

### Introduction

## **Project aim:**

 To improve the habitat and control invasive species on both the Bourn Brook and the River Rhee and its tributaries.

## **Objectives of this survey:**

- To map the distribution of non-native invasive plant species as a first step towards controlling their spread;
- To assess habitats along the river and identify opportunities for restoration:
- To provide some baseline water vole data so that the hoped-for recovery of water voles on the River Rhee and its tributaries may be recorded.

The Bourn Brook and River Rhee Restoration Project is a partnership led by the Wildlife Trust and the Countryside Restoration Trust, working with landowners and local people supported by the Environment Agency, FWAG East and South Cambridgeshire District Council. This survey was made possible by funding from Defra, Anglian Water and the Environment Agency.

As "Bourn Free", the project originally covered the Bourn Brook, but was expanded in 2012 to cover the River Rhee. The lower Rhee, from Byron's Pool to the Malton golf course, was surveyed in 2012. The 2013 survey continues upstream from the golf course to Hook's Mill and includes the rivers Shep and Mel.

As many riparian landowners as possible were contacted as part of this survey and it is hoped to contact them all, share the information collected, and encourage them to participate in the project.

Prior to this survey, American mink were known to be present in the catchment. The most recent water vole records on the Rhee upstream of the golf course were from 2003, although water voles were known to be present on the River Mel. The 2012 survey found the invasive plants water fern (*Azolla filiculoides*) and floating pennywort (*Hydrocotyle ranunculoides*) on the lower Rhee, but the distribution upstream was not known.

Water voles are arguably the UK's fastest declining mammal. Loss and fragmentation of habitat are largely to blame, followed more recently by predation by American mink. Mink can eliminate water vole populations, as water voles have few defences against this non-native animal. Ideal water vole habitat has lush vegetation, providing food and shelter, banks at around 45° soft enough for digging burrows, at least 30cm of water, and no mink.

### **Acknowledgements:**

Thanks to the riparian landowners, Friends of the River Shep, the River Mel Restoration Group and Rob Mungovan (South Cambs DC) for useful information and other help with this survey.

## **Method**

The survey length was divided into 10 sections for convenience of survey. These are listed in Table 1. The watercourse was surveyed on foot from the bank. Binoculars were used to study the bank toe as access was generally difficult and from one bank only.

All sightings of non-native invasive plant species were recorded. Sightings of water vole, latrines, droppings and feeding signs were used to confirm water vole presence. Signs such as holes in the bank, footprints, and runs in vegetation were considered inconclusive on their own. The location and type of field sign found was recorded using a GPS unit. The GPS was also used to record the location of invasive plants and other features, to enable accurate mapping.

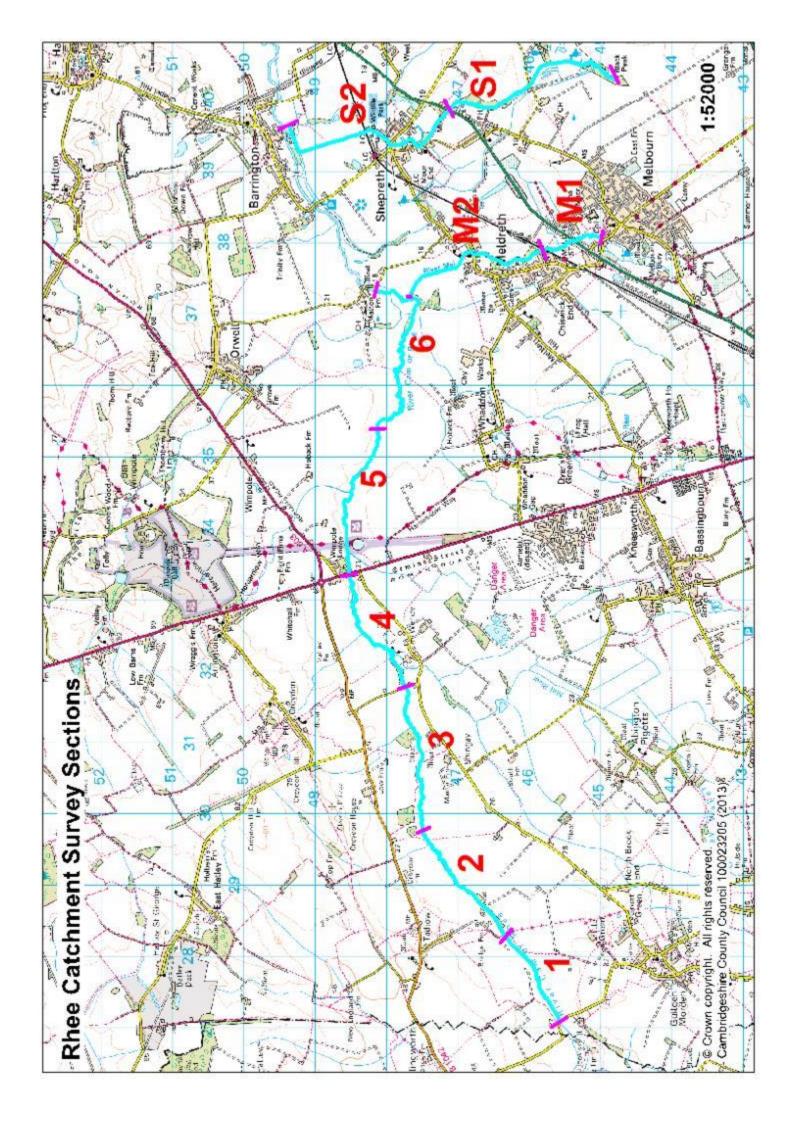
Signs of otter, mink and rat were also looked for and their presence recorded. Where mink rafts were present and accessible, they were checked for scats, spraints and footprints.

Habitat notes were also added to the survey map and the density of shade was noted. The amount of shade can be used as an approximate indicator of suitability of habitat for water vole.

**Table 1: Survey sections** 

Section	Description	Distance (Km)	Upstream grid ref.	Downstream grid ref.
1	Guilden Morden Bridge to Tadlow Bridge	1.6	TL 2706 4556	TL 2825 4633
2	Tadlow Bridge to Simkins Spinney	2	TL 2825 4633	TL 2975 4748
3	Simkins Spinney to Wendy Bridge	2.4	TL 2975 4748	TL 3176 4772
4	Wendy Bridge to A1198	2.3	TL 3176 4772	TL 3332 4852
5	A1198 to Malton Ford	2.4	TL 3332 4852	TL 3538 4812
6	Malton Ford to Malton Farm	3.3	TL 3538 4812	TL 3732 4815
M1	River Mel, Melbourn to railway line	1	TL 3806 4498	TL 3789 4581
M2	River Mel, Railway line to River Rhee	2.4	TL 3789 4581	TL 3722 4768
S1	River Shep, Fowlmere Nature Reserve to Rushmoor Plantation	1.5	TL4033 4479	TL3988 4709
S2	River Shep, Rushmoor Plantation to Boot Lane, Barrington	4.3	TL3985 4711	TL3964 4937

See map for location of sections.



## Results

Detailed results for each section follow the overall summary below. A discussion follows.

# Summary

## **Invasive plants**

No invasive plants were found on the River Rhee or the River Shep. A small amount of water fern was present on the River Mel, especially the upper reaches near Melbourn. There is also a garden with Himalayan balsam near the River Mel (but not on the banks) and Japanese knotweed in Melbourn across the road from the River Mel.

#### Water vole

Water voles are present on this part of the Rhee. Signs were found on the upstream half of the survey section and on the River Mel. Other areas at the downstream end appeared to have good habitat for water vole but no conclusive signs were found. No water voles were found on the River Shep, although they have been recorded there in the past (most recently in 2006).

#### Other wildlife

Otters are present on the Mel and Rhee. Other species recorded include reed warbler, brown hare, kingfisher, green woodpecker, brown rat, bank vole, muntjac deer and fox.

#### **Control structures**

There are a number of control structures present which prevent or impede fish passage:

- Environment Agency gauging weir, Wimpole TL33304851. This has a wide concrete apron, with a drop over a rounded edge of around 40cm at the time of survey.
- Weir downstream of Tadlow TL29034703. This appears to hold back water to fill an on-line pond. Water is leaking around the concrete posts at the side. The drop was around 30-40cm at the time of survey, and the wooden posts supporting the weir have collected some large woody debris.
- Topcliffe Mill, Meldreth TL37844662. A historic building which is a complete barrier to fish, with a water drop of around 1.5m.
- Delahayes Mill, Shepreth TL39364793. Also a historic mill. Water levels change by around 1m.
- Environment Agency gauging weir, Fowlmere TL40214598. The River Shep is confined to a concrete channel with several steps. However, this structure does not appear to impede fish passage, except at times of low flow.

There are also two fords on this section of the river, which do impound water somewhat but do not obstruct fish passage.

#### Habitat

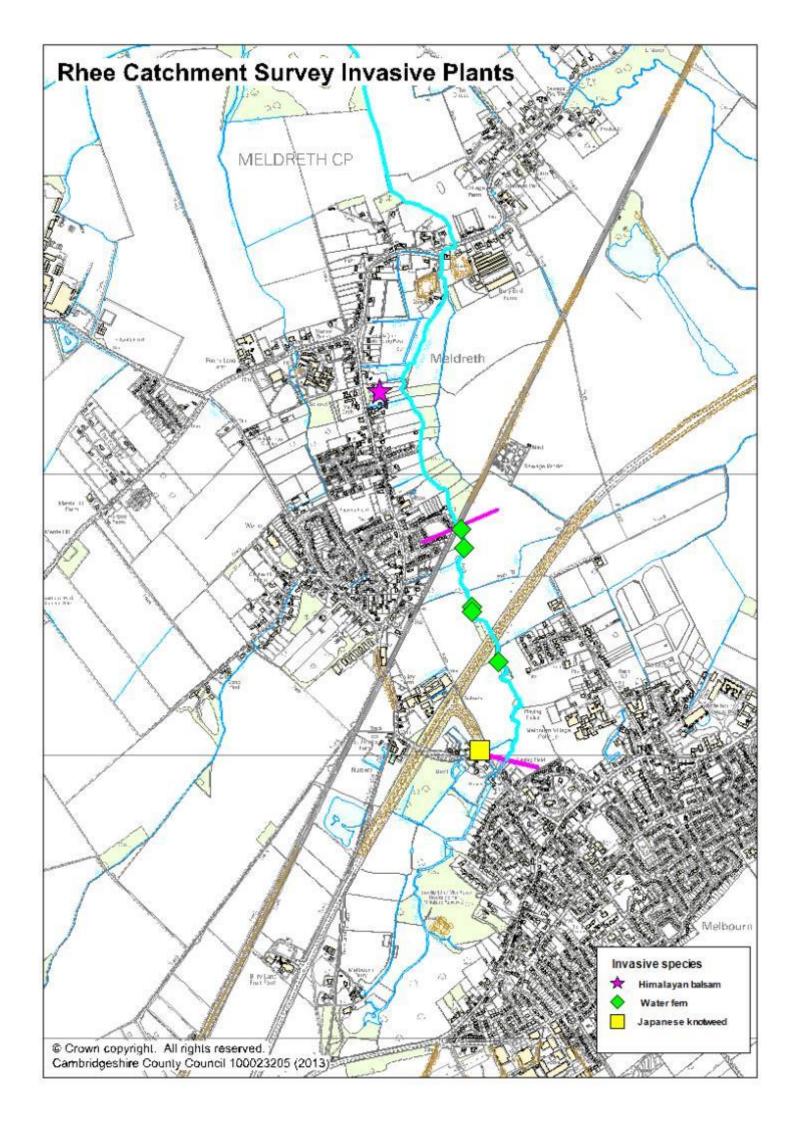
The river has in the past been over-widened, over-deepened and further disconnected from its flood plain where dredged material has formed levees on the banks. This results in very variable water levels (as the floodplain is only used at very high water levels) and a lack of in-channel diversity. Gravels are visible at Tadlow Bridge but otherwise the river bed appears silty. Woody debris (wedged in the channel or branches of bankside trees) provides fish refuge areas and energy to the water flow in some locations.

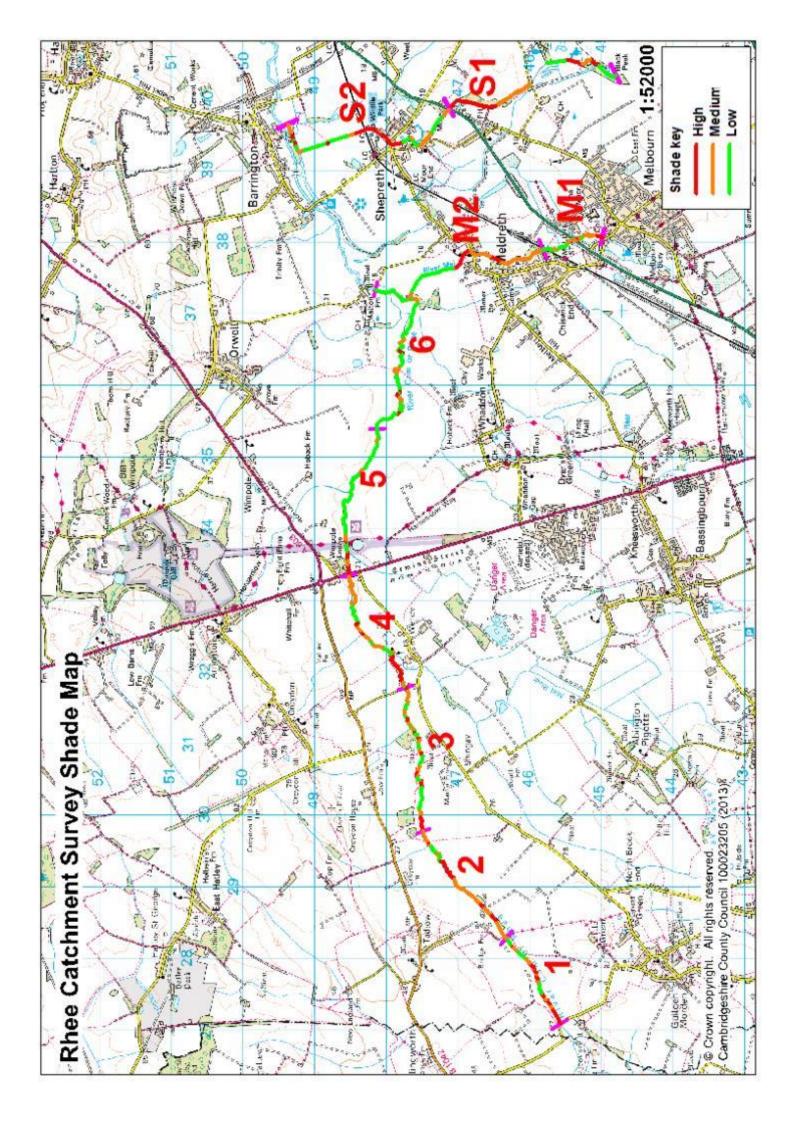
Extensive restoration work on the Rivers Mel and Shep has helped to address similar issues on these tributaries.

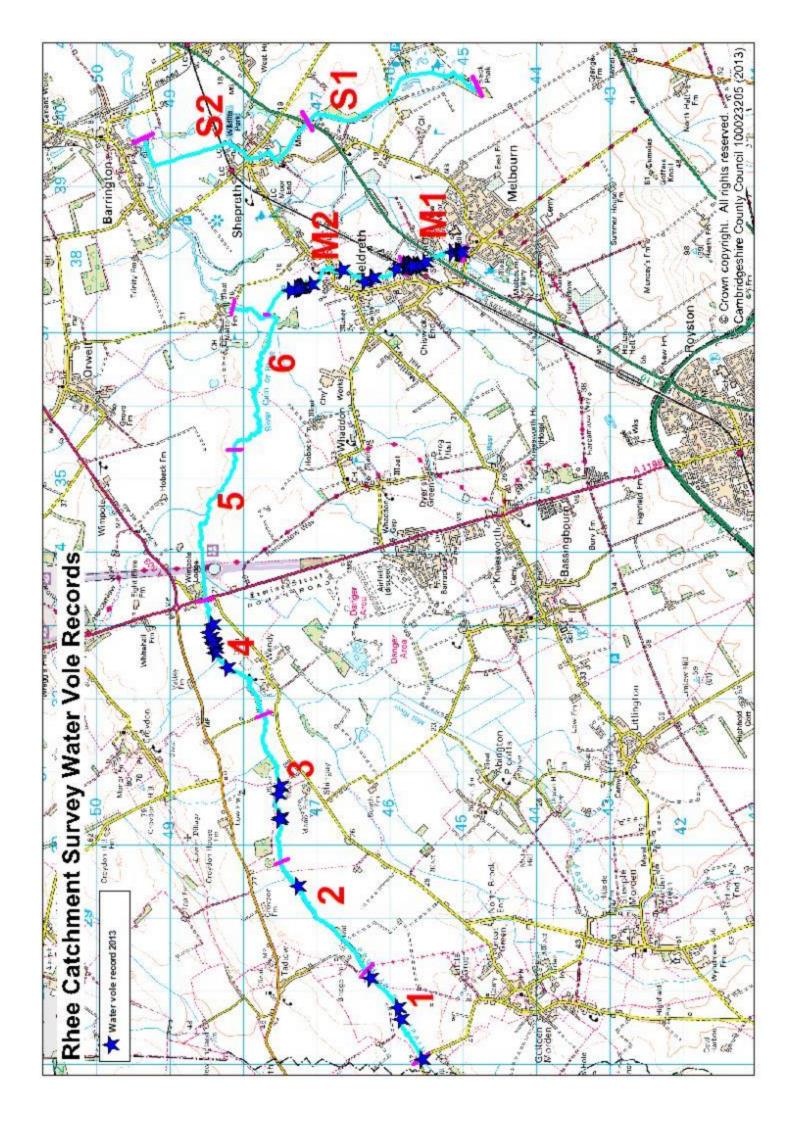
The results for invasive plants and water vole are summarised in Table 2 and the following maps.

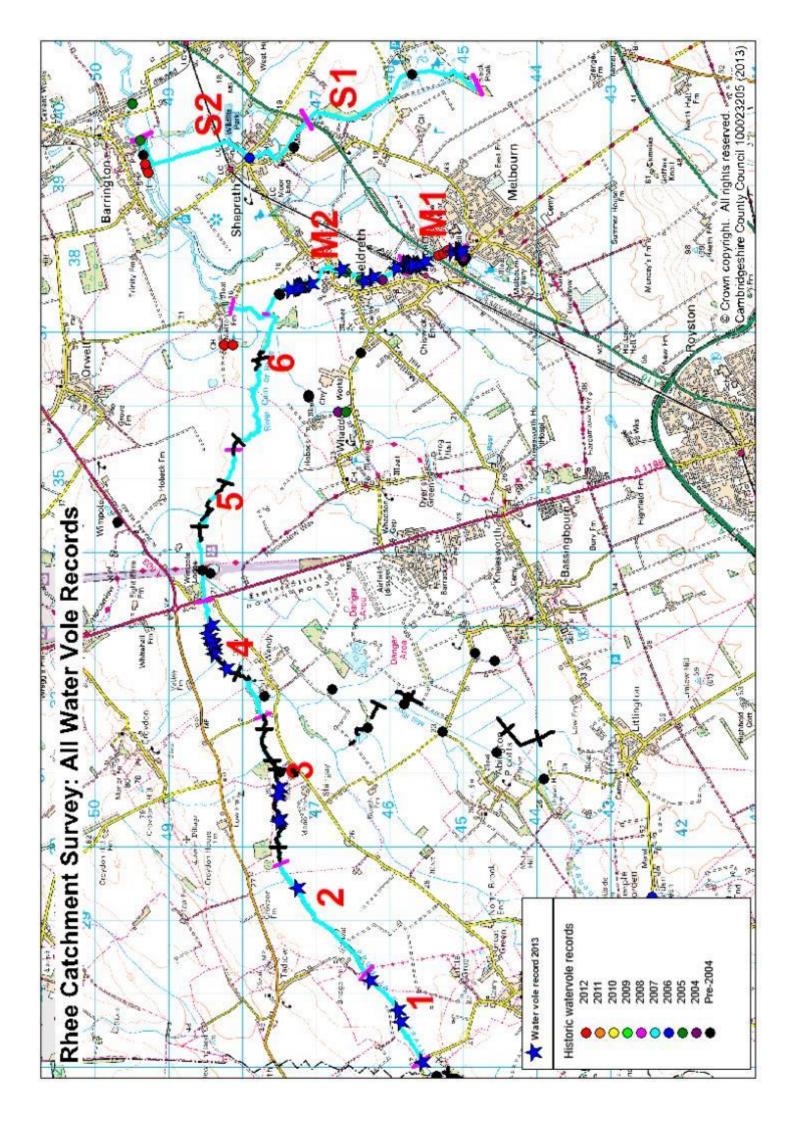
**Table 2: Survey results 2013** 

Section	Invasive plants recorded	Water vole recorded
1	No	Yes
2	No	Yes
3	No	Yes
4	No	Yes
5	No	No
6	No	No
M1	Yes	Yes
M2	Yes (nearby)	Yes
S1	No	No
S2	No	No









# Section 1: Guilden Morden Bridge to Tadlow Bridge

Upstream grid ref: TL 2706 4556 Downstream grid ref: TL 2825 4633

Approx length: 1.6km Date surveyed: 16/5/2013

**Surveyor(s):** Ruth Hawksley, Sarah Salmon

**Survey method:** Walking (Right bank)

## **Description:**

The section runs from Guilden Morden road to Tadlow Bridge. Bank height varies from 1.5 to 2.5m. The right bank is mostly very steep, around 60°; the left bank is generally shallower (closer to 30°). Channel width is 1.5-2m; average depth approx 0.5m. At the downstream end, the river bed is firm with some gravel visible (although the water was turbid at the time of survey).

The upstream third of this stretch is very shady, with tree cover along both banks until a small ash plantation. The channel is relatively uniform but there are small weirs created by woody debris. The downstream section is much more open and provides good water vole habitat. There is also more instream diversity here, created by small bank slips, vegetated silt bars, woody debris and vegetation in the channel. Channel vegetation includes branched bur-reed and reed canary grass with clumps of water starwort, lesser water parsnip and water crowfoot (present near Tadlow Bridge). A huge badger sett narrows the channel to 1m at one point. At several other locations (usually on bends) the bank is steep and eroding.

Veteran willow trees are a feature of this catchment and there are several on this stretch. At least one has been pollarded but most have been left to age naturally.

There are several tributaries / field drains, at least one of which had a reasonable flow at the time of survey and gravel visible on its bed.

Guilden Morden Parish Council reports that the nearby wastewater treatment works is prone to pollution incidents due to pump failure. This will have a direct impact on the river.

## Adjacent land use:

The land adjacent to the river is mostly used for arable crops, although one large part of a field on the right bank was not cultivated this year. Field margins on the right bank are particularly generous and include wider areas where the river meanders. This rough grassland will be home to many small mammals including water vole.

**Water voles:** One water vole was seen, plus 4 feeding signs and several holes and runs. It is very likely there were more signs which could not be

found due to difficult access. Droppings and feeding signs were also found upstream of the road bridge near Hook's Mill.

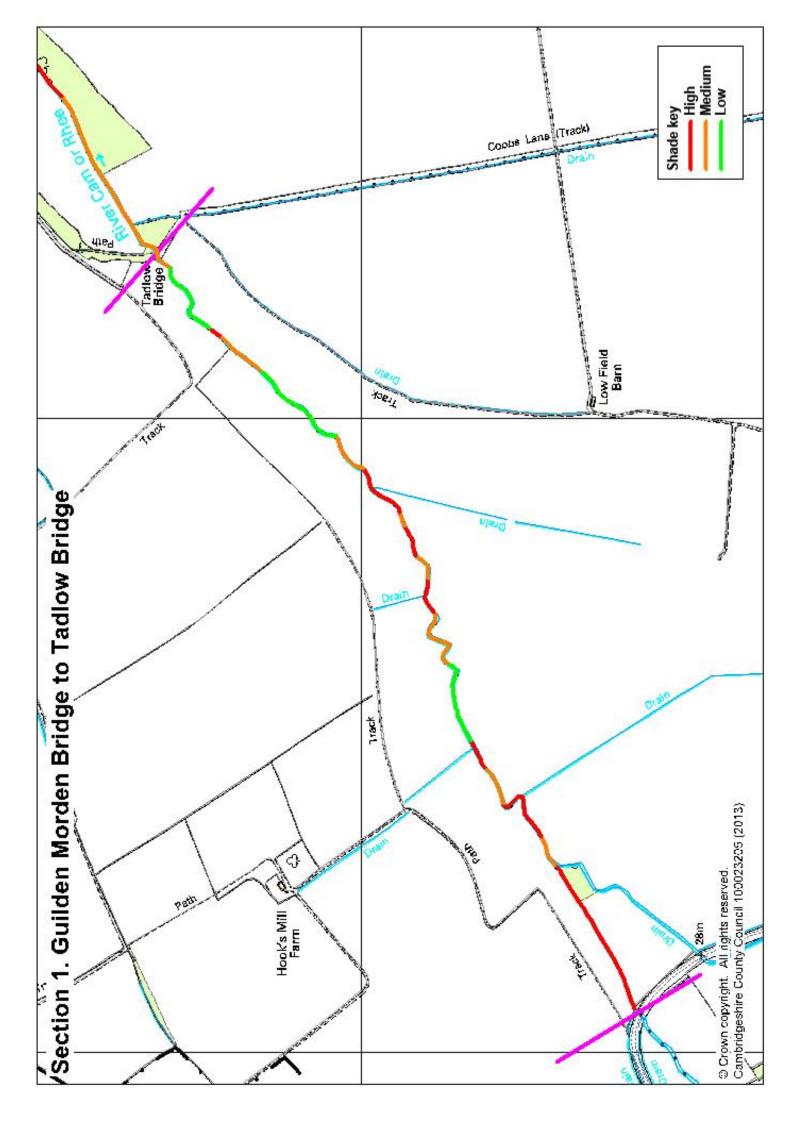
**Invasive plants:** None recorded.

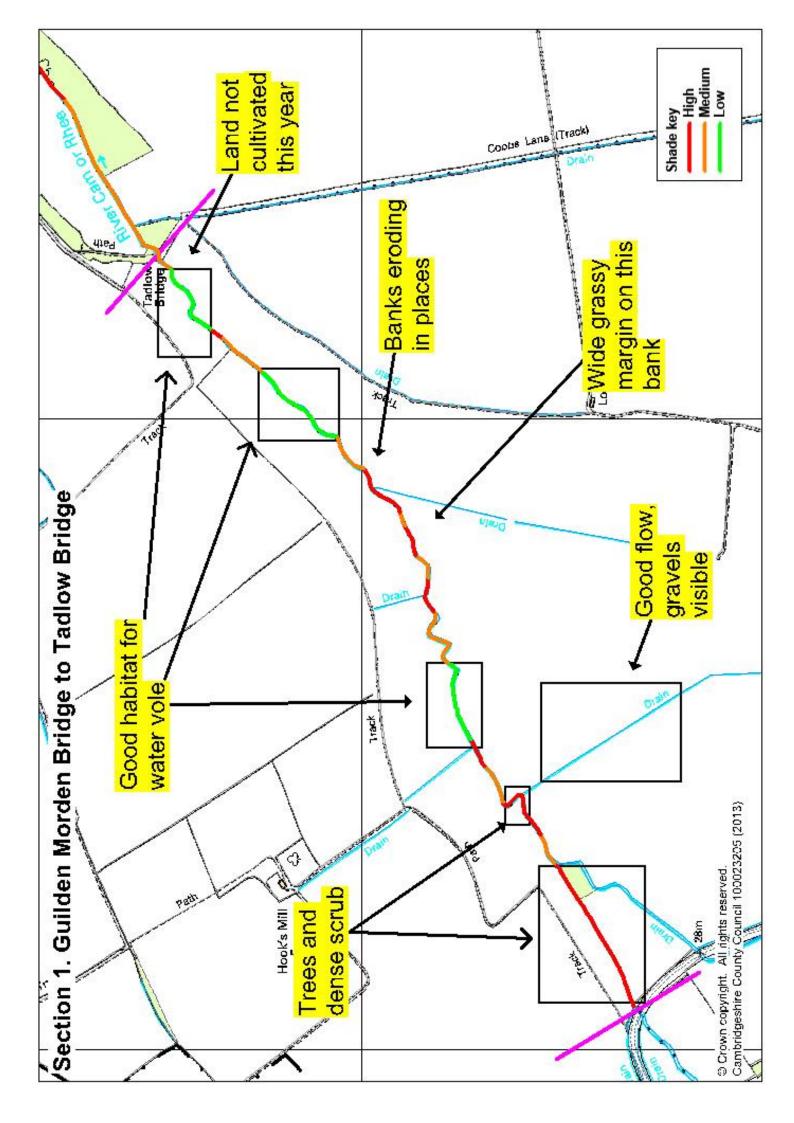
**Shade:** Heavily shaded at the upstream end, becoming much more patchy and open downstream.

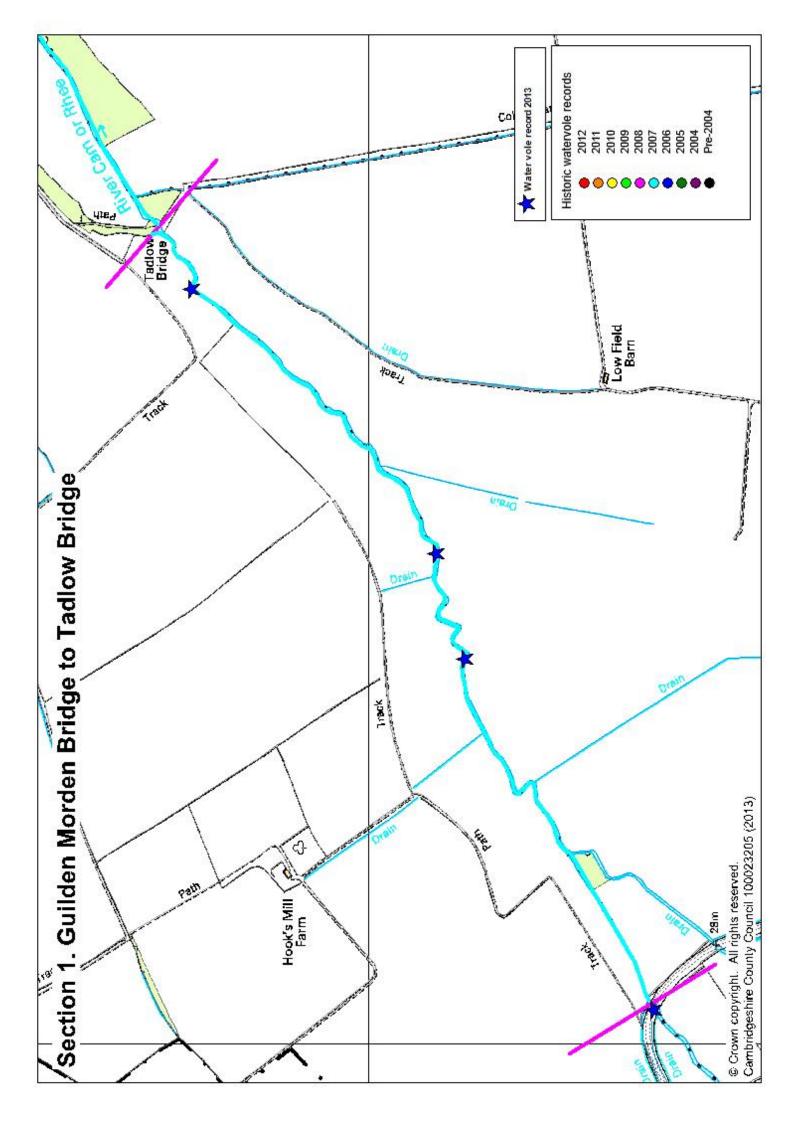
**Other wildlife:** Orange tip and peacock butterfly seen; reed warbler heard; otter prints found under bridge; badger sett seen and bank vole signs found near the middle of the stretch.

**Comments and recommendations:** This section has good habitat, with a variety of shade, vegetation and in-channel features. The field margins provide a valuable extension of water vole cover, which may help them elude mink. It may be that water voles are using the field margin rather than leaving many signs at the water's edge.

- Maintain generous field margins and long grass on river banks; prevent trees and scrub from spreading along the banks.
- Bank stabilisation where erosion is taking place would reduce the sediment input to the river.
- There may be opportunities to enhance the habitat in the gravelly ditch (would need to know the flow variation) and to create a fish refuge near where it joins the river.
- Improvements to the wastewater treatment works could reduce pollution events.
- Pollarding willows lengthens their life and helps provide valuable habitat for invertebrates. Some of the older willows here could be pollarded, although this would entail a landowner commitment to repollard in 10-15 years.
- Low weirs created by pieces of wood wedged in the channel give the river energy and improve oxygenation. Some of these have formed naturally but more could be installed.
- Some of the in-stream woody debris could be fixed more securely in place. Providing it remains at a low level it should not impede flood water but provides refuge for fish and invertebrates as well as flow diversity.
- The outflow from Hook's Mill was holding water at the time of survey, but was dry at the point where it meets the river (with its bed level 1 – 1.5m above river water level). This channel could be expanded to create a back channel or there may be a way to improve flow through the mill (not surveyed).
- The badger sett does not appear to be causing a problem and is best left alone.







## **Discussion**

The results show very few invasive plants present and the water vole population surviving. However, there is plenty of scope for improvements through changes in land management and through practical river conservation.

# Invasive plants

Very few invasive plants were found. It is possible that isolated small plants were missed, but at the time of survey there were no significant invasive plant species present on the survey stretch. It seems 2013 was not an abundant year for floating pennywort or water fern compared to 2012, so spot checks will be carried out where possible in a year when these plants are known to be more widespread.

The only invasive plants were on or near the River Mel, where 3 different species were found, but even here the impact was not great. Water fern (*Azolla filiculoides*) was present at the upstream end of the river and has been here for a number of years. The work of the River Mel Restoration Group (RMRG) ensures a good flow whenever possible, which tends to flush the plant through so that it only collects in areas of slack water. It may be worth experimenting with biological control using the *Azolla* weevil *Stenopelmus rufinasus* to deal with what is mainly a visual problem on the river.

A small amount of each of Himalayan balsam and Japanese knotweed are present near the River Mel but away from the river and bank top. The Himalayan balsam is being kept at the far end of a garden, away from the river (thanks to the efforts of the RMRG), and the owner of the house with the Japanese knotweed is already attempting to control it. Vigilance is needed to ensure it does not spread across the road to the river.

#### Water vole

Because the survey was carried out from the bank, it was not possible to search both banks thoroughly for water vole signs. While it is unlikely that invasive plants were missed, it may be that water voles are more widespread than the survey suggests.

Water vole signs were found at three distinct areas along the River Rhee and on the River Mel, mostly in locations where water vole had been recorded in the past.

#### River Mel

The River Mel had by far the largest population with very good numbers along the open arable fields and golf course at the river's downstream end, and also through the reed-lined section upstream of the railway line.

The River Mel is shaded along much of its length; its trees are an important landscape feature. Water vole signs were found even in some very shaded areas which did not look suitable. However, the two sections with most signs

had "classic" water vole habitat with a very open watercourse allowing dense vegetation on the banks all the way down to the water.

Although the two populations appear separate there were water vole signs scattered between them (including one near Topcliffe Mill, which may not be an obstacle). It could be that the River Mel is acting as a source for water vole populations elsewhere on the Rhee.

## **River Shep**

Although no Water Voles were recorded, the River Shep has some good water vole habitat, in small areas. It is hoped that water voles will return here in future.

#### **River Rhee**

No water vole signs were found on the main River Rhee until upstream of the A1198, although the lower section has some very good water vole habitat and past records from the area (water voles were recorded on a side stream on the Malton golf course in 2012). This may be due to the presence of mink, as captures were made at Wimpole when the project started in 2011. No mink have been detected upstream of Wimpole (where the Rhee water vole records begin). It is hoped that continued mink control will allow water voles to return to this lower stretch.

Where found, populations appeared sparse and signs were hard to find; fewer than might be expected given the quality of habitat. There are a number of possible reasons for this. It may be simply that the population is very small (which could be linked to mink predation). It may be also that water voles in this area are using the habitat differently.

While vegetated margins are present, often the best habitat along the River Rhee is at or near the top of the bank. In one area the only water vole signs found were at the top of a steep bank, with a very steep run going down to the water. If water voles are using the bank top more than in the past, either because habitat is better or to evade mink, this makes surveying for them more difficult. It also means that good field margins are likely to be critical to their survival.

#### Habitat

Past management has over-widened and over-deepened the channel along most of its length, with a section at Tadlow Bridge apparently less damaged. Gravels are visible here but the channel is still very wide and partly silted, suggesting it is recovering rather than untouched. Generally the channel shape is very uniform, resulting in a uniform slow flow and silted river bed.

This deepening of the river and placement of spoil on the bank top has removed the natural connection between the river and its floodplain, which has contributed to the very variable water levels.

## Possible measures to restore a more natural river profile

### Restore / create back channels and ponds

There are a number of back channels / former river channels which have the potential for de-silting to create backwaters or ponds. It may be possible to link these to unproductive field corners, which can then flood more often. By giving the water a place to go, levels in the river can become more stable and flooding reduced in other places. Backwaters provide refuge areas for young fish and invertebrates, have unique botanical communities, increase habitat diversity in the river, and provide valuable habitat for birds, grass snakes and amphibians.

## Place gravel in the river to raise the bed level at selected locations, or create riffles

Gravel placement can increase the energy of the river, improve the invertebrate population and provide spawning sites for fish such as brown trout. These measures will also improve water quality by increasing the oxygenation of the water.

- Use flow deflectors or fixed woody debris to narrow the channel These measures narrow the channel during times of low flow, increasing flow rate and structural diversity. If placed at a low level, water can flow over the top in times of high water levels.
- Re-profile the banks in selected areas to create a shallower slope. This measure creates a better variety of riverside habitat, which will increase botanical and invertebrate diversity. A shallow slope leads to an area of wet ground at the water's edge. The flora and fauna associated with riverside wetlands are rare on this stretch and this would give them a toehold.
  - Bank stabilisation to prevent erosion

Where erosion is undercutting the bank, it may be beneficial to support it and reduce the amount of silt going into the river.

• Retain some steep, eroding banks

Steep banks are a natural feature of rivers, particularly on the outside of a bend, and can contribute gravel to the river bed. They can also be used by kingfishers for nesting.

Extensive river restoration work has already taken place on the rivers Mel and Shep, which has rebuilt some of these natural features and improved the habitat for invertebrates and fish as well as birds and small mammals.

#### **Control structures**

Structures such as weirs and mills have several impacts on rivers. They can prevent fish movement, which means they are not able to colonise new areas of river or to migrate and breed. They also impound water; upstream of an obstacle flow is slow and the river bed accumulates deep silt. This generally leads to low oxygenation of the water and little aquatic life. In this catchment, gradients are low (the land is fairly flat) so the effects of this impoundment are felt for a considerable distance.

It is usually not practical to remove these structures, but they can sometimes be modified to allow fish through, or be bypassed with a new channel. The two fords on this section of the river do not obstruct fish passage, but placing gravel on them might be a way of keeping their function while creating a more natural river feature.

#### Other features

Much of the land next to the river has generous grassy margins, which are excellent for small mammals and invertebrates and a very valuable part of the river corridor. Retaining and increasing these margins wherever possible will enhance wildlife diversity.

Willows are common along river banks in this area; some are veteran trees. As these trees mature, they shed limbs into the channel. The resulting woody debris provides a valuable refuge for fish and invertebrates, provides perches for birds such as kingfishers, and improves water quality by creating still-water areas where silt is deposited. Such debris rarely increases the risk of flooding, and tends to be stable within the channel; it often also helps to stabilise the channel banks and bed. Woody debris should therefore be retained wherever possible. It may occasionally prove necessary to stabilise it with hardwood stakes, or to readjust its position within the channel, and occasionally as a last resort remove it to prevent flood risk.

Pollarding willows can extend their life. An old tree with a significant proportion of dead wood is very valuable for invertebrates, fungi and birds. Managing these trees also improves water vole habitat by reducing shade. Where possible, large diameter deadwood created by pollarding should be retained on-site to provide habitat for reptiles and invertebrates.

### Conclusions

- There are very few invasive plants on the stretches of river surveyed.
- Modifying or removing control structures could improve fish passage along the river. Consent must be obtained from the Environment Agency for any work.
- In-stream river restoration works such as bank stabilisation, channel
  narrowing and gravel placement could improve habitat and water
  quality. A levels survey is required to assess the impact of any works.
  Consent must be obtained from the Environment Agency.
- Water voles are still present, with a good population on the River Mel and low numbers on the River Rhee.
- Mink control is probably benefitting water voles and may soon allow the population to expand.
- Maintenance of wide field margins improves habitat for water voles and other wildlife (e.g. invertebrates) and improves the chances of water voles surviving.
- Riparian owners and interested local people are key to achieving lasting improvements to the river.

# Appendix 1

# The Bourn Brook and River Rhee Restoration Project

The Wildlife Trust, working with the Countryside Restoration Trust (CRT) has launched a campaign to restore native wildlife and habitats on the Bourn Brook, River Rhee and tributaries. We are inviting all landowners along these watercourses to join us; working together we can achieve much more.

The project began as "Bourn Free", focussing on the Bourn Brook, but has now expanded into the River Rhee catchment. The Bourn Brook was surveyed in 2011 for water vole and invasive plants, and this survey has been continued in 2012 and 2013 on the lower and middle sections of the Rhee, including the River Shep and River Mel. The surveys show that water voles are present in the catchment but need some help if the populations are to survive. They also show that invasive species are more of an issue on the Bourn Brook than on the River Rhee and its tributaries.

Control of Himalayan balsam and giant hogweed is already underway on the Bourn Brook, and options are being investigated for dealing with floating pennywort and water fern on the River Rhee.

CRT is leading on the mink control phase of the project. American Mink were brought to Britain for fur-farms, but many escaped, and many more were deliberately released by protesters opposed to the fur trade. They occupied a vacant 'niche' in our countryside, being the same size as the native Polecat, with the added ability to swim well. They found an abundance of prey that was unable to cope with a new predator – particularly our native water vole which has become the most rapidly declining mammal in Britain.

Water voles in the catchment are in decline, but by acting now it should be possible to restore a viable population, as well as increased numbers of water birds and fish.

Eventually we hope through this project to achieve much more, including tackling invasive plants, improving water quality and improving habitat in and adjacent to the watercourses. The aim is to have a properly functioning wetland ecosystem, an abundance of wildlife and storage of floodwater on flood meadows rather than exporting it downstream. Being a 'wildlife corridor', work on the whole length of a river will have a greater impact than the sum of each individual's actions.

# Mink control progress

# Summary of trapping activity

Thanks to Environment Agency funds and help from Cliff Carson of the Middle Level Commissioners, the Countryside Restoration Trust (CRT) has 80 mink rafts in operation throughout the Cam catchment upstream of Cambridge. These rafts were placed with the permission of riparian owners. They are

checked for footprints or trapped animals by CRT staff and volunteers. Volunteers were recruited from the CRT, the Cambridgeshire Mammal Group and landowners and locals living near the rafts.

Raft design, spacing and monitoring are conducted following the excellent guidelines developed by the Game and Wildlife Conservation Trust (GWCT).

Mink Season Totals are calculated at the end of June, for the preceding 12 month period, i.e. July 1<sup>st</sup> – June 30<sup>th</sup> is the mink year. This convention is a consequence of the fact that very little mink trapping activity is undertaken during the summer months.

Mink trapped July 1<sup>st</sup> 2012 – June 30<sup>th</sup> 2013:

Bourn Brook: 5 Rest of Cam: 18

Total: 23

Mink trapped July 1st 2013 to date (Oct 2013):

Bourn Brook: 0 Rest of Cam: 5

Total: 5

In addition, one gamekeeper in the river network catches around 20 mink per year, though he reports numbers are declining.

The map shows approximate raft locations, correct winter 2012-13.

