GREAT CRESTED NEWT SURVEY
AT GROVE FARM
WORCESTER

Report to University of Worcester

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SUMMARY

In June 2009, Worcestershire Wildlife Consultancy were commissioned by the University of Worcester to undertake a dedicated great crested newt survey on land at Grove Farm, Worcester.

No great crested newts or other amphibians were found within the two waterbodies, both of which have historically been used as fishing ponds.

It should be noted that if more than twelve months elapse between this survey and the commencement of any development then a further survey should be undertaken at an appropriate time to determine whether any great crested newts may have colonised during the intervening period.

1 INTRODUCTION

1.1 Commissioning Brief

In June 2009 Worcestershire Wildlife Consultancy were commissioned by the University Of Worcester to undertake a dedicated great crested newt survey on two ponds at Grove Farm, Worcester.

1.2 Summary of the Proposed Development

It is our understanding that the land is to be developed as part of the expansion of the university. It is also understood that there is as yet no firm date for the commencement of any development work.

1.3 Site Location

Grove Farm is situated to the west of Worcester city centre at NGR SO822542. The surrounding land use is a mixture of urban housing and agricultural with the Western bypass immediately along the eastern boundary and a railway line along the southern boundary.

1.4 Scope of the Survey

The survey was undertaken to assess the presence/absence of great crested newts and if presence was confirmed to assess the size of the population in order to inform any mitigation required for a European Protected Species licence (EPSL).

1.5 Biological Records

A search of biological records kept by Worcestershire Biological Records Centre for all protected and notable species within a 2km radius of the site was commissioned.

2 METHODOLOGY

During the initial visit the potential of the site to support great-crested newts was assessed; this included looking for potential breeding sites such as ponds, disused swimming pools and other water bodies. The assessment also focused on the potential for this species to find refuge in places such as log piles, rubble and compost heaps.

Where waterbodies occur it is possible to undertake a Habitat Suitability Index (HSI)
This is a standard assessment method developed specifically to evaluate the habitat suitability for great crested newts a series of factors must be considered. Each factor is assessed along suitability guidelines and allocated a value of between 0.1 (highly unsuitable) to 1.0 (highly suitable). The geometric mean of these values provides an overall suitability score for the site. Although this is no substitute for a dedicated survey it does give an indication of whether such a survey is needed.

For presence/absence surveys a minimum of four visits should be made in suitable weather conditions between March and June with at least two of the visits in mid-April to mid-May. For a population survey six visits are required within the same time period. Although this

survey was undertaken later in the year than the standard dates, by bottle-trapping and netting it is still possible to detect larvae or late-staying adults until September.

The survey was undertaken by Alan Shepherd of Worcestershire Wildlife Consultancy under English Nature licence number 20083136 with assistance from Elizabeth McKay and Nick Button (both hold Natural England great crested newt survey licences), using a combination of netting, bottle trapping and direct observation was employed. In addition a habitat suitability index was calculated

3 RESULTS

3.1 Data Search

The data search from Worcestershire Biological Records Centre yielded no records of great crested newts within 2km of the site

3.2 Site Description

The site is farmland, bounded by major roads to the west and north roads with a main railway line to the south and a modern housing estate to the east. The topography is sloping from its highest point in the north-western corner to the lowest points in the east and south.

There are two waterbodies on the site, both of which are fishing pools. The larger is a reservoir (known as Grove Farm Reservoir) and was observed to contain many large carp (*Cyprinus* sp.). Several unidentified large fish were seen rising to the surface of the smaller pond, which also contained several hundred fish fry of unknown species.

The ponds lie within fields of improved and semi-improved grassland. Other parts of the site include arable fields and a Christmas tree plantation. Other habitats on site include hedgerows, lines of trees, scrub, tall-herb, open vegetation communities and marshy grassland.

The smaller of the two ponds supports emergent white water-lily (*Nymphaea alba*) with a fringe of marginal vegetation comprising locally dominant reedmace (*Typha latifolia*) with frequent hemlock water-dropwort (*Oenanthe crocata*) and occasional soft rush (*Juncus effusus*), false fox-sedge (*Carex otrubae*), great willowherb (*Epilobium hirsutum*) and a single plant of flowering rush (*Butomus umbellatus*), although the latter is probably an introduction. A line of tall cypress trees shelter the pond along its northern side.

This pond drains eastwards along a ditch, which supports a similar assemblage with the water eventually reappearing out of a drain and falling down a moderate slope to the much larger reservoir a short distance further east. Here the water falls steeply from a pipe into a wooded area supporting large crack willows (*Salix fragilis*) and on drier ground pedunculate oak (*Quercus robur*) and beech (*Fagus sylvatica*). Common nettle (*Urtica dioca*) and hemlock water-dropwort is conspicuous throughout this small wooded area as well as the margins of the pool where reedmace, yellow flag (*Iris pseudacorus*) and great willowherb also occur. Crack willows occasionally shade the pond along its margins whilst on drier ground cypress trees have been planted in more recent years. Marginal habitats on drier ground around the pond also include tall-herb, rank grassland and bramble scrub.

3.3 Habitat Suitability Index

In order to evaluate the habitat suitability for great crested newts a series of factors must be considered. For this process we use the Habitat Suitability Index (HSI) a standard assessment method developed specifically for great crested newts (Oldham *et. al.*, 2000). Each factor is assessed along suitability guidelines and allocated a value of between 0.1 (highly unsuitable) to 1.0 (highly suitable). The geometric mean of these values provides an overall suitability score for the site.

Research on great crested newt site suitability identified that sites where great crested newts were found varied in overall habitat suitability with an index value from 0.53 to 0.96.

There are two main roads, a railway line and a modern housing estate around the site that form major barriers to colonisation although the terrestrial habitat across the site is generally suitable.

The Reservoir

Geographic Location

Based on known distribution of great crested newts, Worcestershire is located within Zone A and has a high probability of the presence of great crested newts within each 10km square. Suitability Index Value = 1.00.

Pond Area

Pond area is a determinant of the magnitude of biological productivity of the pond ecosystem upon which the newt population depends. Ponds between 500 and 750m^2 provide the optimal size. This pond had an estimated surface area at the time of visit of approximately 5770m^2. Suitability Index Value = 0.80

Pond Permanence

Pond permanence is essential to permit the completion of metamorphosis in any given year, however intermittent (every few years) drying out may be beneficial in excluding fish populations. The optimum drying out frequency is assumed to be one in every ten years. Although drying out frequency is impossible to be accurate on from a single year, it is thought that because it is a reservoir used as a fishing pool this pond has never dried out completely and is unlikely to. Suitability Index Value = 0.90.

Water Quality

Although the adult great crested newt is relatively tolerant of eutrophic conditions, the larva are more vulnerable and requires reasonably well aerated water with a number of aquatic invertebrates. The water was very turbid due to the many very large carp present. Macroinvertebrate diversity could not be properly assessed due to the turbidity. Suitability Index Value = 1.00

Pond Shading

Shade counteracts the growth of macrophytes and the benefits they provide. Additionally heavy tree cover increases the organic content through leaf fall potentially causing eutrophication. Great crested newts tend to favour ponds with a shade cover of between 60% and 75%. The pond was estimated to have shade coverage of 30%. Suitability Index Value = 1.00.

Waterfowl

Common waterfowl in naturally occurring numbers have little effect on great crested newt populations. However, if at high artificial numbers due to supplementary feeding they can seriously damage the habitat. This pond had several mallard present during the site visit but as it is so large the numbers do not affect the score. Suitability Index Value = 1.00.

Fish

The effect of fish on newt populations varies across species and ponds. However in general the presence of fish species are detrimental to newt populations. In particular the stickleback has a very serious impact, through predation and competition. The reservoir has clearly been stocked with fish and although only carp were seen it is very likely that other coarse fish have been introduced. Suitability Index Value = 0.01.

Pond density

A network of suitable ponds within a landscape increase the chances of great crested newts in an area, through the metapopulation processes of recolonisations from surrounding ponds if any one population becomes extinct. As far as can be determined from aerial photographs and OS maps there are 2 ponds with 1km, one of which is the smaller pond on this site. Suitability Index Value = 0.80.

Proportion of 'Newt Friendly' Habitat

The habitat occupied by great crested newts is highly variable and we do not understand the species' detailed requirements at different phases of their life on land. However, scrub, unimproved grassland, woodland and gardens are regarded as newt friendly habitat, unlike improved pasture, arable and urban habitats. Additionally, features such as ditches and hedges enhance the habitat suitability of any site. Features such as roads and rivers form serious barriers dependent on width and flow of traffic and water. Such barriers cause issues with direct mortality but also through their impact on metapopulation dynamics.

The site is surrounded on all sides by two main roads, a railway line and a modern housing estate that form major barriers to colonisation although the terrestrial habitat across the site is generally suitable. Suitability Index Value = 1.00.

Macrophyte Content

Macrophytes are important for newts as they provide habitat for their prey organisms, provide cover from predators and a substrate for egg attachment. At the time of the visit no floating or submerged macrophytes were seen, although it must be pointed out that the water was

extremely turbid. The total cover was assessed as less than 10%. Suitability Index Value = 0.30.

Suitability Evaluation

The overall Habitat Suitability Index for the site is calculated as the mean of the suitability Indices.

Table 1

Habitat Suitability Index	Factor	Value	Rating for Index
HS1	Geographic Location	1.00	*Excellent*
HS2	Pond Area	0.80	*Excellent*
HS3	Drying out frequency	0.90	*Excellent*
HS4	Water Quality	1.00	*Excellent*
HS5	Shade	1.00	*Excellent*
HS6	Fowl	1.00	*Excellent*
HS7	Fish	0.01	*Poor*
HS8	Pond Count	0.80	*Excellent*
HS9	Terrestrial habitat	1.00	*Excellent*
HS10	Macrophytes	0.30	*Poor*
Overall HSI Value		**0.53**	**Below Average**

The reservoir has a value of 0.53, which is below average but above the minimum index value that has been found to support great crested newts. The overall value is clearly decreased by the presence of fish and the lack of macrophyte cover.

The Pond

This is a pond in a low-lying area that appears to have been dug out but may have been enlarged from a natural pond, possibly as a header or feeder for the reservoir and there is an outflow ditch and culvert that drain towards this.

Geographic Location

Worcestershire is located within Zone A and has a high probability of the presence of great crested newts within each 10km square. Suitability Index Value = 1.00.

Pond Area

This pond has an estimated surface area at the time of visit of approximately 793m^2. Suitability Index Value = 1.00

Pond Permanence

It is thought that this pond is unlikely to dry out in most years but this could not be verified by a single visit. Suitability Index Value = 0.9.

Water Quality

The water was relatively clear apart from some turbidity caused by fish. Suitability Index Value = 1.00

Pond Shading

The pond was estimated to have shade coverage of approximately 25%. Suitability Index Value = 1.00

Waterfowl

This pond had a brood of moorhens (*Gallinula chloropus*) present during the site visit but no other wildfowl were seen. This combined with the size of the pond leads to a Suitability Index Value = 1.00.

Fish

During the visits shoals of several hundred fish fry were seen in the shallows and unidentified larger fish were seen rising to the surface. It has been used as a fishing pool and therefore is likely to have been stocked .Suitability Index Value = 0.01

Pond density

As far as can be determined from aerial photographs and OS maps there are 2 ponds with 1km of this one, including the reservoir Suitability Index Value = 0.80.

Proportion of 'Newt Friendly' Habitat

The site is surrounded on all sides by two main roads, a railway line and a modern housing estate that form major barriers to colonisation although the terrestrial habitat across the site is generally suitable. Suitability Index Value = 1.00.

Macrophyte Content

At the time of the visit the total macrophyte cover was assessed to be no more than 20%. Suitability Index Value = 0.50.

Suitability Evaluation

Table 2

Habitat Suitability Index	Factor	Value	Rating for Index
HS1	Geographic Location	1.00	*Excellent*
HS2	Pond Area	0.90	*Excellent*
HS3	Drying out frequency	0.90	*Excellent*
HS4	Water Quality	1.00	*Excellent*
HS5	Shade	1.00	*Excellent*
HS6	Fowl	1.00	*Excellent*
HS7	Fish	0.01	*Poor*
HS8	Pond Count	0.80	*Excellent*
HS9	Terrestrial habitat	1.00	*Excellent*
HS10	Macrophytes	0.50	*Below Average*
Overall HSI Value		**0.56**	**Below Average**

Pond 2 has a value of 0.56, which is below average. As with the reservoir the overall value is decrease by the presence of fish and the lack of macrophyte cover.

It should be noted that although the HSI scores for both ponds are below average this does not mean that great crested newts will not occur. The fact that the individual HSI scores are all “excellent” except for the presence of fish and poor macrophyte cover (which in turn is most likely due to the adverse effect of fish) suggested that there was a possibility that at least a small population of great crested newts could be found here.

It was advisable to undertake a dedicated presence/absence survey on the ponds. This would normally entail four visits to the site using a variety of methods including torching, netting, egg searching and possibly bottle trapping, undertaken between mid-March to mid-June with a minimum of two visits during mid April to mid May. It is however possible to detect presence later in the year as larvae and occasionally adults can be found in the water until September.[1]

[1] Great Crested Newt Mitigation Guidelines

3.4 Survey Results

Survey 1

Site:	Grove Farm Reservoir	**Date:**	18/6/09
Surveyor:	Alan Shepherd		

Start Time:	13.30	**Finish Time:**	14.40
Survey Methodologies:	Net, direct observation		

Air Temp:	15.4˚C	**Wind Speed:**	Still
Water Temp:	12.7˚C	**Wind Direction:**	-
Water Turbidity (1-5):	5	**Precipitation:**	None
Cloud Cover (%)	90	**Ground Conditions:**	Dry

Other Observations:	Netting only possible from fishing pegs on bank.

Common Frog				Common Toad				Smooth Newt		Palmate Newt		Great Crested Newt			Unidentified small newt	
♂	♀	Pair	Spawn/ larvae	♂	♀	Pair	Spawn /larvae	♂	♀	♂	♀	♂	♀	Egg/larvae	♀	Egg/larvae

Site:	Grove Farm Pond	**Date:**	18/6/09
Surveyor:	Alan Shepherd		

Start Time:	12.30	**Finish Time:**	13.10
Survey Methodologies:	Net, direct observation		

Air Temp:	15.4˚C	**Wind Speed:**	Still
Water Temp:	13.2˚C	**Wind Direction:**	-
Water Turbidity (1-5):	4	**Precipitation:**	None
Cloud Cover (%)	90	**Ground Conditions:**	Dry

Other Observations:	Netting only possible from fishing pegs on bank. 50% of bank not accessible

Common Frog				Common Toad				Smooth Newt		Palmate Newt		Great Crested Newt			Unidentified small newt	
♂	♀	Pair	Spawn/ larvae	♂	♀	Pair	Spawn /larvae	♂	♀	♂	♀	♂	♀	Egg/larvae	♀	Egg/larvae

Survey 2

Site:	Grove Farm Reservoir	**Date:**	9-10/7/09
Surveyor:	Alan Shepherd & Liz McKay		

Start Time:	21.00 (9/7/09)	**Finish Time:**	06.40 (10/7/09)
Survey Methodologies:	Bottle trap		

Air Temp:	15.3.˚C start 13.1° C finish	**Wind Speed:**	
Water Temp:	13.1˚C	**Wind Direction:**	
Water Turbidity (1-5):	5	**Precipitation:**	
Cloud Cover (%)		**Ground Conditions:**	Dry

Other Observations:	140 bottle traps set

Common Frog				Common Toad				Smooth Newt		Palmate Newt		Great Crested Newt			Unidentified small newt	
♂	♀	Pair	Spawn/ larvae	♂	♀	Pair	Spawn /larvae	♂	♀	♂	♀	♂	♀	Egg/larvae	♀	Egg/larvae

Site:	Grove Farm Pond	**Date:**	9-10/7/09
Surveyor:	Alan Shepherd & Liz McKay		

Start Time:	22.00 (9/7/09)	**Finish Time:**	06.30 (10/7/09)
Survey Methodologies:	Bottle trap, torch		

Air Temp:	15.3.˚C start 13.1° C finish	**Wind Speed:**	
Water Temp:	13.4˚C	**Wind Direction:**	
Water Turbidity (1-5):	4	**Precipitation:**	
Cloud Cover (%)		**Ground Conditions:**	Dry

Other Observations:	60 bottle traps set and left in overnight. Only shallow margins suitable for torching due to overall turbidity of water

Common Frog				Common Toad				Smooth Newt		Palmate Newt		Great Crested Newt			Unidentified small newt	
♂	♀	Pair	Spawn/ larvae	♂	♀	Pair	Spawn /larvae	♂	♀	♂	♀	♂	♀	Egg/larvae	♀	Egg/larvae

Survey 3

Site:	Grove Farm Reservoir	**Date:**	15-16/7/09
Surveyor:	Alan Shepherd & Nick Button		

Start Time:	22.30 (15/7/09)	**Finish Time:**	06.00 (16/7/09)
Survey Methodologies:	Bottle trap		

Air Temp:	14.6.˚C start 15.1° C finish	**Wind Speed:**	
Water Temp:		**Wind Direction:**	
Water Turbidity (1-5):	5	**Precipitation:**	
Cloud Cover (%)		**Ground Conditions:**	Damp

Other Observations:	140 bottle traps set and left in overnight

Common Frog				Common Toad				Smooth Newt		Palmate Newt		Great Crested Newt			Unidentified small newt	
♂	♀	Pair	Spawn/ larvae	♂	♀	Pair	Spawn /larvae	♂	♀	♂	♀	♂	♀	Egg/larvae	♀	Egg/larvae

Site:	Grove Farm Pond	**Date:**	15-16/7/09
Surveyor:	Alan Shepherd & Nick Button		

Start Time:	22.30 (15/7/09)	**Finish Time:**	06.00 (16/7/09)
Survey Methodologies:	Bottle trap		

Air Temp:	15.3.˚C start 13.1° C finish	**Wind Speed:**	
Water Temp:		**Wind Direction:**	
Water Turbidity (1-5):	5	**Precipitation:**	
Cloud Cover (%)		**Ground Conditions:**	Damp

Other Observations:	60 bottle traps set and left in overnight

Common Frog				Common Toad				Smooth Newt		Palmate Newt		Great Crested Newt			Unidentified small newt	
♂	♀	Pair	Spawn/ larvae	♂	♀	Pair	Spawn /larvae	♂	♀	♂	♀	♂	♀	Egg/larvae	♀	Egg/larvae

Survey 4

Site:	Grove Farm Reservoir	**Date:**	22-23/7/09
Surveyor:	Alan Shepherd & Nick Button		

Start Time:	22.00 (15/7/09)	**Finish Time:**	06.00 (23/7/09)
Survey Methodologies:	Bottle trap		

Air Temp:	15.3.˚C start 13.1° C finish	**Wind Speed:**	
Water Temp:		**Wind Direction:**	
Water Turbidity (1-5):	5	**Precipitation:**	
Cloud Cover (%)		**Ground Conditions:**	Wet

Other Observations:	140 bottle traps set and left in overnight

Common Frog				Common Toad				Smooth Newt		Palmate Newt		Great Crested Newt			Unidentified small newt	
♂	♀	Pair	Spawn/ larvae	♂	♀	Pair	Spawn /larvae	♂	♀	♂	♀	♂	♀	Egg/larvae	♀	Egg/larvae

Site:	Grove Farm Pond	**Date:**	22-23/7/09
Surveyor:	Alan Shepherd & Nick Button		

Start Time:	22.00 (15/7/09)	**Finish Time:**	06.00 (23/7/09)
Survey Methodologies:	Bottle trap		

Air Temp:	15.3.˚C start 13.1° C finish	**Wind Speed:**	
Water Temp:		**Wind Direction:**	
Water Turbidity (1-5):	5	**Precipitation:**	
Cloud Cover (%)		**Ground Conditions:**	Wet

Other Observations:	60 bottle traps set and left in overnight

Common Frog				Common Toad				Smooth Newt		Palmate Newt		Great Crested Newt			Unidentified small newt	
♂	♀	Pair	Spawn/ larvae	♂	♀	Pair	Spawn /larvae	♂	♀	♂	♀	♂	♀	Egg/larvae	♀	Egg/larvae

After the first two visits water temperatures were not taken on a regular basis as it was assumed that they were consistently stable and suitable for amphibian activity. Full details of

weather conditions are not included where bottle traps were left in overnight but the surveys were conducted within the best practice guidelines, which state that bottles should not be set in periods of very hot weather. After the first attempt it was clear that the extreme turbidity of the water meant that torching was not a viable option as a survey method and thereafter the survey was conducted by using bottle traps.

4. CONCLUSIONS AND RECOMMENDATIONS

There are two potential breeding ponds for great crested newts but the survey, in conjunction with the HSI, indicates that they are not present within either waterbody. Therefore **there appear to be no immediate implications for great crested newts under the Wildlife and Countryside Act 1981, the Habitat Regulations 1994 or the Countryside & Rights of Way Act 2000.**

Research on great crested newt site suitability identified that sites where great crested newts were found varied in overall habitat suitability with an index value from 0.53 to 0.96. The waterbodies on this site have values of 0.56 and 0.53, both within the range of suitability but very much at the lower end of the scale. With the presence of a large fish population it is always more likely that any site has a very low overall suitability for great crested newts and the likelihood of great crested newts breeding within the ponds is very low.

The effect of fish on newt populations varies across species and ponds. However in general the presence of fish species are detrimental to newt populations. Sticklebacks in particular have a very serious impact through predation and competition

Although the adult great crested newt is relatively tolerant of eutrophic conditions, the larva are more vulnerable and requires reasonably well aerated water with a high content of aquatic invertebrates. From net samples taken during the site visit macroinvertebrate diversity was low with very little plankton present and common water boatman (*Notanecta glauca*) the only invertebrate species identified. The water was turbid with no submerged macrophytes apparent, which is only to be expected when carp are present as these fish constantly forage on submerged vegetation and also plough up the bed of the pond.

As great crested newts were not found there are no implications for the proposed development. This leaves an option for the future management and use of the ponds. This is to retain one or both with fish or to remove the fish from one or both and renovate the pond or ponds. Although removing the fish would involve liaison with the Environment Agency it would create cleaner, clearer water conditions that would make them more suitable for amphibians and a variety of other wildlife

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Appendix 1 Plan of Site

Grove Farm, Worcester

Phase 1 and Protected Species Survey Assessment

Produced: June 2009

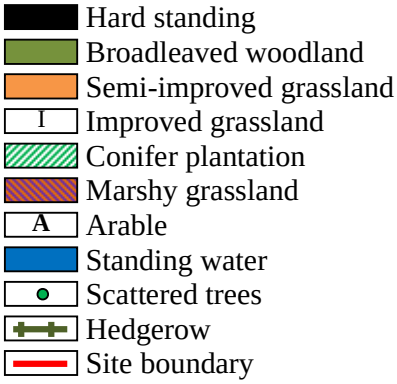
WORCESTERSHIRE wildlife CONSULTANCY

www.worcestershirewildlifeconsultancy.org Tel: 01905 754909

Map Scale: 1:5,000
Inset Scale: 1:2,500,000

N

Key


Hard standing
Broadleaved woodland
Semi-improved grassland
I
Improved grassland
Conifer plantation
Marshy grassland
A
Arable
Standing water
Scattered trees
Hedgerow
Site boundary

Appendix 2 Photographs

1: Grove Farm Pond viewed from east

2: Pond viewed from west

3: Pond showing inaccessible banks

4: Overflow ditch from pond

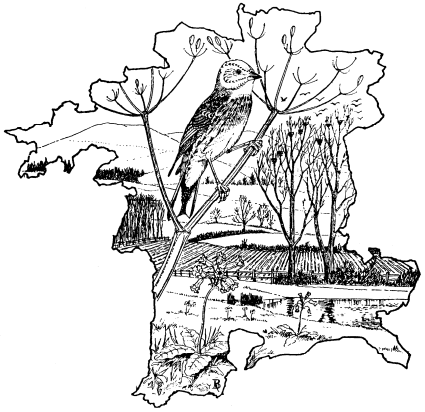
5: Grove Farm Reservoir from west

6: Reservoir from west showing overhanging trees

7: Reservoir from north bank

8: Large carp at surface of reservoir

Appendix 3 Data Search from Worcestershire Biological Records Centre



Worcestershire Biological Records Centre

Lower Smite Farm,
Smite Hill, Hindlip, Worcester, WR3 8SZ
Tel: 01905 759759. email records@wbrc.org.uk
Web site www.wbrc.org.uk

Protected and locally notable species records held by WBRC as at 22/06/09 for 2km radius around SO822542, Grove Farm, Worcester (Ref: 2009/124).

Scientific Name	Common Name	Grid Ref	Location Name	Date	Status	Comments
Anguis fragilis	Slow-Worm	[redacted]	Gregory Mill Street	1996	BC3 WCA5(S9(1) killing/injuring only, S9(5)), NERC s.41, Worcs BAP	
Anguis fragilis	Slow-Worm	[redacted]	Skinner Road Allotment	12/06/2001	BC3 WCA5(S9(1) killing/injuring only, S9(5)), NERC s.41, Worcs BAP	1 adult
Anguis fragilis	Slow-Worm	[redacted]	Broadmore Green	07/04/2007	BC3 WCA5(S9(1) killing/injuring only, S9(5)), NERC s.41, Worcs BAP	75mm long
Bufo bufo	Common Toad	[redacted]	Pitmaston Road	11/03/1995	BC3 WCA5(S9(5)), NERC s.41	1 adult
Bufo bufo	Common Toad	[redacted]	Boughton Park [redacted]	08/07/1997	BC3 WCA5(S9(5)), NERC s.41	1 adult
Campanula patula	Spreading Bellflower	SO823551		18/07/1989	Locally Notable, NERC s.41	One plant, along hedgerow following city boundary
Campanula patula	Spreading Bellflower	SO822542	Near Grove Farm	June 1990	Locally Notable, NERC s.41	Grassy scrubby banks around fishing pool - LF
Campanula patula	Spreading Bellflower	SO823542	Near Grove Farm	June 1990	Locally Notable, NERC s.41	Grassy scrubby banks around fishing pool - LF
Campanula patula	Spreading Bellflower	SO823540	Grove Farm Pool	1997	Locally Notable, NERC s.41	Hedge to west of pool in grass bank - plant in flower

Erinaceus europaeus	Hedgehog	SO8456	St. Michael's Road, Worcester	04/08/1990	BC3 WCA6, NERC s.41	
Erinaceus europaeus	Hedgehog	SO838534		12/09/2002	BC3 WCA6, NERC s.41	dead on road
Erinaceus europaeus	Hedgehog	SO839534	Worcester, Malvern Road	25/04/2004	BC3 WCA6, NERC s.41	dead on road
Erinaceus europaeus	Hedgehog	SO831552	Worcester, St. Johns	31/05/2004	BC3 WCA6, NERC s.41	dead on road
Erinaceus europaeus	Hedgehog	SO832548	Worcester, St. Johns	03/10/2005	BC3 WCA6, NERC s.41	casualty (not road)
Gomphus vulgatissimus	Club-Tailed Dragonfly	SO803533	Bransford,R.Teme	05/06/1989	Worcs BAP	1 larval case
Gomphus vulgatissimus	Club-Tailed Dragonfly	SO826553	Worcester, garden	16/05/1990	Worcs BAP	
Gomphus vulgatissimus	Club-Tailed Dragonfly	SO803533	Bransford,R.Teme	24/05/1991	Worcs BAP	2-5 larval cases
Gomphus vulgatissimus	Club-Tailed Dragonfly	SO834523	Powick, River Teme	18/05/1992	Worcs BAP	2-5 larval cases
Gomphus vulgatissimus	Club-Tailed Dragonfly	SO838563	Worcester,Riv Severn	25/05/1992	Worcs BAP	2-5 larval cases
Gomphus vulgatissimus	Club-Tailed Dragonfly	SO843553	Worcester,R Severn	25/05/1992	Worcs BAP	2-5 larval cases
Gomphus vulgatissimus	Club-Tailed Dragonfly	SO842525	Powick, River Teme	25/05/1993	Worcs BAP	1 adult, 2-5 larval cases
Gomphus vulgatissimus	Club-Tailed Dragonfly	SO825524	Bransford,R.Teme	25/05/1993	Worcs BAP	2-5 larval cases
Gomphus vulgatissimus	Club-Tailed Dragonfly	SO818526	Bransford,R.Teme	25/05/1993	Worcs BAP	2-5 larval cases
Gomphus vulgatissimus	Club-Tailed Dragonfly	SO803533	Bransford,R.Teme	03/06/1993	Worcs BAP	2-5 larval cases
Gomphus vulgatissimus	Club-Tailed Dragonfly	SO836540	Worcester,garden	16/05/1994	Worcs BAP	1 adult
Gomphus vulgatissimus	Club-Tailed Dragonfly	SO803533	Bransford,R.Teme	16/05/1995	Worcs BAP	6-20 adults, 6-20 larval cases
Gomphus vulgatissimus	Club-Tailed Dragonfly	SO826553	Worcester, garden	30/05/1995	Worcs BAP	
Lutra lutra	Otter	[redacted]	Bromsford	28/04/2006	BC2 ECH2,4 CITES1 WCA5,6, NERC s.41, Worcs BAP	1 adult seen
Meles meles	Badger	[redacted]	Lords Wood	July 1999	BC3 PBA WCA6	
Meles meles	Badger	[redacted]	Worcester	2001	BC3 PBA WCA6	burrow, nesthole
Meles meles	Badger	[redacted]	Rushwick, A4103	21/06/2001	BC3 PBA WCA6	dead on road
Meles meles	Badger	[redacted]	Oldbury Wood	10/09/2001	BC3 PBA WCA6	burrow, nesthole
Meles meles	Badger	[redacted]	Henwick	2002	BC3 PBA WCA6	burrow, nesthole
Meles meles	Badger	[redacted]	Earls Court by old holloway	04/03/2002	BC3 PBA WCA6	Small latrine with fresh dung.
Meles meles	Badger	[redacted]	Lordswood, SO85	01/04/2002	BC3 PBA WCA6	dung/droppings etc.
Meles meles	Badger	[redacted]	Oldbury Wood	01/04/2002	BC3 PBA WCA6	dung/droppings etc.

Meles meles	Badger	[redacted]	Worcester	19/09/2002	BC3 PBA WCA6	casualty (not road)
Meles meles	Badger	[redacted]	Bransford	20/12/2002	BC3 PBA WCA6	dung/droppings, etc.
Meles meles	Badger	[redacted]	Worcester ring road, Wick Episcopi	23/02/2003	BC3 PBA WCA6	dead on A4440
Meles meles	Badger	[redacted]	Rushwick	21/10/2003	BC3 PBA WCA6	dead on road
Meles meles	Badger	[redacted]	Little Eastbury	06/04/2005	BC3 PBA WCA6	tracks/trail
Meles meles	Badger	[redacted]	Worcester, [redacted] East Comer	2006	BC3 PBA WCA6	2 seen
Meles meles	Badger	[redacted]	Rushwick	04/01/2006	BC3 PBA WCA6	1 adult
Meles meles	Badger	[redacted]	Powick	24/07/2006	BC3 PBA WCA6	1 adult
Meles meles	Badger	[redacted]	Oldbury Farm	05/12/2006	BC3 PBA WCA6	dung/droppings, etc.
Meles meles	Badger	[redacted]	Bransford	08/12/2006	BC3 PBA WCA6	dung/droppings, etc.
Meles meles	Badger	[redacted]	Bransford, nr Otherton Lane	15/01/2007	BC3 PBA WCA6	dead on road
Mustela putorius	Polecat	[redacted]	Hallow Park	Sep-00	BC3 ECH5 WCA6, NERC s.41	dead on road
Mustela putorius	Polecat	[redacted]	Broadmoor Green	Dec-02	BC3 ECH5 WCA6, NERC s.41	
Mustela putorius	Polecat	[redacted]	Rushwick	09/10/2006	BC3 ECH5 WCA6, NERC s.41	
Natrix natrix	Grass Snake	[redacted]	Hylton Road	03/08/1994	BC3 WCA5(S9(1) killing/injuring only, S9(5)), NERC s.41	1 juvenile
Nyctalus noctula	Noctule	[redacted]	Hectad SO85	July 2007	BC2 BoC2 ECH4 WCA5,6, NERC s.41	Bat detector & Flight
Pipistrellus pipistrellus	Pipistrelle	[redacted]	St. Johns, Columbia Drive	12/08/1993	BC3 BoC2 ECH4 WCA5,6, Worcs BAP	
Pipistrellus pipistrellus	Pipistrelle	[redacted]	Worcester	17/04/2002	BC3 BoC2 ECH4 WCA5,6, Worcs BAP	
Pipistrellus pipistrellus	Pipistrelle	[redacted]	Hectad SO85	July 2007	BC3 BoC2 ECH4 WCA5,6, Worcs BAP	Bat detector & Flight: 4 seen
Pipistrellus pipistrellus 45kHz	45 Khz Pipistrelle	[redacted]	[redacted] Columbia Drive, St Johns	12/08/1993	BC3 BoC2 ECH4 WCA5,6, Worcs BAP	Roost site: 12 present
Pipistrellus pipistrellus 55kHz	55 Khz Pipistrelle	[redacted]	Foley Rd, St John's Worcester	06/07/2006	BC3 BoC2 ECH4 WCA5,6, NERC s.41, Worcs BAP	35 leaving roost from holes in fascia board and felt on flat roof.
Pipistrellus pipistrellus 55kHz	55 Khz Pipistrelle	[redacted]	Hectad SO85	July 2007	BC3 BoC2 ECH4 WCA5,6, NERC s.41, Worcs BAP	Bat detector & Flight: 3 seen
Tyto alba	Barn Owl	[redacted]		06/12/2007	BC2 CITES2 WCA1i, Worcs BAP	adult hunting in long grass by the roundabout.

Vanellus vanellus	Lapwing	SO838535	Worcester , garden	30/04/2003	NERC s.41, Worcs BAP	chick in area once occupied by settling pools

Appendix 4 Basic ecology of the great crested newt

Great crested newts are the largest of the three British newts, with adults reaching a length of 140-150 mm. The skin is rough and granular, giving rise to the old common name "Warty Newt". The belly is orange-yellow with a pattern of black blotches, which is unique to each animal and can be used to monitor individuals.

Great crested newts are fairly long-lived and may reach 15 years old. Generally they do not become sexually mature until 3 years old. In the breeding season males develop a jagged crest along the back and a prominent white stripe along the sides of the tail.

Eggs are laid singly, wrapped in the leaves of aquatic or overhanging vegetation. The larvae or tadpoles have external gills and a crest along the tail. The fore legs develop first, unlike frog and toad tadpoles. When metamorphosed the young newts look like miniature adult females.

Newts feed on a variety of invertebrate prey such as worms, spiders, water shrimps and even daphnia. Great crested newts are cannibalistic and will eat their own larvae; larvae will eat their smaller siblings.

One of the greatest threats to great crested newts is the presence of fish in the ponds. These do not eat the adults, since a toxin is produced within the skin but eggs and larvae are taken. The three-spined stickleback (*Gasterosteus aculeatus*) is a major factor in the depletion of great crested newt populations. Adults appear to be able to detect the presence of fish in a pond and will often avoid it. It is an offence to introduce fish into any great crested newt breeding pond.

All amphibians need to return to water in order to breed and spend most of their lives on land. In the case of great crested newts, some will remain in the ponds for a major proportion of the year and may even hibernate there. Most will leave the water in order to hibernate on land, using log piles, small mammal burrows, piles of stone or even cellars. They are frequently found in the foundations of old barns. This means that terrestrial habitat within 500 metres of the breeding pond(s) is also vital to the species' survival.

Great crested newts are protected by law under the Wildlife and Countryside Act 1981 (Schedule 9) and the Habitats Regulations 1994 (Regulation 39). The Countryside and Rights of Way Act 2000 reinforces the Habitat Regulations by creating a criminal offence rather than a prohibited action (Schedule 12).