Pilley Bridge Nature Reserve

Draft Management plan

For: Cheltenham Borough Council

May 2012

Company Registration No: 05934386
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Pilley Bridge Nature Reserve, Cheltenham

Draft Management Plan

Executive summary

The conservation of ordinary wildlife and plants is no longer provided for by the normal diversity of habitats found in large gardens, and in and around the edges of agricultural land. Pilley Bridge Nature Reserve is a green oasis within the southern part of Cheltenham; it is of significant value for nature conservation in preserving wildlife and plants and offers opportunities for people to connect to Nature.

The Nature Reserve is a 1km length of former railway line which was abandoned in the 1960s. Despite its relatively small size, it encompasses a wide range of habitat types. Management is required to prevent the Reserve becoming over-grown by trees which are cause excessive shade and reduce the diversity of wildlife.

A detailed overview of the existing habitat types is provided, together with proposals for their management. Management proposals are directed at the aims of increasing the Reserve's value for conservation, quiet recreation and education.

The Nature Reserve has no protection status. It is proposed that an application be made to Natural England for designation of the Reserve as a Local Nature Reserve. The management plan has been prepared for Cheltenham Borough Council in order to provide a management framework and a basis for this application.

The writer

This report has been written by Graham King MRAC, Dip.Arb.(RFS), F.Arbor.A. I am an independent arboricultural consultant living in Cheltenham, I have a particular interest in conservation and have been involved in the management of woodlands for conservation since the 1970s. I am a founding committee member of The Friends of Pilley Bridge Nature Reserve group.

1. Introduction

1.1 Pilley Bridge Nature Reserve is a brownfield site (a former railway line) bounded by residential developments of Mead Road, Greenfield Close, Pilford Close and Old Bath Road, a trading estate at the western end of Mead Road and an extensive Cheshire Home off Charlton Lane.

1.2 The Reserve is owned by Cheltenham Borough Council and is comprised of a stretch of former railway line. For the purposes of this report and in accordance with local custom, the section to the east-southeast of Pilley Bridge is referred to as the eastern part of the Reserve, and the section to the northwest of Pilley Bridge is referred to as the western part.

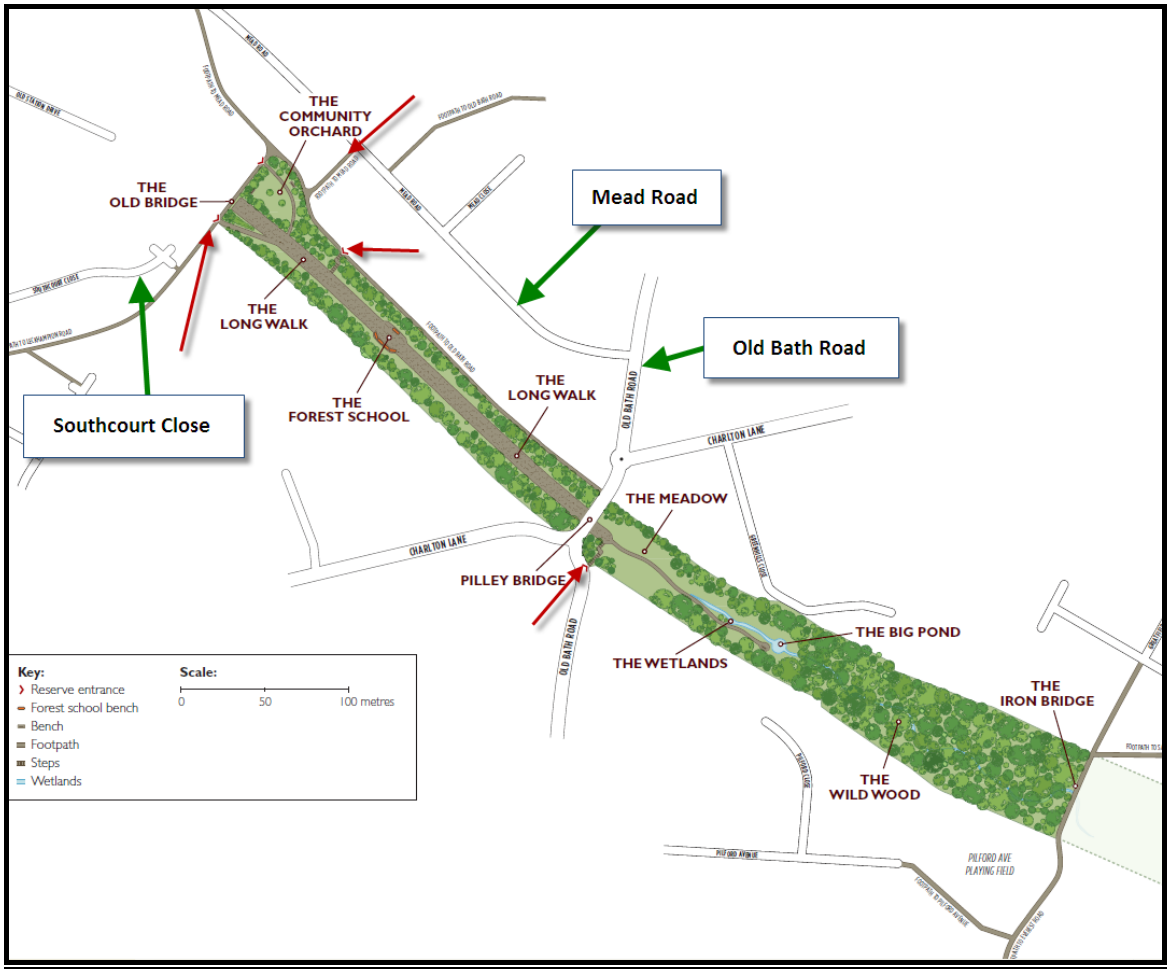
1.3 The Reserve is set in gently undulating ground and is contained almost entirely within a cutting which is approximately 6m deep, deepest at its western end. It is approximately 40m wide and 600m long and thus encompasses an area of around 2.4 hectares (6 acres).

1.4 To the rear of Mead Road on its northern side (the side towards the town) is a narrow perimeter of level ground along which runs a public footpath; to the east of Pilley Bridge the footpath is absent. The former track bed is approximately 10m wide, and the north-facing and south-facing slopes (effectively) thereby provide contrasting micro-climates.

1.5 Access is by steps and a ramp at its western end where a brick bridge takes the footpath from Mead Road to Old Station Drive, and by steps at Pilley Bridge on Old Bath Road.

1.6 To the east, the Reserve ends at the iron footpath bridge behind the Old Patesians' pavilion (Pate's Grammar School). To the east of the iron bridge is a meadow and sports pitch which are also within the line of the former railway, and which are currently leased to the Old Patesians.

1.7 To the north of the meadow and sports pitch are the Pate's Grammar School playing fields, the northeastern side of which run along Sandy Lane. On the opposite side of Sandy Lane is the Lilley Brook Golf Club, which has an impressive population of ancient English Oak trees. In this way there is a degree of connectivity for wildlife with Leckhampton Common to the east.



Scale plan of the Reserve produced by the Friends of Pilley Bridge Nature Reserve. Access points are marked with arrows.

2. Management Objectives

2.1 Summary of management objectives

2.1.1 The **primary aim** is to manage the land for the benefit of wildlife and education.

2.1.2 A **secondary aim** is to provide open public access for quiet recreation. This will be encouraged where it does not conflict with the primary aim.

2.2 Methodology

2.2.1 Primary management objective

To establish a diversity of wildlife habitats through active, targeted management.

Despite the relatively small area of the Reserve, a wide variety of habitats are represented. Management intensity has been generally low and natural succession from grassland, through the biologically diverse stages of scrub and young woodland, to secondary woodland of lower biological diversity and interest, is occurring. Biological diversity and interest is declining and active intervention is now required both to maximise the Reserve's potential and to secure its future.

Educational opportunities exist to introduce young children to wild places, to involve older children in conservation work and to provide an opportunity for local people of all ages to connect with Nature.

2.2.2 Secondary management objectives

To establish good access and to maintain the paths to enable people of all ages to have access to the Reserve. Included in this is the provision of disabled access to the western part of the Reserve where no steps are present; to provide seats, and to cultivate a community orchard in the northwest corner of the Reserve to the rear of Mead Road.

2.3 Perspectives

2.3.1 The conservation of the commonplace:

a. The conservation of ordinary, local wildlife is no longer provided for by the normal diversity of habitats found in large gardens and in and around the edges of agricultural land. Large gardens have been divided, sub-divided and chemically enhanced and wildlife is under pressure from habitat loss in all areas.

b. The care and protection of the ordinary can no longer safely be left to chance, more especially in urban areas where pressures on land are intense.

> "*…by the same process of attrition, a county loses its otters, a village its cowslips, a farm its swallows. These small erosions are not the stuff out of which headlines or Red Data Books are made, yet they are the way that extinction begins, and what, at grass roots level, the conservation movement should be fighting against*."
>
> *The Common Ground: a place for Nature in Britain's future?*
> Richard Mabey 1980
> Hutchinson/Nature Conservancy Council

2.3.2 **Re-connection with Nature**

a. There is a need for people to re-connect to Nature, and for that connection to be maintained into old age. Access to natural places is required for quiet recreation, to introduce children to Nature and Conservation, and to take part in conservation activities.

b. There is a particular need for children to have the opportunity to experience Nature; only in this way will they develop an appreciation of natural processes, and can the well-being of our wild places be assured in the future by their commitment.

'Nature Nearby' is everyday nature, on our doorsteps.

It can take many forms. It might be a place designated for wildlife – a nature reserve, woodland or a country park. But in the majority of cases people's contact with nature takes place in local neighbourhoods – a village common, the local park, the scrap of land at the bottom of the street. And these places should be no less special than 'official' sites.

Everyone should be able to enjoy the thrill of the outdoors, feeling the seasons change, seeing the flowers bloom, hearing the birds sing. It conjures memories of forgotten childhood adventures, offers rare moments of tranquility and helps erase the stress of modern life.

We need nature nearby. We know that greener places are better places to live – more relaxing, more enjoyable to come home to after a hard day at school or work, kinder to our souls, and more likely to make us want to look after and protect them.

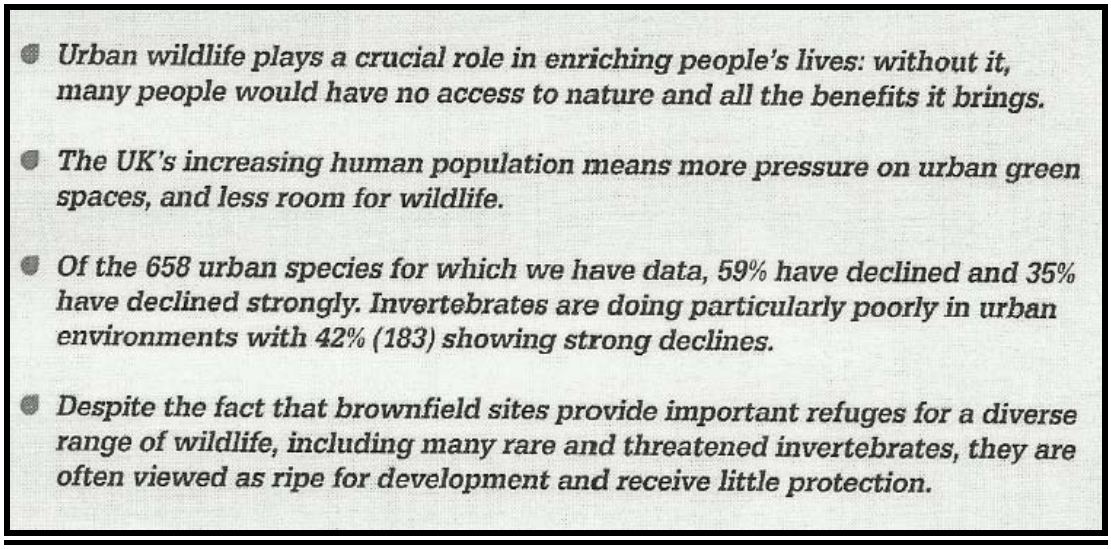
Evidence shows that nature's good for our health. Natural green places provide natural solutions to many 21st century diseases – obesity and inactivity; heart disease and strokes; depression and mental illness. In difficult times, they provide cost effective treatment and improve people's lives.

Green spaces are also our insurance policy against the impacts of climate change. Trees, green roofs and public parks can make urban areas cooler. They help reduce the impacts of flooding, keeping homes and businesses dry. That's carbon free air conditioning and natural flood protection for millions of people. Nature's technology makes good economic sense too.

Nearby Nature – good for people, good for wildlife, good for the environment.

2.3.3 Community involvement and the future

For the land to be secured for wildlife and for future generations of Cheltonians, it must be actively managed. This will demonstrate a commitment to its future as a Nature Reserve by its owners, Cheltenham Borough Council, and an appreciation of its values by, and for, the local community. In the absence of either, the land would be at risk of being used for something other, probably in ways which are at odds with its values for nature conservation.



- *Urban wildlife plays a crucial role in enriching people's lives: without it, many people would have no access to nature and all the benefits it brings.*
- *The UK's increasing human population means more pressure on urban green spaces, and less room for wildlife.*
- *Of the 658 urban species for which we have data, 59% have declined and 35% have declined strongly. Invertebrates are doing particularly poorly in urban environments with 42% (183) showing strong declines.*
- *Despite the fact that brownfield sites provide important refuges for a diverse range of wildlife, including many rare and threatened invertebrates, they are often viewed as ripe for development and receive little protection.*

The State of Nature 2013 **published by The Wildlife Trusts**

Getting the most from LNRs

Natural England believes that well managed LNRs provide places that can ***inspire people to value and conserve the natural environment.***

The natural environment is there for everyone to enjoy, learn and gain benefits from, particularly for their health and wellbeing. Communities should be able to play a leading role in helping to conserve the natural environment particularly on their doorstep. There should be the widest range of access opportunities available to provide experiences that appeal to all abilities and backgrounds.

A key aim for local authorities and their partners is to provide an integrated network of easily accessible green spaces where people can engage with the natural environment and get involved. These should be connected by routes that enable visitors to choose low carbon, environmentally sustainable forms of transport to access them.

LNRs play a key role in engaging and involving communities, especially children, in securing healthy places where they want to live. They can also help local authorities meet their biodiversity duty under Section 40 of the Natural Environment and Rural Communities (NERC) Act 2006, and Local Area Agreement targets across a wide range of national indicators.

Natural England: Local Nature Reserves in England. A Guide to their selection and declaration (NE301)

3. History

3.1 The Nature Reserve is formed by a section of the former Leckhampton to Andoversford (Cheltenham to Bourton-on-the-Water and Kingham) railway line opened by the Great Western Railway Company in 1881 and was closed in 1964.
To be expanded

4. The soils and hydrology

4.1 The predominant soil type of the the area is Lower Lias Clay. This was laid-down around 250 million years ago (early Jurassic period) in warm shallow seas at the time of the early dinosaurs.

4.2 The clay is moderately dense and is yellow in colour where it approaches the surface (<1m deep); below this level, the clay is usually blue, the change to yellow being caused by oxidation of some of its constituents.

4.3 East of Pilley Bridge, the Lower Lias Clay is overlain by aeolian[1] deposits of Cheltenham Sand. These wind-blown deposits were laid-down since the end of the last Ice Age (8,000-10,000 years ago); because they were wind-blown, they tended to have fill-in any small valleys, steep gullies or holes. It is therefore possible to encounter local deposits several metres deep which thin-out abruptly, or cease altogether.[2]

4.4 A short distance east of Pilley Bridge where the Cheltenham Sand overlies the Lower Lias Clay, discernible changes are visible in the woodland composition. Where the railway cutting has exposed the base of the sand superimposed upon the clay, springs emerge.

[1] Aeolus was the Greek god of wind.
[2] The British Geological Survey map (solid and drift edition) Sheet 217.

4.5 The springs emerge between the iron bridge behind the Old Patesians' playing fields and Pilley Bridge. It is evident that the water is draining off the nearby limestone (the Cotswold escarpment is less than a mile away) because within the stream at the base of the former railway cutting, calcium carbonate is deposited on twigs, stones etc. over which the water flows.

4.6 The stream flows as far as a point approximately 40m east of Pilley Bridge where the cutting has been partially filled with soil and the stream has been diverted into a culvert. The alignment of the inspection chambers indicates that it then flows within the culvert along the line of Charlton Lane.

4.7 The water arises from the gently sloping ground of the Old Patesians' playing fields and the Sandy Lane area. To the east of Sandy Lane, an area of Lower Lias Clay outcrops before the Cheltenham Sand is on the surface again at Cirencester Road. Water drains freely into the sand and where the Lower Lias Clay outcrops, it brings the water to the surface.

4.8 When walking eastwards, the springs within the Reserve occur east of Pilley Bridge, soon after passing through the raised open area of meadow. The fact that the springs are present only on the south side of the cutting is consistent with the clay surface over which the sands were deposited by the wind having a downward slope south to north. As the water passes along the interface between the porous sand and the impermeable clay, it emerges on the south side of the railway cutting. This must have been inconvenient to the railway's builders and operators but it is now an advantage for wildlife.

4.9 The 1:50,000 Ordnance Survey map (Sheet 163) map shows that a minor tributary of the River Chelt arises south of Southfield Manor, passing to the east of it and feeds the lakes at Moor End and Charlton Park School. The water which emerges in the Reserve is the western equivalent of this stream; that is, the water is pushed to the surface by the same band of relatively impermeable clay, and on this side of the clay band it flows west.

5. Existing habitat types

5.1 Secondary woodland

5.1.1 The principle habitat type within the western half of the Reserve is secondary woodland.

5.1.2 Secondary woodland is that which has developed on land which previously had been cleared of woodland and used for other purposes.[3] Despite its distinction from *ancient semi-natural woodland* [4] which usually is of high conservation value, the value of secondary woodland also can be high.

5.1.3 At Pilley Bridge, the secondary woodland is dominated by naturally regenerated Common Ash (*Fraxinus excelsior*), Sycamore (*Acer pseudoplatanus*) and Norway Maple (*Acer platanoides*), and is similar to the vegetation commonly observed on roadsides and abandoned railways throughout much of southern Britain. Records are available from local amateur naturalists of the changes which have occurred as the woodland has developed; as is to be expected, they report that as the sunlight reaching the ground has diminished, so has the occurrence of woodland-edge plants and flowers, together with the numbers and diversity of butterflies and other invertebrates.

5.1.4 The natural succession of vegetation usually proceeds from grassland through scrub to woodland. The scrub growth is characterised by Brambles and Goat Willow, then shrubby woodland dominated by Goat Willow, Hawthorn and Blackthorn, and secondary shrub and small tree species such as Dog Rose, Crab Apple, Spindle etc. Eventually the Hawthorns etc. are dominated by larger trees, Ash and Sycamore with some Willow, Oak and Wild Cherry, and the woodland canopy closes.

[3] It does necessarily include, for instance, woodlands which have been felled and replanted, or which have been felled and which have regenerated naturally.
[4] Taken to be those which were in existence in 1600. Woodland planting before 1600 was uncommon, and it therefore likely that such woodlands are on sites from which the naturally occurring woodland has never been removed.

5.1.5 Of the scrub vegetation, only small areas of dense, low brambles and Hawthorn remained before works to reduce the numbers of trees began in 2012. Considerable areas of secondary woodland of tall Hawthorns, Ash and Sycamore were developing rapidly and had no management been carried out, in a few years there would have been little direct sunlight reaching the woodland floor. Where light levels were already low in some places, ivy has become widespread growing along the ground. Thickets of ivy are also present in some small trees lining the footpath to the west and provide valuable wildlife habitats.

5.1.7 That these works will be of benefit to bees, butterflies and a very wide diversity of invertebrates etc., together with a wider range and number of nesting birds, is evident.

Secondary woodland. Looking west along the former track bed from Pilley Bridge, the arch of the western bridge can just be seen. The clinker-built walls are visible on the right. The trees in the foreground have now been felled.

5.2 Oak/Hazel woodland

5.2.1 East of Pilley Bridge and in the region of the pond(s), the woodland character[5] changes from that dominated by Common Ash (*Fraxinus excelsior*), Sycamore (*Acer pseudoplatanus*) and Norway Maple (*Acer platanoides*), to dominance by English Oak (*Quercus robur*) with an understorey of Hazel (*Corylus avellana*).

5.2.2 This may be a product of the floristic variation caused by the change in the soil, from relatively dry clay to deeper soils where the Cheltenham Sand is present. In these areas there is an abundance of soil moisture originating from the springs which occur approximately 1m above the floor of the former cutting. It may have been contributed to by the pre-existence of several large mature Oak trees which had seeded themselves on the upper slopes of the cutting in the early days of the railway, rather than after the railway closed. English Oak is an effective coloniser of open grassland.[6]

5.2.3 It is not known whether the Hazel originated naturally, or was planted at some time after the railway closed.[7] The general (and agreeable) character of this small area of Oak/Hazel is similar to woods of that type found on *Greensand* in the southeast of England. While it is tempting to suppose that the character of the vegetation directly reflects the changes in the soils, it is by no means certain that this is so. So far as is known, no assessment of the ground flora has been undertaken and no records of the are known to exist.

5.2.4 Springs are present on the lower slopes of the cutting in this area, more especially on the south side (see also paragraph 4.5 above).

[5] Assessed on general visual characteristics of species composition of trees and shrubs. No assessment of lower plant communities has been undertaken.
[6] Jays frequently bury acorns as a food reserve.
[7] A former Friends Group existed which almost certainly accounts for various pollarded Willows growing in the associated marshland area.

5.3 The ponds and marshland

5.3.1 Prior to the partial in-filling of the land immediately east of Pilley Bridge[8] and culverting of the stream which flows through the eastern part of the Reserve, it is to be assumed that the stream was more extensive than it is now. The stream and marshland are considered below in reverse order; that is, from where it disappears into the culvert, upstream to its source.

5.3.2 Immediately above the culvert is a small marshy area caused by partial silting-up of the culvert entrance. There appears to be little opportunity to raise the water level by restricting water to the culvert without being in danger of blocking its entrance entirely.

5.3.3 Above this on the edge of the woodland where there is still an abundance of sunlight, the stream flows through dense herbaceous vegetation dominated by Willowherbs. Further upstream where the sunlight is reduced by dense growth of Willows (*Salix caprea* or similar and Hazel), the stream-sides are mostly devoid of vegetation. Despite the stream being only a few inches deep and devoid of water weeds etc., pond skaters and small fish abound. In this way the stream extends for approximately 30m as far as the larger pond retained by a dam.

5.3.4 The pond in its present, relatively extensive form, was created in the spring of 2012 as an emergency measure in order to re-locate amphibians from Cox's Meadow in very dry weather. The dam was created with vertically aligned corrugated iron and some sheets of concrete reinforcing mesh and soil.

[8] For reasons yet to be established, but possibly to prevent slippage of the banks supporting nearby houses.

5.3.5 It was reinforced during works undertaken during early 2013 which included creating a more robust soil-based dam, a second small stream taking the overflow water from the pond and a new pond between the dam and the meadow. This was undertaken with a small digger which was able to access the Reserve by the ramp at its west end. At the same time, the ramp was widened and its gradient was reduced.

5.3.6 There are plans to provide a wooden deck along part of the dam to improve access to the water for pond-dipping etc, and various walkways to improve access generally and to give access around the south side of the large pond.

5.3.7 The pond extends for approximately 20-30m until the natural gradient of the land extinguishes it. Above this, and around its edges, are conditions which are similar in appearance to naturally occurring wet woodland. In some places there is vigorous growth of Weeping Sedge (*Carex pendula*) which is known to be a good habitat for a number of invertebrates.[9]

5.3.8 In some marshy areas, rust coloured precipitates are present within the water and/or oil can be seen on the surface. These conditions are likely to be natural and have been observed by the writer in similar conditions at the base of *Greensand* escarpments in Alder carr. Young frogs and/or toads abound (tadpoles were seen to be present in the first week of August 2012 and in spring 2013) and what appear to be the same small fish as below the pond, are also present within it.

[9] On the advice of a entomologist within the Friends Group

5.3.9 The stream as a recognisable entity flowing along the bed of the former railway, comes into existence in dense woodland to the south of the pond. Its origin is probably to the west of the iron bridge crossing the Reserve and linking Greatfield Drive to Southfield Approach,[10] but this is obscured by dense undergrowth.

Looking west from the larger pond through wet woodland towards the meadow in summer. The coppiced plants are Hazel and Goat Willow. The Oak/Hazel woodland is behind the camera.

[10] The historical references in these names to the former open-field system of agriculture in this area are of interest.

5.4 Dense woodland area east of the ponds

The dense woodland east of the ponds is wet and largely inaccessible. Consideration is being given to its management and the relative advantages of preserving a wild area and improving access to it.

5.5 The Community Orchard

5.4.1 The Community Orchard is bounded on its northwest side by the footpaths behind 40-46 Mead Road and the southern part of the Leckhampton Trading Estate (Travis Perkins). Across the eastern part of this area, a storm drain was installed some time after 2007 to take road water from Mead Road. The drain passes along the footpath on the west side of No.38 Mead Road and down to the former track bed, from where the route of the culvert is not known to the writer. Rainwater from the adjacent footpath drains into this area along the same line as the drain and causes damp conditions after rain. The soil is clay and is likely to be overburden from the excavated line covering the original soil of the site; this can be seen on the opposite side of the cutting where the ramp has been re-excavated recently and blue clay overlies yellow.

5.4.2 The area was cleared of Ash and Sycamore trees (approx. basal diameter <25cm) during the late winter of 2011/12 and the stumps were treated with *Glyphosate*. The treated stumps have not re-grown, but where smaller stumps avoided treatment, re-growth has occurred. A few Hawthorn (*Crataegus monogyna*) saplings were retained.

5.4.3 Around the edge of the area are a number of cultivated fruit trees, mostly Apple, presumed to remain from its former use as a garden/allotment. On the banks leading down to the former trackbed are a considerable number of Damsons/rough Plums which are likely to have originated from root suckers from former cultivated Plums.

5.4.4 In the spring of 2013, the Friends of Pilley Bridge Nature Reserve raised funds for, and planted, five fruit trees. All but one (a Pear on Quince C rootstock) were on M25 or Wild Pear rootstocks and were planted at between 10m and 15m apart. The area has been designated as a Community Orchard and at the time of writing (May 2013) it, and the wider Reserve, have been used by various community groups for children (Woodcraft Folk, Nature Explorers, Scouts) on a number of occasions.

5.4.5 Management of the Community Orchard has been assumed by the Friends Group with the encouragement of the community rangers of Cheltenham Borough Council. A monthly work party is held on a Saturday morning at which maintenance works within the scope of enthusiastic volunteers using hand tools are undertaken.

5.4.6 During the summer of 2012, a greater variety and number of invertebrates associated with woodland edge and clearings were observed, together with changes of the floristic character. Records are being compiled by members of the *Friends* Group. The plants include a diversity of species which reflect both the former garden (eg. Cow Parsley), the dry conditions of the railway sides (Perforated St. John's Wort), and the wetter conditions where the ground is level.

5.5 Open grassland east of Pilley Bridge

5.5.1 The open area of ground immediately east of Pilley Bridge is accessed by steps leading down from Old Bath Road to the level of the former track-bed. It was formerly maintained as an open area for butterflies etc. by a previously existing Friends Group following partial in-filling of the area in the 1990s. It is the only area where unobstructed sunlight reaches the ground, and greater abundance of invertebrates is evident.

5.5.2 The vegetation is dominated in different areas by the dense growth of nettles (part of the south-facing bank), brambles (part of the south-facing bank), willowherbs (part of the north-facing bank) and creeping thistles (part of the north-facing bank). The central part is dominated mostly by grasses which, in the absence of management, is being invaded by brambles. Occasional cutting-back of the brambles is planned, gorse is being established to provide early flowers for bees and the grassland will be cut on various rotations which will be decided upon with advice from the appropriate naturalist expert within the Friends Group.

5.6 Former trackside drystone walls

5.6.1 Drystone walls, or their partial remains, line parts of the former track-bed. The walls were constructed from what appears to be clinker of some type, presumably originating from some industrial process or directly related to the railway. A local resident has recounted how common lizards formerly lived in these walls, and the value of drystone walls to many sorts of invertebrates and small mammals is well documented.[11]

5.6.2 Grass snakes and slow worms are known to occur in the gardens on the south side of Mead Road, and it is presumed that they also inhabit the Reserve. The removal of a considerable number of trees during the winter 2012/13 has increased sunlight to some stretches of the walls and observations will continue in the hope that common lizards will be found. A reptile survey is being conducted with the use of 24 squares of roofing felt distributed through the reserve.

[11] The same resident recounted how lizards also frequent railway ballast, and will bask on the warm rails.

5.7 Bridges

Three bridges are present:

- Western bridge east of Travis Perkins yard.
- Pilley Bridge.
- Iron bridge at the eastern end of the Reserve.

Western bridge by Travis Perkins

5.7.1 The western bridge is 3-arched has been used by rough-sleepers, sometimes with drug habits. Some local residents find the presence of rough-sleepers objectionable and the area was cleaned-up by Cheltenham Borough Council during the winter of 2012/13. Youths continue to light fires beneath the bridge and consume inappropriate amounts of alcohol. On one occasion (autumn 2012) the police were called because of a disturbance and on another the fire brigade were needed to extinguish a particularly large fire.

5.7.2 Two of the three arches were once partially or completely walled-up. One of the arches remains walled-up, but the former wall of the larger central arch has collapsed and a steel barrier has been erected to prevent access to the other side arch. Some trees which were causing damage to the bridge abutments and have been felled.

5.7.3 It appears that repairs are required to prevent deterioration of the brickwork, and the fires may be accelerating the rate of deterioration.

Pilley Bridge

5.7.5 Pilley Bridge was destroyed by bombs in the 2nd World War, and was re-built in the 1954. It appears to be in good condition although trees are also likely to cause damage to the abutments and are to be removed. One of the principal accesses to the Reserve is by way of a flight of steps on the southeast side of the bridge.

5.7.6 Graffiti artists use the sides of the bridge abutments as their canvas. These works are not visible from the highway and there appears to be no reason to attempt to deter such use.

The iron bridge at the eastern end of the Reserve

5.7.7 The condition and maintenance of this iron bridge presents greater challenges than does that of the brick bridges. Its construction is such that regular routine maintenance is more likely to be required to maintain it in a safe condition and it appears that none has been undertaken recently.

5.7.8 The condition and management of the structure of the bridges is outside the scope of this report.

6. Management recommendations

6.1 Secondary woodland in the northern half of the Reserve.

6.6.1 Fell all woody vegetation which is causing, or is likely to cause damage to the bridge abutments. (Completed during 2012/13)

6.6.2 Continue the programme of tree felling begun during the winter of 2011/12 and 2012/13 to reduce the tree cover and to create a mosaic of light and shade with larger woodland clearings. Undertake a further evaluation in September 2013 and annually thereafter. (In progress)

6.6.3 Identify the best trees/interesting trees species to retain. These would be likely to include good specimens of Crab Apple (*Malus sylvestris*), Wild Pear (*Pyrus communis*),[12] Wild Cherry (*Prunus avium*) which exist close to the track-bed, as well as English Oak. A small number of well placed good specimens of Ash and Sycamore will also be retained, together with some areas of dense and vigorous Ash saplings which could be managed as coppice.[13] (In progress)

6.6.4 Enquiries made of local residents and walkers suggest that support existed prior to the works being undertaken, and feedback since that time has been almost unanimously positive. Some trees are of greater landscape importance, more especially to elderly people who may be more-or-less housebound and therefore more dependent upon the views from their windows. The effects of tree felling upon the landscape were, and will continue to be considered as part of the decisions on the felling of larger trees.

[12] Not yet established whether a single known specimen is in fact a seedling from a cultivated variety, which would still be of some interest.

[13] A local market might be found for the sticks as bean sticks etc. and provide a further link with the community.

6.6.5 In some areas of secondary woodland, Ivy (*Hedera helix*) is abundant both on the ground and on trees. The value of flowering ivy for bees cannot be over-estimated,[14] and it also provides good nesting habitats for many bird species. Where it present on the ground, the introduction of greater amounts of sunlight is likely to cause it to be replaced by other plants which are less tolerant of shade. It was also observed during the winter of 2012/13 that Goldcrests, which are usually associated with coniferous woodland, were feeding within it.

6.6.6 In some areas invasive non-native plants have become established, including variegated Yellow Archangel (*Lamium galeobdolon argentatum*), Spanish Bluebell (*Hyacinthoides hispanica*) and Ground Elder (*Aegopodium podagraria*). Measures to contain and/or eradicate these species should be considered.

6.2 Oak/Hazel woodland

6.2.1 Optimise the growth of English Oak (*Quercus robur*). Reduce the number of more aggressive underwood species such as Goat Willow, to encourage the growth of Hazel (*Corylus avellana*).

6.2.2 Give consideration to the reduction of the areas of the highly invasive Ground Elder (*Aegopodium podagraria*) which appear to be spreading.

6.3 Ponds and marshland

6.3.1 Establish a wooden deck area adjacent to the dam of the upper pond to facilitate access for children of all ages to explore the pond life. The Friends Group has plans to provide a simple bench at this site.

6.3.2 Raising the water level by the reinforcement of the dam has created a larger area of pond and marshland. Access to the south side of this area should be established by the construction of a boardwalk from the south side of the dam for approximately 6m to the dry falt ground upstream.

[14] Most especially as a source of pollen very late in the year when most other plants have finished flowering.

6.3.3 An initiative of the community rangers is for the establishment of a viewing area which is to be created on the north side of the dam, partly beneath the branch spread of the adjacent large English Oak tree and accessed by a few simple steps leading from the raised section on the south side of the dam. This will give a slightly raised view of the pond and marshland, it will be an attractive feature and assist in a greater understanding of the area by children. The Friends Group intend to put these works into effect during the winter of 2013/14.

6.4 Establishment of a Community Orchard.

6.4.1 The model for this is the organic cultivation of fruit on full-standard trees in ways which were typical of lowland Gloucestershire before 1950.

6.4.2 Orchards, although subject to management for the production of food, are valuable habitats which are now much reduced in extent. They are subject to low-intensity management which can be undertaken in ways which encourage wildlife and wildflowers. In years when fruit is plentiful, it is possible that not all of the fruit would be used by local people. At these times it will become a valuable food source for wild birds during the winter.[15]

6.4.3 It is to be expected that floristic diversity will increase naturally, and appropriate wildflowers of local provenance could be introduced. A programme of low intensity mowing would be established at appropriate times of the year to enable access to the orchard throughout the summer, and in order to maximise the orchard's biological interest.

[15] eg. Fieldfares and redwings which visit the Naure Reserve during the winter, feeding with resident blackbirds and thrushes.

6.4.4 The orchard area may be increased by further clearance of small trees and scrub growth. The possibility of extending the clearing is under consideration.

6.6 Open grassland south of Pilley Bridge

6.6.1 The grassland area is a popular site for visitors because it is the only place within the Reserve which receives full sunshine. As a result it is a pleasant place to visit and rest on the bench; the numbers and variety of butterflies, dragonflies and other invertebrates is far greater here than elsewhere in the Reserve.

6.6.2 Some of the Brambles were cut, probably for the first time in many years, during the winter 2011/12. A programme of cutting, both annual and in some areas more often, should be established in consultation with entomological experts to maximise the value of this site. The Friends Group has established contacts with various local naturalists who would be able to advise.

6.6.3 Management being undertaken includes the introduction of species such as Gorse (*Ulex europaeus*) on the upper part of the eastern bank. Gorse is a valuable nectar and pollen source for invertebrates early in the year, and a popular nesting site for long-tailed tits and others.[16]

6.7 Former trackside drystone walls

6.7.1 The drystone walls are valuable for a range in invertebrates and amphibians including masonry bees (which burrow into the soil retained by the walls) and common lizards, both of which prefer or require full sunshine. Other amphibians (frogs, toads, newts and sloe worms) also use stones to shelter or hibernate beneath. It is to be hoped that some common lizards remain from the population which formerly was present on the site, and slow worms are known to be present.

[16] Eg. The former are frequently seen and probably nest in ivy and other evergreen shrubs. Other species could include the incredibly rare Dartford Warbler!

6.7.2 Wherever it is practical, these walls should be retained, and trees and bushes which are threatening their integrity should be removed. Repair of damaged and collapsing walls will be undertaken by the Friends Group in due course.

6.8 Bridges

6.8.1 Brick-arched bridges offer particular opportunities for the creation of bat roosts. The Friends Group is investigating the feasibility of creating a bat roost in the bricked-up arch of this bridge. The Gloucestershire Bat Group has advised that despite the disturbance, it is likely that this initiative would be successful. Habitats for the rare Lesser Horseshoe bats, which exist in considerable numbers on Leckhampton Common, are few. It would be a significant achievement to establish a new roost for any bats, but especially a rare species such as Lesser Horseshoe bats.

6.8.2 Creation of the bat roost would involve bricking-up of both sides of an arch and providing access behind a grille for bats to fly into the space provided. Careful design would be required to create satisfactory conditions of temperature and ventilation for summer and winter conditions[17] and to provide a structure which would be proof against vandalism.

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[17] Cool moist conditions are required for hibernation., and warmer conditions in summer.