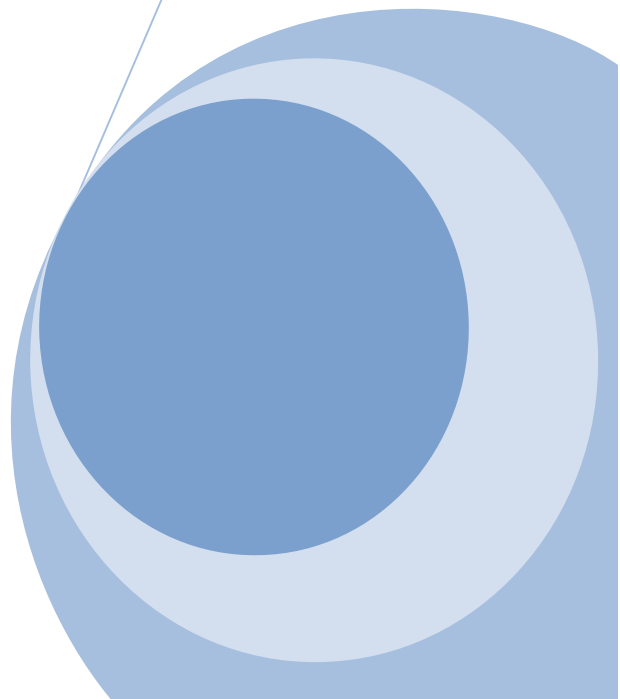
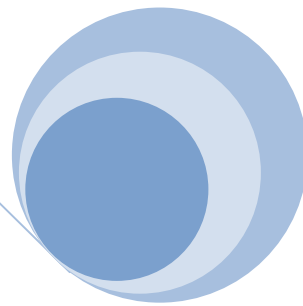
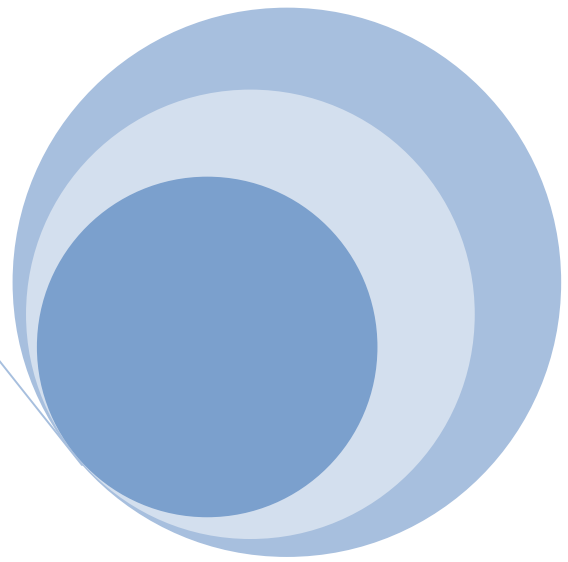




Bude Catchment Water Vole Survey Summer 2014

**Report Compiled by
Teagen Hill**



Contents

Introduction.....	1
Aim	1
Survey Site Layout	2
Survey Details	2
Methodology and Materials.....	3
Transect 1.....	3
Transect 2.....	3
Transect 3.....	3
Transect 4.....	3
Transect 5.....	3
Transect 6.....	3
Transect 7.....	3
Transect 8.....	3
Transect 9.....	3
Survey Results	4
Transect 1.....	4
Transect 2.....	5
Transect 3.....	6
Transect 4.....	6
Transect 5.....	7
Transect 6.....	7
Transect 7.....	8
Transect 8.....	8
Transect 9.....	8
Discussion	9
Limitations	10
Conclusion	11
Acknowledgements	11
References.....	12
Appendices	13
Appendix 1: Water vole survey form.....	13
Appendix 2: Results	14
Appendix 2a	14
Appendix 2b	14
Appendix 2c.....	15
Appendix 2d	15
Appendix 2e	16
Appendix 2f.....	16

Introduction

Water voles (*Arvicola amphibious*) were once a widespread species in Britain, however with mink finding their way into the local catchment, they soon became Britain's fastest declining mammal (MacPherson, *et al.*, 2003). By 1989, 97% of the water vole population had declined and they became a Biodiversity Action Plan (BAP) priority species (MacPherson & Bright, 2011). Mink eradication schemes have since been completed in various locations, allowing local areas to go from a mink "black spot" to being almost free of mink. Mink are a devastating opportunistic feeder, preying on small mammals, birds, ground nesting bird eggs as well as larger prey should the opportunity arise.

The water vole reintroduction programme in Cornwall initially started with mink surveys in summer 2012. No field signs were detected and with funding from the Westland Countryside Stewards the first water vole release took place in June 2013, with a second soon after, in September of that year. Surveying for the voles took place at the end of April/ beginning of May 2014, and with funding from BIFFA, through the Landfill Communities Trust, a third water vole release took place June 2014. Overall an approximate total of 500 water voles have been released into the catchment since the start of the project.

The over wintering survey in spring 2014 showed that there was an extant population within the catchment, which was estimated to expand in the breeding months. The signs over the summer survey should indicate a larger population due to breeding. The field signs for water voles over the summer months are "D" shaped burrows, pat latrines, droppings, feeding stations, gnawing on roots and tubers, feeding lawns and runs.

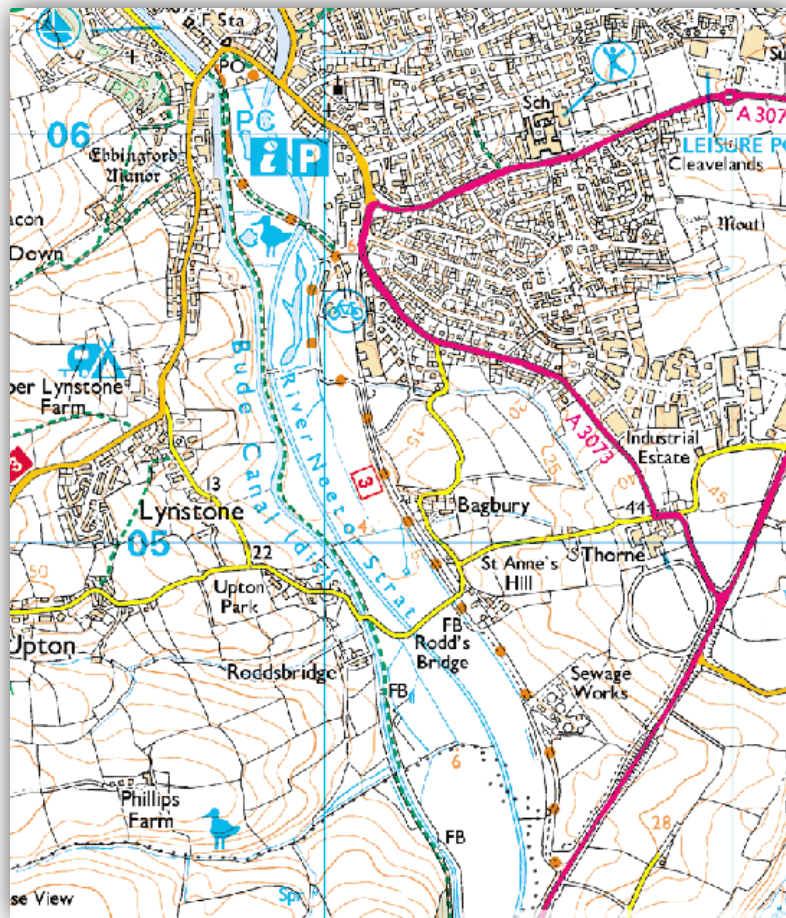
Aim

The aim of the summer 2014 survey was to survey the edges of waterways and ditches, in order to determine if the water voles, that were released in 2013 have reproduced, and if the voles released in summer 2014 have become established in the catchment. Surveying will include searching along the water body for evidence of water voles, such as burrows, feeding stations, latrines, ball nests and runs.

Survey Site Layout

The River Strat (12.7 miles) and the River Neet (10.5 miles) catchments drain a combined area of approximately 133.5km² (Westcountry Rivers Trust, 2006). The River Strat runs between Stratton and Helebridge, a small fishing pond can be found at the end. The river then flows into the River Neet. The River Strat or Neet is then split at a weir forming Bude Canal and the run off then flows adjacent to the canal with agriculture land in between (Figure 1).

Figure 1: Section of the River Strat / Neet catchment and the Canal



Survey Details

The surveyor that undertook the summer water vole survey was Teagen Hill from the Westland Countryside Stewards, who has been overseeing the water vole project. Volunteers were also conducting the survey. The survey was completed over 3 days; Monday 4th August through to Wednesday 6th August.

Methodology and Materials

The local catchment was divided into manageable transects, and permission was given by local land owners and organisations in order to access the land.

Transect 1- Bodies of water within Bude Marshes Local Nature Reserve (LNR).

Transect 2- Closest transect to the mouth of the River Neet or Strat, Bude. Lower end of the river, starting at Bencoolen Bridge and ending at Rodd's Bridge

Transect 3- Section of river upstream from Transect 1, starting at Rodd's Bridge and ending at the Weir/ fish ladder in Marhamchurch.

Transect 4- Lower end of the canal from Bencoolen Road and ending at Rodd's Bridge.

Transect 5- Section of the canal, starting at Rodd's bridge and ending at the Underpass, Helebridge.

Transect 6- Starting at the underpass at Helebridge and ending at the top end of the water body/ stock pond at Helebridge.

Transect 7- Lower Cann Orchard, to the North East of Marhamchurch, between Marhamchurch and Stratton. A 0.2 km tributary that flows into a section of the River Strat, along with 1.3km of River Strat downstream of the tributary. This will also include the small pond adjacent to the River Strat.

Transect 8 - A section of the River Neet including the Viaduct, between Marhamchurch and Box's Shop.

Transect 9-Section of the River Neet at Poundstock, including a stocked fishing pond. This is the furthest upstream section to be surveyed.

At each transect the surveyors worked together to look through the bank side vegetation and up to the water's edge, searching the habitat for water vole field signs. A water vole survey form was filled out for each site (Appendix 1) with details of the site such habitat type. Field signs were recorded on a map and photographic evidence of field signs were taken. Binoculars were used to view the opposite side of the bank where access was restricted. The survey was completed on foot and the river was accessed where it was safe to do so, in order to get a better view of the banks.

Survey Results

Transect 1

Bude Marshes, Local Nature Reserve (LNR) is comprised of 3 main bodies of water separated by paths and the river (Figure 1). The bank profile for the water bodies at the north and south end of the marshes were flat at less than 10° , offering no bank for the voles to burrow in. The middle water body, situated by the bird hide, is the closest to the public paths. This water body has a range of bank profiles, comprised of earth and silt, providing ideal burrowing banks. Rushes, sedges and reeds cover a large amount of the marshes and therefore provide shelter and a food source for water voles.

The majority of field signs within the marshes belonged to field voles. No water vole burrows were found within the marshes, one pat latrine was recorded to the southern end of the middle water body (Plate 1) and old feeding was found to the southern end of the southern water body (Appendix 2a). The mink monitoring raft at the end of the ditch that runs adjacent to the south of the cycle path has previously shown water vole footprints. This raft is surrounded by dense vegetation and therefore was not surveyed due to limited access. At the time of the survey cattle were grazing the southern end of the marshes. These cattle had trampled and grazed a large amount of the vegetation and any potential latrines, or feeding stations within this area would have been destroyed.

Plate 1: Pat latrine on the marshes.



Transect 2

Covering 1.5km of the river between Bencoolen Bridge and Rodd's Bridge, this was the lowest section of river that was surveyed. Adjacent to the southern water body in Bude Marshes, 560 meters upstream of Bencoolen Bridge, a mink monitoring raft has had abundant water vole signs, feeding stations, footprints and latrines (Plate 2). A large portion of the river adjacent to the marshes was left un-surveyed due to the depth of the water and density of vegetation.

Plate 2: Raft adjacent to the marshes.



Upstream of the wooden bridge linking the canal path with the cycle path, a total of 14 latrines, 16 burrows and two feeding stations were recorded (Plate 3 and 4, Appendix 2b). The bank profile varied between steep banks, vertical undercutting banks and eroded banks. Both river banks were abundant in flora, providing food and shelter. In this section, water voles have been sighted outside of survey times.

Plate 3 and 4: Feeding station and latrine in Transect 2



Transect 3

Covering approximately 1km of the River Neet or Strat, this transect was surveyed using waders in the river as the height of the earth bank was greater than two meters. A total of three burrows and three latrines were found within this section. Historic burrow systems appear to have been utilised by the voles within this section as fresh latrines could be seen (Plate 5, Appendix 2c). The raft which is situated near to where the field signs were found, has had one set of water vole prints on every day.

Plate 5: Historic burrow with fresh latrines.



Transect 4

This section covered the canal between Bencoolen Road and Rodd's Bridge. Downstream of the wooden bridge the habitat was unsuitable for water voles as increased human activity and wooded areas dominate the lower end of the canal and therefore was not surveyed. Between the wooden bridge and Rodd's Bridge some areas were inaccessible due to dense vegetation, however, two latrines, one feeding station and a single run was found within the tussocks of reeds, rushes and flag iris (*Iris pseudacorus*) (Appendix 2b).

Transect 5

The upper section of the canal between Rodd's Bridge and the underpass at Helebridge, contained the most amount of water vole signs along the canal. The canal bank that runs alongside the footpath is subject to dogs climbing in and out of the canal, and the opposite bank was inaccessible. Between the Weir/ fish ladder and the loch gate, sightings of two different water voles were recorded, along with three burrows on the bank opposite the paved side (Appendix 2c). Between the upper loch gates latrines and feeding signs of field voles were recorded, and five water vole burrows were found just upstream of Rodd's Bridge on the canal path bank.

Transect 6

Transect 6 covered the river located Helebridge side of the underpass as well as a body of water at Helebridge. The river had a shallow earth bank profile and 21 burrows were recorded in the small section (Plate 6), as well as a single latrine. The ditch running between the river and the water body showed signs of old feeding, however was inaccessible to survey completely.

The water body (fishing lake) is dominated with water vole field signs. The southern bank of the fishing lake was only accessible up to the barge workshop half way along. In the half that was surveyed, a total of 116 burrows, five feeding stations and 16 latrines were recorded, showing a thriving population of water voles. The north bank was heavily vegetated and therefore was not as accessible. Despite this, 39 burrows, a single feeding station and one latrine were recorded (Appendix 2d). Burrows on the southern bank were clumped together and often ten or more appeared to be linked in one section.

Plate 6: Burrows by the underpass



Transect 7

Lower Cann Orchard was the furthest transect upstream of the River Strat. The majority of the bank profile for the tributary and the river were steep cliffs and vertical with undercutting. Large stretches of the river were shaded by mature trees. Natural dams from collections of branches and debris create a variety of water depths, from pools to shallow ripples. Very few water vole signs could be seen in this stretch, those that were found mainly consisted of historical burrows. Signs of brown rats, foxes and otter were also found along silt bars in the tributary. A total of eight potentially active burrows were recorded and a single latrine (Appendix 2e).

The pond the bank profile was shallow and had a depth of less than 0.5 meters giving no bank for potential burrowing. Around the pond, field vole signs of runs and burrows further back from the water's edge could be seen as well as otter runs leading to the river. No signs of water voles were recorded by the pond.

Transect 8

This section of the River Neet had a water vole release summer 2014. Approximately 100 water voles were released along this stretch of river. Before the Viaduct, the river is shaded with mature trees, and a man-made stone bank has been created around the road bridge at the southern section of this transect. The bank profile ranged from flat ($<10^{\circ}$) to vertical and undercut cliffs. Recent cattle grazing caused trampling and poaching on the flat banks. The depth of the river varied from shallow to deep pools. The deeper sections of river were usually directly below the sheer earth cliffs on the tightest meanders.

One sighting of a water vole was recorded approximately 144 meters downstream of the viaduct. Due to the depth of the river at that location no field signs were recorded. Further downstream five burrows and footprints were recorded (Appendix 2f).

Transect 9

This transect was located just outside of Poundstock and was the furthest upstream that was surveyed. The pond was too overgrown to survey, with heavy shading from trees, and abundant tall flora. The river was also shaded; mature trees were along the length of the river. No water vole field signs were recorded in this transect.

Discussion

The number of voles released over the last 14 months, compared to the number of field signs recorded to date suggests that the water vole populations have declined. Compared to the April 2014 survey a significant decline in field signs can also be seen. This possible decline could be due to predation, natural death, climatic conditions, and loss of habitat and / or dense vegetation.

Water voles are predated on by a range of species. Foxes (*Vulpes vulpes*), herons (*Ardea cinerea*) and the non- native invasive American mink are some of the main predators (Reynolds et al., 2004). Surrounded by farmland and wooded areas, Transect 7: Lower Cann Orchard was subject to a large number of fox prints. In a study created by Forman (2004) 30% of fox scat analysed contained water vole remains. This would indicate that foxes may be a predatory reason for the decline of signs at Transect 7.

Transects 4 and 5 along the canal have a large population of herons. Herons can often be spotted flying over the farmland adjacent to the canal, or perched at the water's edge. In the same Forman (2004) study, 18% of heron pellets contained the fur from water voles. Predation from herons would cause a small decline along this transect, however signs along the banks were further downstream than the April 2014 survey, suggesting that water voles have continued to thrive along the canal.

Predation from American mink (*Mustela vison*) has been a severe issue in the past and one which has previously caused devastating declines to the point of extinction within the water vole populations (Richards *et al.*, 2013). Mink rafts have been situated along the catchment and no signs of mink have been detected since May 2014. Between August and November any matured young mink would be forced out of the natal den and will be in search of their own territory, so mink predation cannot be ruled out. Surveying using mink rafts will continue to monitor the catchment for any field signs.

Two water voles were recorded as deceased within the river in June; both accounts are thought to be natural causes. More voles, not seen may have also died through natural causes and not seen or recorded. Death in burrows, as well as death with the body being consumed could also amount to a sizeable number leading to a small decline.

Climatic conditions are thought to be the main decline of water voles since the first release. Both extremes from flooding to heat waves have occurred over the last 24 months. Flooding occurred in January 2014, the time of year where water voles can suffer up to a 70% decline naturally. The floods are likely to have forced the water voles into areas where they would not usually seek residence. As well as this the floods would have flooded out burrows causing a loss of voles within the burrows themselves. As many of the water bodies are surrounded by farmland, the amount of rain leading to the flooding may have caused pollution in the rivers from the arable land around. Pollution from farmland is likely to contain Nitrogen (N), which in turn will create algal blooms, causing a loss of food source for the voles.

Alongside the flooding, temperatures of up to 30°C were recorded in Cornwall during summer 2014. This heat dried up many wet ditches. Water voles will not normally live in ditches, however areas overpopulated with water voles can force the voles to move into habitat they wouldn't usually be found in. The heat also had an effect on the vegetation. The lack of precipitation caused slow re-growth and even dieback in the vegetation.

After the heat wave, the weather changed to showers, and this caused a bloom of vegetation growth. This growth has created sections of river which are inaccessible for surveyors. The vegetation however has created an ideal habitat for water voles as they have the cover from predation as well as an abundant food source. Water voles will breed through to October and therefore with this ideal habitat they will hopefully continue to breed and eventually repopulate all water bodies within the local area without the need of more reintroductions.

Limitations

Due to the survey being undertaken in summer months, the bankside vegetation is very dense, causing bank access to be at its minimum. In order to mitigate this, the survey will be conducted again when the vegetation has died back, allowing a clear view and access to the edges of the banks. All nine transects had areas which were inaccessible due to over growth of vegetation. As well as this there were areas of deep water which were too deep to access in order to survey the banks.

Conclusion

Water vole releases in 2013 were located in Lower Cann Orchard, the pond at the Weir Café, and the 2014 releases were located at Marhamchurch by the viaduct, Poundstock and along the River Neet (Transect 3). Water vole signs show that there has been a spread of water voles as they have established a population at Helebridge, and signs along the canal show that the voles have spread from the river. A few water vole signs could be seen in Transects 1 and 4, whereas Transects 2, 3, 5 and 6 all contained larger numbers of field signs. Transects 7 and 9 had no field signs recorded, as well as transect 8, however this transect had one sighting recorded. Transect 8 shows that there are likely to be field signs however due to the limitations were not recorded.

Although the results of the summer 2014 survey appear to have a decline in water voles, the limitations suggest that the cause of this is not likely to be due to a water vole decline, but due to the inaccessible banks. With follow up surveys there should soon be clear signs of a thriving water vole population within North Cornwall. Thriving populations can still be seen at Helebridge, Marhamchurch which shows that the reintroductions can be successful.

Acknowledgements

Permission to carry out this study was given by local landowners including Cornwall Council and the Environment Agency. This project has been funded by Biffa Award, a multi-million pound fund that helps to build communities and transform lives through awarding grants to community and environmental projects across the UK (www.biffa-award.org).

Supported by



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Appendices

Appendix 1: Water vole survey form

WATER VOLE SURVEY FORM

BACKGROUND INFORMATION

Site name/river _____

Site number _____ 10km square _____ Grid ref _____

County _____ Water Authority _____

Recorder _____ Date _____

HABITAT INFORMATION (mark features on map)

Survey distance _____ km

<p>Habitat</p> <p><input type="checkbox"/> Ditch</p> <p><input type="checkbox"/> Dyke</p> <p><input type="checkbox"/> Gravel pit</p> <p><input type="checkbox"/> Pond</p> <p><input type="checkbox"/> Lowland lake</p> <p><input type="checkbox"/> Upland loch</p> <p><input type="checkbox"/> Reservoir</p> <p><input type="checkbox"/> Running water</p> <p><input type="checkbox"/> Marsh/bog</p> <p><input type="checkbox"/> Canal</p>	<p>Shore/bank</p> <p><input type="checkbox"/> Boulders</p> <p><input type="checkbox"/> Stones</p> <p><input type="checkbox"/> Gravel</p> <p><input type="checkbox"/> Sand</p> <p><input type="checkbox"/> Silt</p> <p><input type="checkbox"/> Earth</p> <p><input type="checkbox"/> Rock cliffs</p> <p><input type="checkbox"/> Earth cliffs</p> <p><input type="checkbox"/> Canalized</p> <p><input type="checkbox"/> Poached</p> <p><input type="checkbox"/> Reinforced (man-made)</p>	<p>Bordering land use</p> <p><input type="checkbox"/> Upland grass</p> <p><input type="checkbox"/> Permanent/temporary grass</p> <p><input type="checkbox"/> Mixed broadleaf woodland</p> <p><input type="checkbox"/> Conifer wood</p> <p><input type="checkbox"/> Peat bog</p> <p><input type="checkbox"/> Arable crop</p> <p><input type="checkbox"/> Salt marsh</p> <p><input type="checkbox"/> Urban/Industrial</p> <p><input type="checkbox"/> Park/garden</p> <p><input type="checkbox"/> Heath</p> <p><input type="checkbox"/> Fen</p> <p><input type="checkbox"/> Cattle/grazing</p> <p><input type="checkbox"/> Bank fenced?</p>	<p>Vegetation (DAFORN)</p> <p><input type="checkbox"/> Bankside trees</p> <p><input type="checkbox"/> Bushes</p> <p><input type="checkbox"/> Herbs</p> <p><input type="checkbox"/> Submerged weed</p> <p><input type="checkbox"/> Reeds/edges</p> <p><input type="checkbox"/> Tall grass</p> <p><input type="checkbox"/> Short grass</p>
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Disturbance: _____

<p>Bank profile</p> <p><input type="checkbox"/> Flat < 10°</p> <p><input type="checkbox"/> Shallow < 45°</p> <p><input type="checkbox"/> Steep > 45°</p> <p><input type="checkbox"/> Vertical/undercut</p>	<p>Depth</p> <p><input type="checkbox"/> < 0.5m</p> <p><input type="checkbox"/> 0.5-1m</p> <p><input type="checkbox"/> 1-2m</p> <p><input type="checkbox"/> > 2m</p>	<p>Width</p> <p><input type="checkbox"/> 5-10m</p> <p><input type="checkbox"/> 10-20m</p> <p><input type="checkbox"/> 20-40m</p> <p><input type="checkbox"/> > 40m</p>	<p>Current</p> <p><input type="checkbox"/> Rapid</p> <p><input type="checkbox"/> Sluggish</p> <p><input type="checkbox"/> Fast</p> <p><input type="checkbox"/> Static</p>
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WILDLIFE INFORMATION

<p>Water voles</p> <p><input type="checkbox"/> Sightings (count)</p> <p><input type="checkbox"/> Latrines (count)</p> <p><input type="checkbox"/> Burrows (count)</p> <p><input type="checkbox"/> Footprints</p> <p><input type="checkbox"/> Pathway in vegetation</p> <p><input type="checkbox"/> Feeding remains</p> <p><input type="checkbox"/> Cropped grass around tunnel entrance</p>	<p>Flat</p> <p><input type="checkbox"/> Sightings</p> <p><input type="checkbox"/> Droppings</p> <p><input type="checkbox"/> Footprints/runs</p>	<p>Otter</p> <p><input type="checkbox"/> Sightings</p> <p><input type="checkbox"/> Droppings</p> <p><input type="checkbox"/> Footprints/runs</p>
<p>Mink</p> <p><input type="checkbox"/> Sightings</p> <p><input type="checkbox"/> Droppings</p> <p><input type="checkbox"/> Footprints/runs</p>		
<p>Other wildlife</p> <p><input type="checkbox"/> Kingfisher</p> <p><input type="checkbox"/> Heron</p> <p><input type="checkbox"/> Coot</p> <p><input type="checkbox"/> Waterfowl</p> <p><input type="checkbox"/> Mooten</p> <p><input type="checkbox"/> Dipper</p>		
<p>Identified plants from feeding remains:</p> <p>_____</p>		

SKETCH OF SITE – vole activity indicated (if any)

(mark route surveyed and direction of flow)

<p>KEY TO SYMBOLS</p> <p>Mature trees </p> <p>Over-hanging branches </p> <p>Fallen tree </p> <p>Exposed roots </p> <p>Pollarded tree </p> <p>Sapling </p> <p>Scrub </p> <p>Hedge/grow </p> <p>Fence </p> <p>Reed/edge bed </p> <p>Flood bank </p> <p>Artificial bank </p> <p>Earth cliff </p>		<p>ADJACENT LAND-USE CODES</p> <p>Broadleaved wood BW</p> <p>Conifer plantation CP</p> <p>Moorland/ heath MH</p> <p>Rough pasture RP</p> <p>Wetland WS</p> <p>Improved grass IG</p> <p>Tilled land (arable) TL</p> <p>Suburban/ urban devel. (no amen.) US</p> <p>OTHER FEATURES</p> <p>Road/bridge </p> <p>Footbridge </p> <p>Weir </p> <p>Culvert </p> <p>Ford </p> <p>Outlet </p> <p>Dredgings/ spoil </p> <p>Silt bars </p> <p>Islands mark positive and size</p>
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ADDITIONAL COMMENTS:

water level management

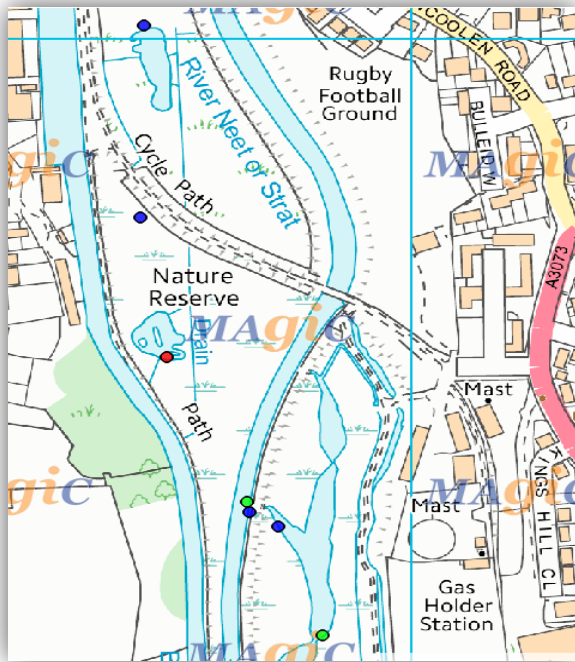
signs of drying out

flood debris position

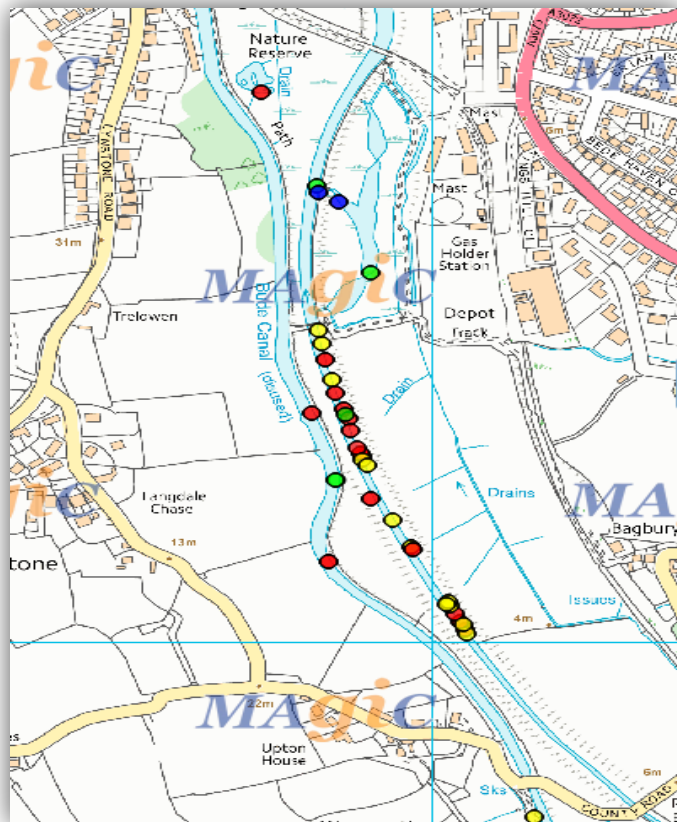
evidence of pollution

Appendix 2: Results

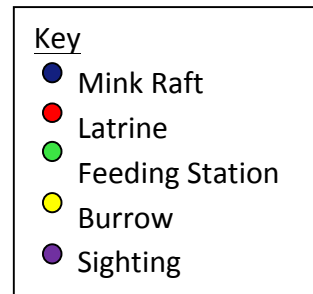
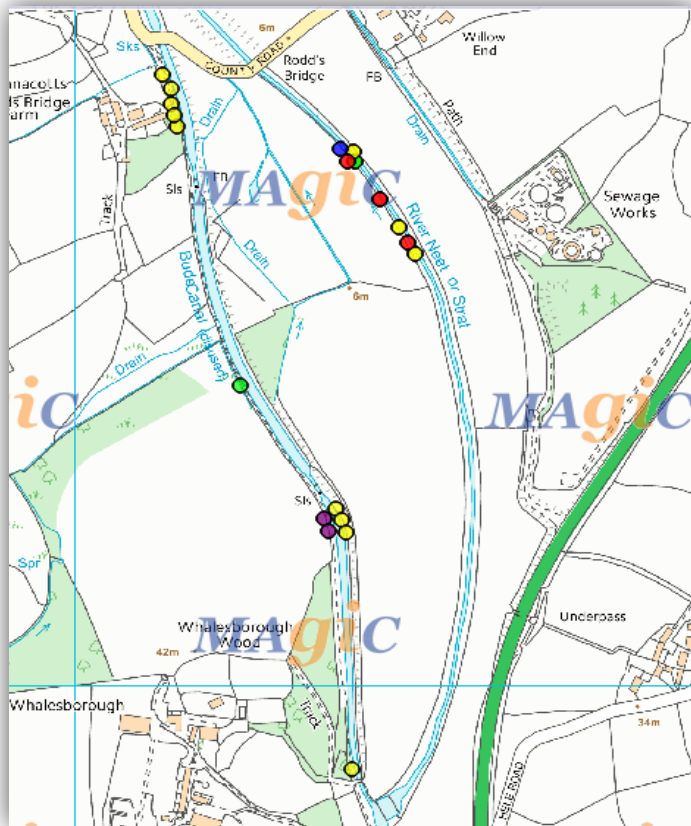
Appendix 2a: Mapped results for Transect 1 (Magic Interactive Maps, 2014)



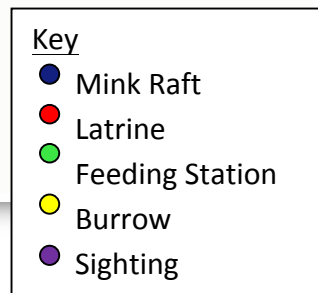
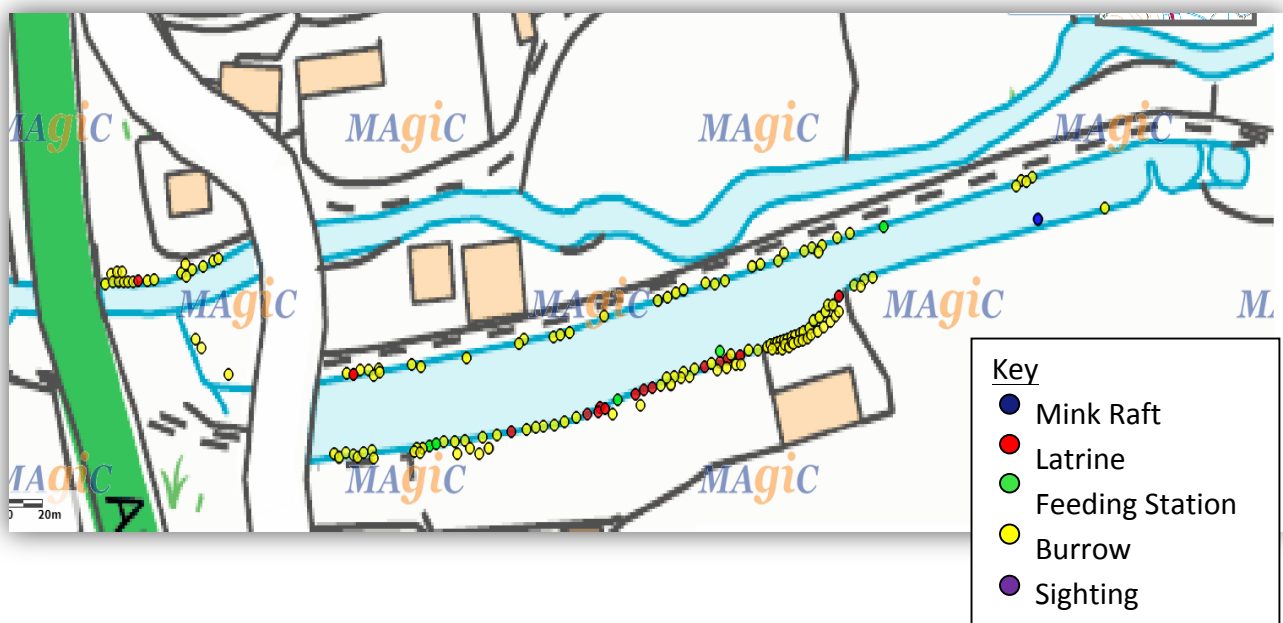
Appendix 2b: Mapped results for Transect 2 and Transect 4. (Magic Interactive Maps, 2014)



Appendix 2c: Mapped results for Transect 3 and Transect 5 (Magic Interactive Maps, 2014)



Appendix 2d: Mapped results for Transect 6 (Magic Interactive Maps, 2014)



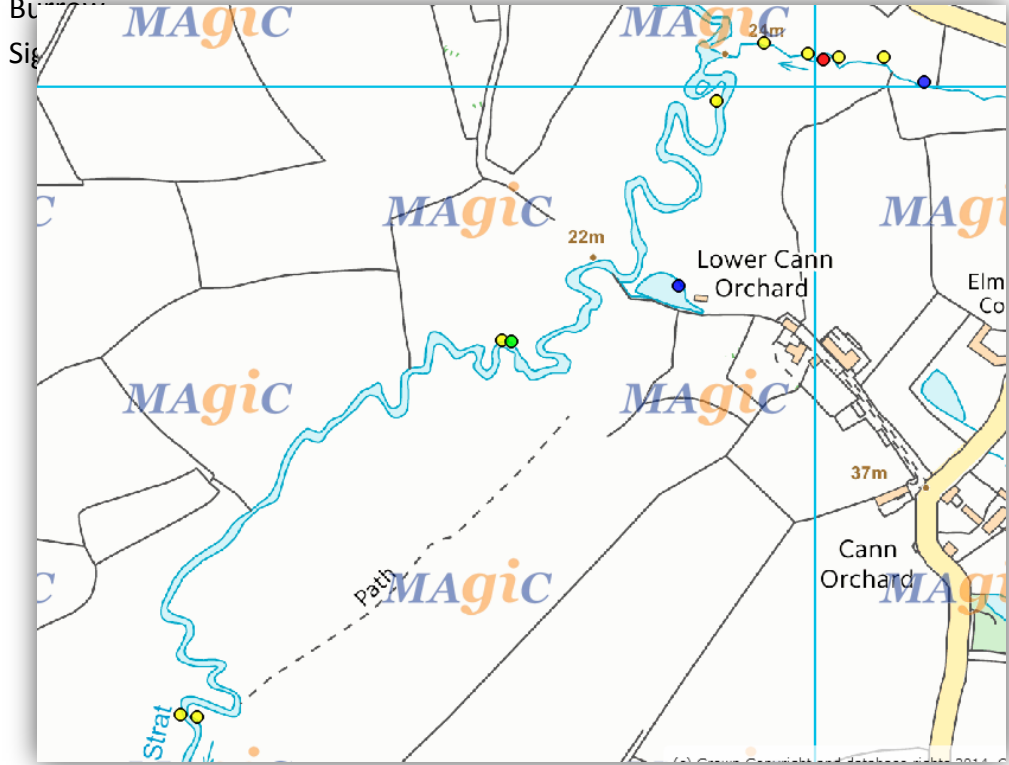
Mink Raft

Latrine

Feeding Station

Appendix 2e: Mapped results for Transect 7 (Magic Interactive Maps, 2014)

Feeding Station



Appendix 2f: Mapped results for Transect 8 (Magic Interactive Maps, 2014)

