and sedge/grassland, in front of pond 3	A	To prevent encroachment of reed into the sedge/grassland area			✓						✓			
2	Northern fen	Cut 1/3 of fen vegetation; Cut scallops into scrub and brambles encroaching into reedbed/fen	A	Leave 6m uncut adjacent to the stream edge. Remove all arisings to the edge of the fen away from all watercourses	✓									✓		
2	Perimeter footpaths	Repair and create dead hedging ; infill with hedge plants if possible	A	Along Eason drive, Audlett Drive, Hadland Road footpaths	✓	✓	✓								✓	✓
2	Reedbed, woodland	Cut paths along tree line in reedbed for Himalayan balsam pulling access	C	Once bi-monthly if necessary - Warden or volunteers.			✓		✓		✓		✓			
2	Within main reedbed	Coppice willow/scrub within reedbed/fen	A	Treat stumps with herbicide to prevent regrowth? If poss. Habitat pile brash in wet woodland cpt 3.	✓	✓								✓	✓	✓
2	Reedbed	Cut the "lines in the sand" between reedbed and fen	A	To prevent encroachment of reed into the fen areas										✓		
2	Reedbed/ fen	Cut reedbed/fen area between stream & stream runnel (aka smaller stream within reedbed/fen).	A	To prevent dominance of reed into the fen areas										✓	✓	✓

2	Small stream and runnels in reedbed	Cut reed/vegetation in stream runnels in reedbed and fen, and alongside small stream	A	Cut reed below first node to prevent regrowth, remove all arisings to designated piles away from watercourses							✓			✓	✓	✓
2	Within main reedbed	Hand dig small pools (or winch out 1 willow/yr) from reedbed/fen	A	At least 1m diameter and 1 spades deep to prevent reedbed encroachment immediately - max of 7 pools in reedbed and 7 in total fen, re excavate pools on a 5 year rotation				✓	✓	✓	✓	✓				
3	Northern woodland	Non-intervention	---													
2, 3 & 5	Perimeter	Repair and create dead hedging	A	Along Eason drive, Audlett Drive, Hadland Road footpath - consider fence/hedge planting?	✓	✓								✓	✓	✓
3	*Right hand fork of the "Y" stream*	*Build 'leaky dam/s' in small stream*	*O*	*Initially replace dam at junction of both streams. Further dams/bunds can be located along the stream at a later date to create a series of bunds with pools behind.*	*If get time to do*											
3	*Reedbed*	*Divert Cedar Wood spring into the reedbed*	*O*		*If get time to do*											
4	Southern fen	Coppice willow/scrub within fen	A	Treat stumps with herbicide to prevent regrowth?										✓	✓	
4	*Behind Gardiner Close*	*Build 'leaky dam/s' in spring runnels within southern fen*	*O*	*Runnels from the springs lead through the fen, dam or bund these in specific locations to retain water in the fen. Exact locations to be determined by topography*	*If get time to do*											
4	Southern fen	Cut 1/3 of fen vegetation & cut scallops into willow scrub/brambles encroaching into fen. Leave 6m uncut adjacent to the stream edge. Remove all arisings to	A	Cut 1/3 of vegetation in southern fen, leaving small patches uncut within the cut area to create a mosaic of different stages.	✓									✓		

		the edge of the fen away from all watercourses														
4	Southern fen	Dig new pond/scrap in fen	O	At least 1m diameter and 1 spades deep to prevent reedbed encroachment immediately - max of 7 pools in fen, re excavate pools on a 5 year rotation				✓	✓	✓	✓	✓	✓			
4	Stream bankside	Coppice willow/scrub/trees/reduce brambles on southern section of stream	A	Southern section of stream from Audlett Drive to the bridge. Cut only one bank in any one year, leave a strip of vegetation at the toe of the bank and in the water, remove all arisings to designated pile										✓	✓	✓
5		Cut scallops in soft vegetation and/or cut back scrub and brambles encroaching into grassland and footpath to create scallop/s.	A	Scallops to be cut in variety of areas. Scything.							✓					
5	Near the Audlett Drive entrance	Coppice willows	A	Rotational coppicing as required to create thicker scrub in this area	✓	✓								✓	✓	✓
5	Stream bankside	Coppice willow/scrub/trees/reduce brambles on southern section of stream	A	Working north from the Audlett Drive entrance clear small sections per year, never clear both banks in any one section. Cut only within 2m of the top of the bank. Leave small piles of cut brash on the edge of the 6m buffer strip to create a barrier to prevent access to the fen.	✓	✓								✓	✓	✓
6	Top of eastern daisy bank	Cut small scallops in blackthorn scrub on top of eastern daisy bank	A		✓	✓								✓	✓	✓

6	Daisy bank	Cut vegetation on daisy bank. Early spring cut & late summer cut.	A	Western Daisy bank (adjacent to Hadland Road entrance). Using brushcutter/scythes, remove all arisings to a small number of designated piles away from watercourses				✓				✓				
	Perimeter footpaths	Monitor and cut back vegetation on perimeter footpaths	C	As required	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Whole reserve	*Remove garden escapes and non-native plants*	*C*	*As required*	*As and when required/discovered*											
	All footpaths	Woodchip on paths	A	As required	✓	✓	✓							✓	✓	✓
	All footpaths	*Add rubble to raise up footpath where required on boggy sections*	*A*	*As required*	✓	✓	✓							✓	✓	✓
	Main footpaths	*Mow grass alongside paths*	*Vale*	*Vale contractors to mow paths 6 x/yr*				✓	✓	✓	✓	✓	✓			
	All footpaths	Monitor and cut back vegetation alongside and overhanging paths and gates to maintain a 2m path width	C		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Whole reserve	*Fell non native trees or those shading the grassland/scrub mosaic*	*A*		*As and when required*											
	Whole reserve	Pull Himalayan balsam	A	Along stream, fen and reedbed						✓	✓	✓				
	Stream	*Remove blockages in stream*	*C*		*As required*											

Monitoring/Survey tasks					Month/s to be carried out in											
Cpt	**Location**	**Task**	**One off, Annual, Continuous VWHDC task**	**Detail**	**January**	**February**	**March**	**April**	**May**	**June**	**July**	**August**	**September**	**October**	**November**	**December**
	BMS transect route	Butterfly transect	A	1st April - 30th Sept weekly - Volunteer surveyors				✓	✓	✓	✓	✓	✓			
	Whole reserve	Tree safety survey	A	Carried out by Vale	Vale											
	Bird transect route	*Bird transect - not yet set up*	*A*	*Methodology not yet decided*	*When set up*											
	Odonata transect route	*Odonata survey*	*A*	*Not yet set up - would be good to register transect square with British Dragonfly Society (BDS) https://app.bto.org/batmap/squares/bds_adopt_site*	*When set up*											
	Stream margin	Check mink raft	C	Whilst wardening - check for mink footprints in clay - report back to BBOWT Water Vole recovery project once /yr. Set mink trap if positive mink footprints, but will need to be checked daily and mink dispatcher set up. Use trained and certified Earth Trust/BBOWT staff to euthanize the mink.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Stream	Water vole survey	BBOWT	Part of BBOWT project - managed by them. Done every 3 years, last done in 2020.	Every 3 yrs											
	Stream	Stream Rapid assessment (May - August)	3yr	S:\Land Management\08 Recording & Monitoring\01 Recording & Monitoring data\02 Habitat Monitoring\Rapid Assessments	Not fully set up - every 3 yrs											

	Stream & ponds	Spawn survey (frog/toad)	A	Check all ponds/scrapes on site, use Fresh Water Habitat Trusts reporting forms		✓	✓	✓								
	Stream & ponds	Record any pollution incidents - report to EA		Ad hoc.												
Cpt 1 &5	Ponds	Pond Rapid Assessment (July & August)	3yr	As above	Not fully set up - every 3 yrs											
Cpt 1 &2	Reedbed	Reedbed Rapid assessment (July & August)	3yr	As above	Not fully set up - every 3 yrs											
Cpt 2&4	Fen	Fen Rapid Assessment (July & August)	3yr	As above	Not fully set up - every 3 yrs											
Cpt 1 &5	Grassland/ scrub	Grassland/tall herb/scrub mosaic Rapid Assessment (May - August)	3yr	As above	Not fully set up - every 3 yrs											
	Whole site	Record & report incidences of vandalism	C	To the police 101	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Admin tasks			**Month/s to be carried out in**											
Tasks	**One off, Annual, Continuous VWHDC task**	**Detail**	**January**	**February**	**March**	**April**	**May**	**June**	**July**	**August**	**September**	**October**	**November**	**December**
Book Abingdon Green Gym	C	Book the green gym – they usually plan their calendar in 3mnt 'chunks' through year		✓			✓			✓			✓	
Claim management payment for each quarter; Jan-March; April-June; July-Sept & Oct-Dec	C	Contact Property@southandvale.gov.uk to get quarterly PO no; Supplier ID 13881 to valeinvoices@capita.co.uk		✓			✓			✓			✓	
Contact Richard Ballard <richard.ballard@southandvale.gov.uk> regarding woodchip for the footpaths.	A	Good-will arrangement between Vale contractors and AFP - need to ask before they will be directed to drop any off onsite (Radley Rd entrance & Hadland Rd entrance).										✓		
Contact Marjorie White (Volunteer Warden) - to discuss tasks for up-coming work party	C	2 wks before each monthly work party	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Revise site risk assessment	A	Every 6 months – email over to Ed Church at VWHDC		✓						✓				
Revise site management plan (5 yearly revision)	O	Next revision in 2021	**2021-2026**											