

Amphibians and Reptiles in Leicestershire and Rutland: A Review

by Andrew M. Heaton, County Recorder for Amphibians and Reptiles, 2018

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Note: References in the text to [L14], etc, refer to the edition number of the LARN Newsletter where further information can be found. The Naturespot website (<http://www.naturespot.org.uk/>) carries copies of all newsletter editions (from No.1 in 1999 to the latest, No. 30, which came out in 2017), together with a complete index to all issues, and much other information on amphibians and reptiles in Leicestershire and Rutland.

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PROLOGUE – In 1998, an advert in the Wildlife Trust’s Newsletter asked if anyone was interested in joining the County Recorder in setting up an Amphibian & Reptile Group for the two counties of Leicestershire and Rutland. Positive responses led to LARN (Leicestershire Amphibian and Reptile Network) being established in 1999. It was not exactly a full ARG (none of the people involved had the time to devote to it), but the group survived as a force speaking up for amphibians and reptiles locally, gathering information on status, distribution and ecology of the nine native species and varying number of introductions. Data amassed over the subsequent two decades (together with re-analysed historic data) has been used by LARN in various ways, supporting the science and conservation of herpetofauna, and has provided the background knowledge required in drafting this paper, relating the story (so far) of the amphibians and reptiles of Leicestershire and Rutland.

1. The Background

1.1 The Historical View

1.1.1 *Limited Fauna* - With a limited number of native British species, and some of these confined to the coast and/or southern heaths, the two counties of Leicestershire and Rutland (L&R), in the centre of the country, have rather few species of herpetofauna (amphibians and reptiles) - though none are “missing” that might be expected in the East Midlands. Typically of the Midlands, the two counties have never been noted herpetofauna areas, even with several attempted introductions, more or less successful, from Victorian times onwards (see Browne 1907). Montagu Browne, writing the natural history section of the Victoria County History for Leicestershire (1907) said “Reptiles and batrachians (ie amphibians) are, as may be supposed, exceedingly few in the county...” William Page, drafting the equivalent section of the Rutland Victoria County History a year later (Page 1908), took an even more gloomy line in stating: “The list of reptiles and batrachians to be found in Rutland is an extremely meagre one. No doubt more careful and continuous observations would add one or two names to the list, but in any case herpetology is not a science that would find any great scope in this county.” (Note that both VCH volumes refer to “reptiles and batrachians”, using an alternative word for amphibians which was later superseded by our modern usage).

1.1.2 *Early Studies* - The first attempt to catalogue this paucity of species, and perhaps try to strengthen it (see Sand Lizard in section 5), was made by James Harley, who between 1820 and 1843 produced “A Synopsis of the Vertebrate Animals of the County of Leicester”, of which a manuscript copy is held by Leicestershire Museums Service [L13]. Montagu Browne, a noted Victorian naturalist in Leicestershire, drew on Harley’s records to produce “The Vertebrate Animals of Leicestershire” (Browne 1889), and made use of his own text, almost word-for-word, in drafting the natural history (herpetofauna) section of the Victoria County History of Leicestershire (Browne 1907) [L22]. The lack of species variety in each group, as well as a closeness of these two taxonomic Classes in evolutionary terms, means that amphibians and reptiles are generally studied together, despite being significantly distinct groups. This is certainly the case in Leicestershire and Rutland: previous reviews of the groups have generally addressed both together – eg Browne 1907, Page 1908. However, there have been occasional studies dealing just with the amphibians, such as the papers relating to amphibians in garden ponds (see 4.4.3).

1.1.3 *Conservation Concerns* - Only in recent years, perhaps since the 1960s, has the interest in cataloguing amphibian and reptile species developed into a wider concern for their conservation. As well as national and European moves to protect the more vulnerable species, various local initiatives have been established to ensure their survival in Leicestershire and Rutland. The Red Data Book for Lower Vertebrates (Heaton 2012) and the Amphibian and Reptile Conservation Manifesto for Leicestershire and Rutland (Heaton 2013) are both attempts to set out the

conservation requirements of the groups in the two counties, and these, together with other initiatives such as BAPS, are considered further in relevant sections of this document. Of course, there have always been groups concerned about the threats to herps on a local scale; one of the first groups to make contact with LARN when the latter was set up in 1999 was the Friends of Knighton Park, worried about disturbance to their breeding Frogs and Newts [L3,4].

1.2 Promoting and Recording Herpetofauna

1.2.1 *Promoting the Cause* - Local amphibian and reptile organisations have been established to record and further the study and conservation of the two groups. The Leicestershire Herpetological Study Group appear to have been active for only a short while in the mid-1960s, producing two newsletters containing some useful information on the status of the herpetofauna in that period. Since 1999, the Leicestershire Amphibian and Reptile Network (LARN) has been drawing together local people interested in the status and distribution of these two lower vertebrate groups in Leicestershire and Rutland. The group has been held together by a newsletter produced on an irregular basis (generally twice a year), the first issue appearing in January 1999, running through to the latest issue, number 30, in October 2017. The aims of the group are to encourage recording of herpetofauna in the two counties, and to use the data to support conservation initiatives. (Anyone wanting to join the group should contact the coordinator, Andrew Heaton). Hence, LARN is the local expression of a nationwide movement, ARG-UK, the national umbrella body providing support services to the local Amphibian and Reptile Groups. National conferences for those interested in amphibians and reptiles have been put on since 1988, when they were organised by Rob Oldham's team at De Montfort University (1988 to 1992); latterly they have been arranged by ARG-UK, with varying assistance from Froglife, and have moved around the country. The Herpetofauna Workers Conference, as it became known, has returned to Leicestershire on just one occasion, being held in Hinckley in 2010.

1.2.2 *Recording Herpetofauna* - Species recording in L&R is undertaken on the basis of the Vice-County system, whereby Leicestershire and Rutland comprise a single recording area, Vice-County 55 [L30]. Recording effort in this area in the past has been at a relatively high level compared with other counties (Oldham & Swan 1991). It has also emphasised the need to know the distribution of the Great Crested Newt, as a fully protected species. Certainly the data held by LRERC (Leicestershire and Rutland Environmental Records Centre, a unit of Leicestershire County Council), running in total (as at 23 May 2017) to 3252 reptile records and 10298 amphibian records, concentrates on GCN information (forming 23% of the amphibian data). The County Recorder (currently Andrew Heaton) holds records for both groups (with totals of 2000 amphibian and 500 reptile records), and is able to generate maps with Mapmate, in as fine detail as monads (1x1 km squares) – these form the basis for the maps in the species accounts in Section 5.

1.2.3 *Filling the Gaps* - It should be noted that these maps show a pattern, especially obvious in the more numerous species, of gaps in the West Leicestershire, Hinckley and Bosworth and Melton Mowbray areas. Probably due to a lack of recorders rather than a lack of animals, this pattern is seen whatever the taxon mapped. With the aim of filling some of these gaps, the County Recorder and LCC collaborated over surveys aimed at the general public – Snakes Alive (2001) and Spawn Spot (2005), both successful in drawing in new records. A third survey, Pondemonium (1999), was also relevant to wetland species. Recently, new routes for getting amphibian and reptile sightings through to the county databases have developed. The website Naturespot gathers information for Leicestershire and Rutland (all taxa), whilst iRecord and the Record Pool are intended to encourage recording across Britain. LARN has also encouraged its members to get involved with the National Amphibian and Reptile Recording Scheme (NARRS), a rather long-drawn-out pilot study for a national herpetofauna recording scheme which, despite having had apparently significant resources put into it over a number of years, seems to have produced little in the way of positive conclusions. There has certainly been some local involvement in NARRS each year, but it is not a project which

has generated a huge amount of interest in L&R [L17].

1.2.4 *GCN* - The gaps in the data were of most concern when it involved Great Crested Newts, given their legally-protected status and the need to identify all breeding ponds. Two grid squares in particular have stood out, being predominantly in Leicestershire but with a complete absence of Great Crested Newt records: SK30, with Twycross at its centre; and SK42, a tongue of land bounded by the Trent and Soar to their confluence and reaching as far south as Worthington. LARN members were urged to fill in these gaps establishing the presence of GCN populations, by looking at sites such as Newton Burgoland Marshes, wetlands on the River Sence, ponds at Gopsall Park, Twycross Zoo and Bosworth Water Park (for SK30), and for SK42, visiting ponds along the Trent created by gravel extraction, and wetland areas at the Trent-Soar confluence [L20, L21]. Small groups of LARN volunteers also took part in GCN surveys in North West and East Leicestershire (2008) and other areas of Leicestershire (2009), organised by LARN and LCC with support from ARC. In 2008, 32 ponds were visited, chosen as being close to existing populations or where GCNs had been recorded but not recently. Results were disappointing in the first year: although other amphibians were identified, no GCNs were seen in any of the ponds. Even more worryingly, a high proportion of the ponds were unsuitable for GCNs, due to various factors: fish, wildfowl, siltation, shading or total disappearance of the ponds. In 2009, there were sightings of GCNs at three sites, with 40 seen at Stamford Quarry, 22 at Nature Alive in Coalville and 3 in a field pond in Sileby. Frogs, Toads and Smooth Newts were also recorded, with thousands of Toad tadpoles at Stamford Quarry, and most ponds surveyed had potential for good amphibian populations, in contrast to sites in 2008 [L13, L14].

1.2.5 *Rutland* - It should be remembered, of course, that even before the centralised databases were established, the various natural history societies were actively recording species on their patch. Dr Charles Gallimore, amphibian and reptile recorder for Rutland Natural History Society, has analysed records in our smallest county going back a hundred years, revealing some notable patterns of distribution in fine detail [L13, L14]. For example, Slow-worm records have long been concentrated in the parishes of Burley and Clipsham, with a scattering elsewhere. Common Lizards are found in Clipsham, Ketton and Tickencote, and rarely anywhere else. Adders are only seen at Ketton, but Grass Snakes have been recorded in Oakham, Hambleton, Empingham, Braunston and Barrowden parishes particularly, and many other places. Of the amphibians, Frogs are found in most parishes, with regular breeding in Empingham, Langham, Oakham and Wing, but seem to have disappeared from Little Casterton and South Luffenham. Toads are also fairly widespread, with recent records from Braunston, Brooke, Exton, Hambleton, Oakham and Wing. Great Crested Newts are the most restricted in distribution (*Palmates* not being found in Rutland), regular records coming from Empingham, Hambleton, Lyddington and especially Wing. Smooth Newts are fairly well distributed, with regular sightings at Barrowden, Edith Weston, Egleton, Hambleton and Lyddington. The extensive Rutland data has allowed this detailed analysis for the county, but natural history societies covering several parts of Leicestershire will hold similar information.

1.3 Conserving the Herpetofauna

1.3.1 *Conservation Initiatives* – The Leicestershire Red Data Book: Fish, Amphibians, Reptiles and Mammals (originally produced in 1997, updated for lower vertebrates in 2012 – see Heaton 2012) highlights seven species for special conservation measures – see details in sections 2.4 and 5 (checklist). The Leicestershire Biodiversity Action Plan (1998) includes no Species AP for herpetofauna (concentrating, as it does, on Habitat APs), but the National Forest BAP highlights the Adder as a species requiring a SAP. Conservation needs and those needing to take effective conservation leadership roles, are brought together in the Amphibian and Reptile Conservation Manifesto for Leicestershire and Rutland (Heaton 2013), produced by LARN – see 1.3.2.

1.3.2 *Manifesto* - All of these various conservation issues were brought together in the Conservation Manifesto (Heaton 2013) for herps in the two counties, which set out the conservation responsibilities for all the key players. This included the Wildlife Trust (nature reserves, BAP), LARN (recording, publicity), Leicestershire County Council and the other LAs (database, planning, site management), National Forest (BAP), Natural England (GCN protection, SSSIs) and others (landowners, EA, etc). The intention was to identify the priority actions needed to secure the conservation of amphibians and reptiles in Leicestershire and Rutland. The Manifesto was produced by LARN in 2013 and was promoted by the Network and LRWT, though it never really got the attention it perhaps deserved; however, it is still available (from LARN) for use as the basis for future conservation initiatives [L20, L21].

1.3.3 *Statutory Sites* - Statutory protection can, of course, be provided through the SSSI system. Some SSSIs – rather few – specify amphibians and/or reptiles as the main reason for designation, whilst other SSSIs, important for different reasons, also mention herpetofauna as being important additional features, ensuring that the management of the site takes heed of their interests (eg Beacon Hill, Bradgate Park). Other SSSIs in L&R give incidental protection to herps, but rarely are these species seen as highlighted features of the sites. Burley and Rushpit Woods, and Benscliffe Wood, are examples where herps are given only incidental protection, despite there being good populations present – they are not seen as primarily herpetofauna sites so they are not mentioned in the description of interests. The European Habitats Directive gives strong protection to a small number of sites – only Rutland Water and the River Mease in our counties are European sites. In both of these, amphibians and reptiles are certainly present but are not seen as key features of the sites.

2 Species Categories

2.1 Native and Exotic Species

2.1.1 *The Few* - There are just nine native species of herpetofauna to be found in Leicestershire and Rutland – five amphibians and four reptiles (see Species Accounts, Section 5). Additionally there are a number of established exotic introductions to the Leicestershire fauna – currently, at least three amphibians and one reptile – bringing the total number of Leicestershire and Rutland herpetofauna up to thirteen. There are concerns over the latter group of non-native species: introductions can bring competition with native species, predation of other species, and, most worryingly, exotic diseases (see 4.2.3).

2.2 Absent Species

2.2.1 *Blanks* - Those native British amphibians and reptiles which are not found in Leicestershire nor Rutland comprise two amphibians (Natterjack Toad and Pool Frog) and two reptiles (Sand Lizard and Smooth Snake). These four species, all rarities in Britain, are largely confined to the heathlands of southern England and the coast (sometimes extending along the coast to the north of Leicester's position inland). Of those species, native but absent from Leicestershire and Rutland, it is probable that the two counties have always been outside their natural range. Only the Natterjack, of all the absentees, is found in any of the Midlands counties, with a population on the Lincolnshire coast and another small population introduced (outside its natural range) and clinging on at a site on Cannock Chase. Apparently, less-than-serious attempts were made in Victorian times to introduce natterjacks in Leicester (Browne 1907). Sand lizard was reported in Charnwood in 1842/3 by Harley (see Browne 1907), who could apparently distinguish it from the Common Lizard, but Browne was not convinced. It is probable that Leicestershire and Rutland have never held any of the missing native species. With regard to introductions, elsewhere around Britain there are exotic species established in the wild (eg Bullfrog, Midwife Toad) which are not found in Leicestershire nor Rutland, as yet, though they may well turn up in the future.

2.2.2 *Marine* - It should not be forgotten that there is a group of half-a-dozen reptiles on the British biodiversity list, which are never likely to be seen in VC55 – the marine turtles. These comprise the Leatherback (apparently a true migrant to British waters), the vagrant Loggerhead, Hawksbill, Green and Kemp's Ridley Turtles, and the latest to be added to the British list when a specimen was washed up on an Anglesey beach in 2016, the Olive Ridley Turtle. LARN members have been encouraged to look out for these species when holidaying on the coast [L4, L30]!

2.3 Legally Protected Species

2.3.1 *Legal Protection* - Various items of legislation apply to the native amphibians and reptiles in Britain. The core legislation is the Wildlife and Countryside Act 1981 (WCA81), amended by subsequent enactments. In brief, of the amphibians, the Great Crested Newt, as a European Protected Species, is fully protected under the WCA81, making it an offence to injure, kill, disturb, capture, keep or sell the species, or damage/destroy habitats in which it lives. The other amphibians - Frog, Toad, Smooth Newt, Palmate Newt - are partially protected, being an offence to sell them. The Great Crested Newt's European Protected Species status means that it is necessary to fulfil the commitments of the European Habitats Directive, including the designation of sites as SACs for the species – though no L&R sites are deemed worthy of this recognition, local GCN populations being seen as limited in national terms. All the locally-native reptiles (Grass Snake, Adder, Slow-worm, Common Lizard) are partially protected under WCA81, so that it is an offence to injure, kill or sell them. Other legislation (NERC Act 2006) places a duty on public authorities to conserve biodiversity – the list of species of principal importance includes the Toad, GCN and all the reptiles. The UK Biodiversity Action Plan (1998, updated 2007) lists species for which specific action plans would be prepared – these priorities also include the Toad, GCN, and all four reptiles.

2.3.2 *Case Studies* – One of the first local successes of wildlife legislation was a case considered at Melton and Belvoir Magistrates Court in January 2007 which resulted in a rare and substantial penalty against a building company for damaging Great Crested Newt habitat. The construction company concerned and its company secretary were fined a total of £8400 for offences at a site in Nether Broughton. The company had purchased a building plot in the village, which included a pond containing Great Crested Newts. Despite being informed of the presence of the GCNs, and even having a survey done which confirmed this, the company carried out clearance and building work that caused significant damage to the pond. Investigations by the Leicestershire Police Force Wildlife Officer, Neil Hughes, led to the prosecution under the Wildlife and Countryside Act and the Habitats Regulation. [L12, L25]. Given this success, it is even more unfortunate that LARN had to take action in 2008 when one of our local MPs, Andrew Robathan, MP for Blaby introduced a Ten Minute Rule Bill into Parliament, seeking to reduce the protection afforded to GCNs (and bats) because of problems they caused for developers. LARN contacted the MP to set out the reasons for the protection given to GCNs. LARN can only claim to have played a small part in this debate, but the attempt to downgrade the status of GCNs was not taken any further [L14]. Another unfortunate incident in 2007 saw Rutland County Council issuing a press release, on the basis of no evidence, stating that Adders were all over the place in the smallest county and were busy biting people[L13]!

2.4 Red Data Book Species

2.4.1 *Data and Management* - As there never was a national UK Amphibian and Reptile Red Data Book to refer back to, the L&R RDBs had to provide their own local rationale for “inclusion of highlighted species”. The county Red Data Book for mammals, fish and herpetofauna was published in 1997, one of a series summarised in “Rare Wildlife in Leicestershire and Rutland” (Heaton 2000) and was revised for lower vertebrates only in 2012 (see Heaton 2012). Conservation requirements for key species are listed in the RDB (and are summarised in Section 5 of this

document - see also 4.3). The strong pressures upon the habitats which they favour – primarily wetlands for amphibians and heathlands for reptiles – means that a high proportion of the Leicestershire herpetofauna is of conservation concern – seven of the nine native species present (Toad, Palmate and Great Crested Newts, Adder, Grass Snake, Slow-worm, Lizard) are listed as priority species. Only Common Frog and Smooth Newt are secure in the two counties. Common Toad and Grass Snake feature as BAP species due to recent declines in central England. However, there is no apparent evidence of decline of these species in our counties (except in the intensively studied Coleorton Toad population – Oldham, pers comm). Great Crested Newt is still widespread but thinly distributed and declining sharply in the East Midlands; recent dedicated surveys have found few new sites. The Palmate Newt is at the edge of its range in Leicestershire, being largely absent from eastern England. The three other reptiles are all now relatively rare in the Midlands generally, as a result of habitat loss. For the Slow-worm and Adder, particularly, declines in the East Midlands have been significantly greater than across the country as a whole. The herpetofauna face numerous pressures– habitat fragmentation, climate change, disease, non-native species) – and are amongst the most threatened animal groups. Management guidance produced in recent years in the form of Reptile and Amphibian Habitat Management Handbooks (Edgar et al (2010) and Baker et al (2011) respectively) addresses these problems, and are certainly utilised by LRWT.

3 Habitats for Herpetofauna in Leicestershire and Rutland

3.1 Wetlands

3.1.1 *Natural Wetlands* - Amphibians are essentially wetland species, needing to return to water every year to breed. Grass Snakes, predatory on fish and amphibians, are equally at home in water. L&R have a variety of wetland types (natural and created) which can support populations of these species, though the numbers of wetlands in optimal condition have probably declined over the last century due to drainage and pollution, and most extant examples are relatively small sites. Natural wetlands in L&R include Groby Pool (said to be the only natural lake in Leics, though it has been modified); probably some ponds (though the majority are likely to be man-made); and wetlands associated with rivers. This last group includes sites such as Narborough Bog, featuring Leicestershire's only substantial deposit of peat, and other sites in the Soar Valley such as Croft Pasture, as well as wetland habitats bordering some of the smaller rivers (Lea Meadows, Ulverscroft, and Stoneywell along the River Lin, for example). Each of these sites has established amphibian, and often Grass Snake, populations.

3.1.2 *Created Wetlands* -Artificial wetlands, the origins of the majority of wetland sites in the two counties, include reservoirs created for irrigation (usually small, on a single-farm scale, and too variable in depth to support much wildlife), for canal maintenance (Knipton for the Grantham Canal, Saddington for the Grand Union Canal, and the now-disappeared Swainspark Reservoir at Moira for the Ashby Canal) and for water supply (most notably Rutland Water, with its associated habitats); flooded gravel pits and quarries, especially along the main river valleys (Soar, Wreake, Trent) and in west Leicestershire, providing excellent wetland habitat with good amphibian populations, such as the Watermead/Wanslip area on the Soar, Priory Water on the Wreake and Trent Valley Pit. Most ponds are artificial: pond numbers have stabilised in recent years – historic losses to agricultural intensification, pollution, development and neglect have been balanced by strong efforts by landowners to create new ponds, especially in areas such as the National Forest, where new wetland sites such as New Lount and Moira Junction have quickly acquired a rich fauna and flora, including significant amphibian and Grass Snake populations, though at Moira Junction, the wetland is threatened by extensive growth of *Crassula*, the invasive New Zealand Pigmyweed.

3.2 Heathlands and Dry Grasslands

3.2.1 *Dry Habitats* - Heathland, dry grassland, and a few other habitats such as open woodland, provide optimal reptile habitat requirements (basking sites/foraging areas/hibernacula), with the exception of the Grass Snake, which is a wetland denizen. Local heathland sites in L&R tend to be grass heath, rather than having an extensive cover of dwarf shrubs such as heather. The three main heathland sites (Bradgate Park, Beacon Hill, Charnwood Lodge) are well managed by their respective owners, but no matter how good condition they are in, they suffer from being relatively small as heaths go, on a national scale, and especially by being isolated from each other and from the various smaller heathland sites which are scattered around the two counties, such as Ulverscroft and the newly-developing pure *Calluna* heath at the junction of Hicks Lodge and Newfield Colliery at Moira in the heart of the National Forest, which should provide a home for the expanding Moira lizard population.

3.2.2 *Grasslands* - Leicestershire was always known as a county well supplied with rich grasslands. Whilst a significant proportion of the counties' grassland areas are down to silage, a wildlife-poor habitat, there are still a number of grasslands in the two counties which are biodiversity-rich and well managed. There are threats even to these sites though, such as nitrogen deposition leading to over-enrichment of the soil and a loss of the more sensitive species at the expense of robust, generally widespread species. Grassland sites with good herpetofauna populations include Ulverscroft Valley, Greetham Meadows, Wymondham Rough, Cribbs Lodge Meadows, and Muston Meadows (a National Nature Reserve). It is noticeable that the majority of these are owned and/or managed by the Wildlife Trust, who are willing to put in the effort and resources to manage grassland sites properly/appropriately, which can be quite a challenge for site owners.

3.3 Other Habitats

3.3.1 *Woodland* - Woodland and scrub are also habitats which need to be considered in relation to herpetofauna habitat requirements. Scrub and open woodland, with sheltered edges and glades, provide good habitats for reptiles, including Adders, the more open areas providing basking sites. Also, it should not be forgotten that amphibians have a terrestrial phase to their lifecycle, when essentially all they require are damp resting places and a source of invertebrate prey. Scrub and woodland can provide these features, and woodland is especially favoured by newts in their terrestrial period. Several of the counties' more open woodlands have good herpetofauna populations: examples include Benschliffe, Burley and Rushpits, Launde Big Wood, and Swithland Wood. Details of these and other local woodlands are well covered by Squires and Jeeves (1994). The value of woodland scrub for Toads is also indicated by the surveys in Coleorton (Oldham and Swan 1991). There is a need for active management of woodlands to keep the open areas from closing in, as the Wildlife Trust is doing on reserves such as Great Merrible Wood and Priors Coppice.

3.3.2 *Post Industrial* - Whilst East Leicestershire and Rutland display a traditional agricultural landscape, the West of Leicestershire has been more heavily marked by industry, leaving a network of post-industrial sites. There are worked-out mineral quarries (of limestone, ironstone or roadstone), abandoned/redundant transport routes (canals and railways), areas of former opencast coal mines, gravel pits and sewage disposal sites – all are found in Leicestershire. Indeed, they provide the origins of several Wildlife Trust nature reserves, often supporting good populations of herpetofauna, having given rise to the kind of varied, mixed, “scruffy” habitats of scrub, ponds, immature woodland and hard surfaces which are such an attraction for some amphibians (Smooth Newt, Frog and Toad) and reptiles (Slow-worm). Examples can be found amongst the Wildlife Trust reserves (Kelham Bridge, Dimmingsdale) and at many non-designated sites, such as Stanigal Water (“Stanny Pond”) at Newbold with its large population of Toads. These latter sites, being recognised as

brownfield sites, are vulnerable to reclamation projects, (“tidying-up”) which, whilst done for positive reasons, are not always in the best interests of the wildlife present.

3.3.3 *Urban* - These “informal” habitats tend, by definition, to be clustered in urban areas, of which Leicestershire (less so Rutland) has a number, ranging from towns the size of Ashby de la Zouch up to Leicester city. The urban wildlife has, in recent years, been studied at all these built-up areas, but the best-resourced projects have been the two largest, Loughborough (surveyed by Charnwood Wildlife project) and Leicester itself, where studies of the urban wildlife, including herpetofauna, have been led by the City Wildlife Project, working under different names over a series of years. Gardens, though rarely given statutory protection, can harbour good numbers of amphibians and reptiles, notably Slow-worms, this lizard being something of an urban specialist – though not particularly in Leicestershire, where it is found mainly in Charnwood Forest, and in urban fringe areas around Leicester rather than in the city itself. Several studies of amphibians’ use of gardens in Leicestershire have been carried out, as reported by Bell (1970), Mathias (1975) and Latham et al (1993), each concluding that amphibian populations were increasing in urban areas, as the construction of numerous, albeit small, garden ponds provided many new wetland areas.

3.3.4 *Poor Habitats* - Other habitats in the two counties tend to be suboptimal for amphibians and reptiles. These include dense woodland plantations, with too little light to maintain optimal conditions, strong flowing waters, rarely used by amphibians, and areas of dense urbanisation with little room for natural features. The greater part of the Leicestershire countryside is now arable agricultural land, which is made little use of by herpetofauna, other than passing through (on migration to breeding ponds, or as part of the dispersal movements of juveniles).

4. Amphibians and Reptiles in a Leicestershire/Rutland Context

4.1 Recreation and Culture

4.1.1 *Early Interest* - For many people, an early interest in natural history was brought about by delight in spotting frogspawn as an early indicator of spring, and seeing newts and frogs in ponds, whether at noted sites like Bradgate Park and Beacon Hill, or out in the countryside generally. (Even David Attenborough acknowledged how important his early explorations of the Leicestershire countryside were to setting him off on his glittering career). To encourage young naturalists, the various WATCH groups operating around the two counties have, over the years, run, amongst their other projects, studies of the amphibians in particular. Recently, a young member of LARN has appeared on national childrens’ television, presenting a report on Great Crested Newts [L 24]. For adults taking part in activities such as walking/hiking or angling (claimed to be the country’s largest participation sport), enjoying the sight of tadpoles, newts or even the odd snake when out in the countryside is an important part of that activity. The readiness with which frogs and newts, in particular, will take to life in gardens (as demonstrated by Mathias 1975) is another factor in their cultural importance, and their interest for the general public. Sometimes, though, the degree of interaction with some species may be rather more intimate than is comfortable – see Richard Iliffe’s tale of the invasion of his house at Hinckley by toadlets [L24].

4.1.2 *Culture* - Amphibians and reptiles (frogs, toads and snakes especially) have long played a small but significant role in our cultural heritage. As well as more recent examples, such as the Teenage Mutant Ninja Turtles craze which gave rise to the abandonment of Red-eared Terrapins in the countryside [L26], LARN has, over the years, examined imagery of the herpetofauna in heraldry (linked to stone toads on Ashby de la Zouch’s parish church) [L26], place names (very few locally, apparently just Frog Lane in Plungar and Frog Island in Leicester) [L25], folklore (stretching the definition of “reptile” to the many British dragon stories) and publishing, where a special issue of the newsletter in appreciation of Loughborough’s Ladybird Books [L28] obviously struck a rich vein of nostalgia, judging by the response to that homage.

4.2 Interactions with other species

4.2.1 *Food Chains* - In the great ecological web that is the British countryside, the herpetofauna are both predators and prey. On the predatory side, they are often to be seen feeding on each other - Adders eat Lizards, newts feed upon frogspawn, Toads will take hatchling snakes, and amphibians form the main item of prey for Grass Snakes – as well as forming the prey of many other animals. The amphibians' life-strategy is to produce lots of offspring and accept that many of them will die before they reach maturity. Thus, it is not surprising that there are many organisms which prey upon amphibians at all stages of development, but arguably rather fewer which are specialist reptile feeders. Reptiles pursue a different life strategy, whereby individual reptiles show great resilience, being fast-moving, bulky, covered with scales, etc – so fewer eggs and young need be produced, and they are assisted in their early stages by eggs being laid in appropriate warm, dry situations to help bring development along. This is why the main reptile populations are to be found on sites with light sandy soils, such as Bradgate and Beacon Hill, or with light limestone-based soils, including Ketton and Stonesby Quarries.

4.2.2 *Feeding* - Amphibians feed generally on invertebrates, especially insects and spiders; Frogs and Toads also take woodlice, earthworms, slugs and snails, acting as “sit and wait” predators, allowing prey items to come to them. Newts are more active, hunting on land and in water (where they feed on aquatic invertebrates such as worms and crustaceans). Reptiles are more active again – speedy predators, with Lizards taking insects, spiders and woodlice, Grass Snakes feeding on fish and amphibians, and Adders preying upon small mammals and chicks of ground-nesting birds. Slow-worms, rather less agile than the others, tend to specialise in catching slugs, especially the small white ones. In the equable conditions of our two English Midland counties (average productivity in the soils, lacking the extreme weather conditions found in the uplands or on the coast), prey items are always likely to be readily available and are unlikely to provide a constraint upon the development of herpetofauna populations.

4.2.3 *Birds* - A number of birds prey upon one or both groups, at all stages of development, ranging from the smallest species, Kingfishers, to the largest, Herons (Heaton 2014) – the latter are known to feed regularly upon amphibians in particular. Amongst the more familiar birds to be found in L&R, not only Herons but also Crows, Bitterns, Kingfishers and Ducks all take adult Frogs, Toads and Newts, as do some of the counties' less common species, including Spoonbill and Marsh Harrier. Blackbirds have been known to pick off frog tadpoles from the edge of a pond, and Dippers also take tadpoles (though it should be noted that Toad tadpoles exhibit some toxicity which deters predation). Gulls will eat frogspawn, which raises the question of whether the increasing numbers of gulls around landfill sites, such as the thousands seen around Albert Village, are having a detrimental effect on local Frog populations. Of the reptiles, Kestrels and Pheasants are known to take Lizards (and the Hoopoe, uncommon but still turning up regularly in L&R, is a lizard-feeding specialist). Snakes are a food source for a range of predatory birds, as is highlighted when local photographers have captured images of Common Buzzards carrying large Grass Snakes in their claws whilst flying high over Hicks Lodge and Rutland Water [L26]. Less likely species will on occasions take reptiles, demonstrated by a LROS report of a Common Sandpiper chasing a swimming Grass Snake along the shoreline at Saddington Reservoir [L1]. Buzzard, Carrion Crow and Raven take both amphibians and reptiles, though the evidence for all of this is generic, with rather little information coming from local sources – specifically L&R anecdotes of herpetofauna predators would be very interesting and useful.

4.2.4 *Mammals* - Two elusive aquatic mammals, Otter and Water Shrew, present in the two counties in small numbers, will take adult amphibians and tadpoles respectively, as will the introduced Mink. There have been some strange sporadic events, probably due to mammal activity. At Willesley

Wood, the gruesome discovery (originally by the county Badger Group on an outing to this Woodland Trust site in 2006) of large numbers of dead Grass Snakes, mostly gravid females and each found with their heads bitten off, required some detective work to explain. It appeared that the reptiles were attracted to piles of rotting woodchips from management clearance works, which would have provided warm basking/egg-laying sites, which in turn led to Foxes taking advantage of the dense concentration of snakes (notably the less-active pregnant females) by feeding on their most favoured part of the body, the head. Fox droppings provided evidence of the predator [L12]. Other disturbing findings at Nature Alive, a reserve on the edge of Coalville, of a pile of Toads, each with its hind legs removed, and at Coleorton, where large numbers of dead Toads were found beside a breeding pond, were attributed to Mink and Rat predation respectively. A domestic mammal, the cat, will catch Slow-worms in gardens [L24]. Bell (1970) reports female Toads being eaten by badgers at Cropston, and also pinpoints the most dangerous predatory mammal threatening newts – humans. Discussing the few breeding ponds for Palmates in Leicestershire, he describes Beacon Hill as “...heavily predated by small boys and by larger boys too, who take any newts in the full knowledge, and indeed for the express reason, that they are rare creatures...”

4.2.5 *Fish* - Sticklebacks are often blamed for the lack of GCNs in ponds, and there is at least one example documented in Leicestershire: the introduction, in 1963/4, of Three-spined Sticklebacks into a Bradgate Park pond was followed by a rapid decline in subsequent years in the numbers of GCNs breeding there. Recorded instances of predatory fish taking amphibians or reptiles are generally rather few, but they are undoubtedly occurring - large Pike certainly take anything they can cope with, whether ducklings (as recorded regularly at Stoney Cove) or Frogs and Newts. Amphibians, especially, will be vulnerable to predation by fish of various kinds – both predatory native fish, most notably the Pike, together with smaller predators including Perch and Chub (the adults of which are known to take Frogs), and introduced species such as the Zander and Wels Catfish, both recorded in Leicestershire waters [L7]. Proposals to reintroduce Burbot from continental stock would bring back another predator, albeit a native species which became extinct in Leicestershire waters in the early 20th Century, previously being quite numerous in local rivers. In addition, some of the larger invertebrates are aggressive and strong enough to take tadpoles, or even adult amphibians, examples being the Great Diving Beetle, *Dytiscus*, and its larvae, and some of the larger crayfish, of which there are now two alien species in our rivers as well as the smaller native Whiteclawed Crayfish. Again, there are few local observations, and the County Recorder would be keen to collate relevant information.

4.2.6 *Disease* – There has long been concern over frogspawn mortality due to the fungus *Saprolegnia* – Bell, (1970), for example, notes 30% mortality of spawn clumps in a Bradgate Park pond in 1960, and there may well have been greater mortalities elsewhere, undocumented. Amphibians are particularly susceptible to diseases, especially fungal diseases which thrive on their moist, exposed skin; this risk will increase with climate change trends. There has been much concern over the increasing incidence and virulence of amphibian diseases which have led to extinctions of species in other parts of the world. In the UK there have been worries about Ranavirus, a disease affecting Frogs, Toads and Newts (especially the Common Frog), with symptoms including general poor condition, bleeding/haemorrhaging, reddening of the skin, ulcers and breakdown of the limbs. In 2011, a request for information on instances of Ranavirus in the two counties, as part of a national study of the disease, seemed to provoke very little response, but was soon followed by a major Ranavirus incident in 2013 which hit the large population of Toads at Coleorton, documented by Rob Oldham who lives in the village [L22]. Another virulent fungal disease that has hit amphibians across the world is *Chytridiomycosis*. LARN members were invited, in 2008, to provide samples of dead amphibians for a Froglife/ Institute of Zoology study looking at the incidence of the disease in UK amphibian populations. In fact, L&R seems to have produced fewer reports of disease problems than similar counties, though, in the future such problems are likely to be exacerbated by climate warming [L13].

4.2.7 *Parasites* - The Toadfly (*Lucilia bufonivera*) is a type of blowfly which lays its eggs on the skin at the entrance to the nostrils (or around the eyes) of Common Toads (and occasionally other Toads and Frogs). On hatching, the larvae feed on the tissues of the nostrils, burrowing into the nasal cavity and then into other tissues. When the Toad dies, the larvae totally consume the tissues, move into the soil and pupate. As well as an Ashby record, Toadflies have been recorded affecting the populations of toads at Coleorton and there are reports from elsewhere in Leicestershire [L20]. In 1965, Toad tadpoles at Lount, between Ashby and Breedon, were found to be harbouring the Fish Louse *Argulus foliaceus* [L27]. This is a species rarely recorded in VC55 (though it probably turns up in Environment Agency fisheries surveys). Fish lice belong to the class of crustaceans known as the Branchiura, with two common species in northwest Europe, *A. foliaceus* being the more numerous in Britain, parasitising any freshwater fish - and, it seems, tadpoles as well. In an unexplained occurrence at Leicester University Botanic Gardens, Great Crested Newts were observed to have *Pisidium* Pea Mussels clinging to their toes. The significance of this is not clear - *Pisidium* species are not known to be parasitic.

4.3 Conservation

4.3.1 *Legislation* - Several decades of, generally slow, evolution of the law (from the 1949 National Parks and Access to the Countryside Act) led ultimately to the WCA81, which had the primary effect of strengthening the protection given to SSSIs, including a number of sites of importance for their herpetofauna population such as Great Bowden Borrow Pit, Bradgate Park, and Beacon Hill. Further protection was given to sites of European significance by the European Birds and Habitats Directives, brought into effect by domestic legislation, the Conservation (Natural Habitats) Regulations 1994, leading to the designations of SAC and SPA. VC55 has just one of each: the SPA (Special Protection Area, a European conservation site designated as being of importance for birds) is Rutland Water, whilst the SAC (Special Area of Conservation, a site of European importance for the conservation of habitats and organisms other than birds) is the River Mease. As related in section 2.3, WCA also developed the idea of species conservation, thus emphasising the importance of the GCN, the only herpetofauna species to be given full legal protection. Because of their legal status, establishing the distribution of GCNs became the main aim of the recording community; though despite all the effort expended, new sites are still being turned up and it has been suggested that it is unlikely that we know more than 75% of all GCN breeding sites.

4.3.2 *Government Indifference* - Conservation action over the last quarter century has been a mixture of different approaches, led by, variously, Government (Local, National and European), voluntary bodies and even, on occasions, the commercial sector (eg wildlife-friendly farming initiatives). Government has generally taken the lead on the protection of statutory sites (SSSIs and European sites) and on protected species (including Great Crested Newts, etc). The initiatives following (whether survey work, strategic documents/plans or practical land management), are mainly voluntary body-led, with local authorities having their main impact on conservation through the planning process. Lately, Government funding to its nature conservation agencies has been reduced (as to all the public sector), and increasingly, in L&R just as elsewhere, the voluntary bodies have had to pick up the ball as it is dropped by Government, taking the lead in relation to activities such as identifying Local Wildlife Sites and coordinating biological recording - just as they had done nearly 30 years earlier in producing the county's series of Red Data Books.

4.3.3 *Toads on Roads* - Another conservation initiative, the "Toads on Roads" campaign coordinated by Froglife [L13], was aimed at preventing mass mortalities on the roads as Toads returned to their breeding ponds, along traditional migration routes which cross now-busy roads, by means of patrols at appropriate sites. Several sites were covered by patrols in the two counties, at Coleorton, Ashby Magna, Stockerston (Uppingham Road), Glenfield and Thurmaston, as well as

patrols operated at a number of Severn-Trent Water sites (Swithland, Cropston). The first three sites were registered with the Froglife project, but all appear to have ceased activity in the late 90s. At the Coleorton site, the crossing point has now been replaced with a toad tunnel under the A512, showing the interaction of conservation with the planning process. The enforcement of strong conservation policies in the planning system is the main way in which district councils can promote conservation. (However, the success of the Coleorton tunnel has been questioned).

4.3.4 *Red Data Books* - The conservation requirements of the most vulnerable species **in our area** were set out in the eight county Red Data Books which were first produced in the 1990s (with an overview covering all taxa, published as “Rare Wildlife in Leicestershire and Rutland” - Heaton 1998) [L17]. The county RDBs are now beginning to be revised: that for the lower vertebrates was revisited in 2012 (Heaton 2012). In this revision, seven of the nine native amphibians and reptiles were identified as requiring special conservation measures – these requirements are noted, in summary form, in the checklist of species below (Section 5). The various conservation measures required are down to the several actors in conservation in the two counties, both statutory and voluntary bodies. The different organisations’ responsibilities are set out in the Conservation Manifesto (see 1.2.5).

4.3.5 *Nature Reserves* – The acquisition of Stoneywell by the National Trust brings another important herpetofauna site into conservation management. NT has had limited involvement with nature conservation in Leicestershire, other than ownership of Ulverscroft and Rocky Plantation, two reserves managed by the WT, but acquisition of Stoneywell, an Arts and Crafts-style cottage near Ulverscroft, also gives it extensive woodland and wildlife-friendly gardens holding a good population of Slow-worms as well as small numbers of Palmate Newts which live in a tiny cold plunge pool [L23, L24]! Whilst some of the biodiversity hotspots of the two counties are managed by local authorities and others (examples being: Beacon Hill – Leics County Council; Bradgate Park – Bradgate Park Trust; Muston Meadows – Natural England - the first two, in particular, holding important herpetofauna populations), sites managed strictly for the benefit of their wildlife are essentially down to the suite of nature reserves held by LRWT. A recent assessment of the significance of WT reserves for herpetofauna confirmed the pleasing fact that all of the nine L&R herps are present (and thus protected) on LRWT nature reserves. The most numerous species on WT reserves are the Common Frog, found at 24 sites, Grass Snake (18 reserves) and Common Toad (17). Least well represented are Palmate Newts, only certainly present at one site - Charnwood Lodge - and possibly two others in the past – Holwell and Lucas Marsh. There is also certainly just one reserve holding Adder populations (Ketton Quarry), with possibly also Holwell in the past. The Slow-worm is also vulnerable, with only three sites supporting the species (Merrys Meadows, Rutland Water, Ulverscroft). The richest reserves, in terms of herpetofauna species present, are Rutland Water, Charnwood Lodge (and possibly Lucas Marsh) with six species each, Merrys Meadows (five species) and Holwell (four species definitely, possibly as many as seven). Three reserves have neither amphibians nor reptiles recorded (Croft, Rocky, Coombs – each of these has the potential to turn up species with further survey) whilst 10 reserves have had only one species noted. The above figures relate only to presence/absence; further work is needed to determine whether these species are actually breeding on Trust reserves, which they should be if the Trust is truly to be said to be conserving populations.

4.3.6 *SSSIs* – Sites of Special Scientific Interest designated under the WCA81 for other reasons may serve to protect amphibians and reptiles when they are present, but the herpetofauna are rarely key features of SSSIs. They tend to be simply an incidental part of the complement of species, rather than noted features of the sites, and even this low level of recognition is not voiced very often. Each designated SSSI has, as part of its documentation, a Citation which gives an outline of its biological (and geological) interests. Of the 100 or so SSSIs in Leicestershire and Rutland, only three have Citations which refer to herpetofauna species: Beacon Hill, with its breeding ponds for

Palmate Newt; Muston Meadows for the presence of GCNs; and Pickworth Great Wood, a breeding site for Slow-worms. The latter two may be a surprise to see listed amongst top herpetofauna sites; indeed, the county recorder was not aware of the occurrence of Slow-worms at Pickworth, holding only records of Grass Snake and Lizard for the wood. Of course, other SSSIs do have good amphibian and reptile populations - mostly Wildlife Trust sites, such as Rutland Water and Ketton Quarry. Of the non-Trust SSSIs, only Bradgate/Cropston with all nine species reported, Beacon Hill, with six, and Burley/Rushpits Woods with five species, have anything like the variety of herps to be found in Wildlife Trust reserves. As well as SSSIs, L&R also has examples of an SPA (see 4.3.1 for definitions of SPA and SAC) – Rutland Water with its strong amphibian and reptile populations, six species noted by the Trust – and also a SAC, the River Mease, for which the herpetofauna are peripheral to its flowing-water interests, and few have been recorded on the site itself, though there are plenty of records of Frog, Toad, Smooth Newt, GCN, Grass Snake, Lizard and even a Palmate Newt sighting in the surrounding countryside of grid square SK31.

4.3.7 *Biodiversity Action Plans* - The UK Biodiversity Action Plan (1998, updated 2007) lists key species for which specific action plans would be prepared – priorities relevant to L&R included Toad, GCN, and all four reptiles – as well as detailing action plans for habitats [L1]. In support of the national BAP, in the 1990s/2000s, the production by counties and others of their own local BAPs brought a business-like approach to planning and resourcing conservation activities, leading to detailed Habitat and Species Action Plans which set out actions and resources required to conserve the most vulnerable local species. In the Midlands, at least, amphibians and reptiles did not figure highly in the detailed action plans produced – the Leicester, Leicestershire and Rutland BAP (1998) actually concentrated on habitats rather than species, so there was no amphibian nor reptile included in the limited list of highlighted species. The National Forest BAP (2nd edition 2004) did include the Adder as a highlighted species, though it is probably true to say that this vulnerable snake was more likely to benefit from the implementation of the Heathland HAP rather than its own SAP.

4.3.8 *Local Wildlife Sites* - The criteria for designating Local Wildlife Sites in L&R (which have run here and elsewhere under several different names – County Wildlife Sites, Sites of Importance for Nature Conservation – to some confusion) includes a set of criteria based on amphibian presence and numbers, meaning that Local Wildlife Sites could be designated on the basis of amphibian populations alone [L6]. Under these (very welcome) criteria, a LWS could be rated as being of the required value for designation if 50+ clumps of frogspawn were counted; Toads, to reach a similar standard, required 100 adults to be counted; Smooth Newts needed to see 10 adults trapped, netted or counted at night. The other newts and all the reptiles, being L&R Red Data Book species, are covered by the “Red Data Book Species Criteria”, whereby the simple presence of these notable species can be enough to fulfil criteria for LWS designation. Good herpetofauna sites in the two counties should thus be designated as LWS, so providing some protection under the planning system, LWS being regarded as the next tier down from SSSIs in terms of conservation importance, and consideration should be given to protecting them as far as possible when they are threatened by developments. However, even this recognition in the planning process does not guarantee that sites are left in a pristine condition, protected from all development. Noted amphibian sites which were “protected” in this way (involving the translocation of GCN populations, which thrived at first in their new sites, but then suffered a rapid decline) included Bosworth Battlefield visitor centre, and the Coalville, Albion and Minorca opencast sites. Local authority commitment to this system seems to have waned in recent years.

4.3.9 *Non-native Species* - An issue that has come to the fore recently is that of the impacts of introduced, invasive species, now seen as one of the key factors bringing about a general decline in biodiversity across the world, and L&R have certainly picked up a notable suite of alien species, including several newts, frogs and Red-eared Terrapin. [L21] The complete list comprises a dozen

introduced species reported from L&R, as follows: amphibians - Moor Frog*, Pool Frog*, Marsh Frog, American Bullfrog* Natterjack, Italian Crested Newt*, Alpine Newt; reptiles – Red-eared Terrapin, Sand Lizard*, Kingsnake, Pythons, Alligator*. (Note: * = reported but not satisfactorily confirmed) [L26]. Concerns over the introduction of non-native species to L&R (see 2.1) should, to some extent, be countered by action by the statutory agencies making full use of the legal back-up which is available: controls over imports, eradication measures, etc. (The emphasis tends to be on control rather than eradication, as the latter is rarely completely possible). Some aliens are well established in L&R, notably the Red-eared Terrapin, much disliked as it preys upon small birds amongst other native fauna; mainly present on open water sites as single animals, it has been seen in numbers of up to half-a-dozen at Groby Pool. Strict biosecurity measures are required to prevent the introduction of others, such as the American Bullfrog, which potentially poses a grave threat to native species. Once established, complete eradication is rarely attempted, as generally not possible – the prevention of establishment is certainly the preferred option. The actual impacts of aliens in L&R is something that could be looked at through local research projects, and could perhaps be included in the list of R&D projects outlined below, though there is the danger of researching species to extinction.

4.4 Research and Survey

4.4.1 *Albinism/melanism* - Even in the early days of modern scientific knowledge, Leicestershire had a role to play. The Victoria County History for Leicestershire (Browne 1907) records that at Eye Kettleby in 1905, some digging work turned up an albino Grass Snake “*with eyes a bright ruby red*”. The VCH text stated that “*Albinism has hitherto been entirely unknown in connexion with reptiles*” - Leicestershire had thus harboured the first known example of an albino reptile [L24]. In complete contrast, colourifically, in 2014, a Plungar farmer saw a snake with seven young on an allotment compost heap - the snake was completely black with a red collar, and it was not obvious what the species was. The mention of young at a compost heap points to Grass Snake; there are certainly records of black (melanistic) Grass Snakes, though none, apparently, in Leicestershire. It may be that this genetic abnormality has the effect not only of turning the majority of the animal black, but also turning the Grass Snake’s yellow collar to a red colouration [L26].

4.4.2 *Beginnings of Knowledge* - Leicestershire has benefitted from the focus for herpetological research that was the biology unit at De Montfort University, led by Professor Rob Oldham – who has continued his long-term studies after retirement from the university, looking at Toad and GCN populations around Coleorton. Their expertise and experience of the British herpetofauna (much of the work summarised in Oldham 1999) led to the group being awarded the task of developing the first national amphibian and reptile surveys, which were reported in 1993 (Swan and Oldham, 1993a and 1993b), and presented at a series of meetings at the Scraftoft campus, which in turn led directly to the annual Herpetofauna Workers Meetings which now travel around the country.

4.4.3 *Research Projects* - The other local universities (Leicester, Loughborough) have certainly undertaken ecological studies around the two counties, but probably nothing so directly relevant to our herpetofauna populations. Natural England (and its predecessor bodies) has supported research and survey work, and on occasions the Wildlife Trust has been involved with studies related to management of its own reserves – for example, peat/hydrology reports on Narborough Bog (Brown and Hatton 2002), a wetland reserve with the greatest extant area of undisturbed peat in Leicestershire, supporting Frogs and Grass Snakes. Several studies have looked at amphibians in Leicester gardens (see 4.4.4). Recently, with research under pressure from “austerity measures”, emphasis has been on site surveys (including blanket surveys or “bio-blitzes”) and distribution studies of herps including LCC public surveys (eg Snakes Alive etc – see section 1.2.3.1) with a similar approach taken for other taxa. There have been a number of small-scale projects carried out in the two counties (often by students from the local universities and colleges), which have been

identified as being of use and practicable, and have thus served to further our knowledge of the herpetofauna of L&R [L30].

4.4.4 *Gardens* – There seems to be a great deal of interest in VC55 in the use of gardens by amphibians. Three comparable studies of garden ponds and their amphibian populations in and around Leicester have been undertaken over the course of some 25 years, reported by Bell (1970), Mathias (1975) and Latham, Bowen and Jeffcote (1993). The studies came to similar conclusions on the positive value of garden ponds for amphibians, the importance of appropriate pond management, and the distribution of amphibians around Leicester. The Frog is very much the most adaptable and the commonest amphibian in urban areas, the Toad is the least able to benefit from garden/urban habitats, the Newts (aggregated) falling in the middle. The paper by Latham et al concludes with the following priceless quote: “...if you want newts you can’t have fish, if you want Toads you need a large pond and a lot of patience and if you just want Frogs then you really only need the pond.” – popular science writing at its finest! However, probably the most notable work on this theme was an individual’s project and “labour of love” - Jenny Owens’ thirty-year study of the animals and plants living their lives in her garden in a very ordinary part of Leicester; the extraordinary total of species she detected in her garden (which included, as a minor feature, three amphibians but no reptiles) resulted in a very successful book (Owen 2010) and many appearances in the media. Bell’s 1970 paper, whilst including much data on amphibians in gardens, is actually broader in scope. It is a comprehensive, extremely detailed description of everything known about amphibians in Leicestershire at the beginning of the 1970s, including details of all spawning sites in Leicestershire, and an overview of other data on local amphibian populations. It answers many questions relating to the Frogs, Toads and Newts in this period, whilst making it clear just how little data was available at that time, compared with the numbers of breeding sites that are documented today. It is surprising that the paper is not better known; it would provide much scope for identifying gaps in our knowledge on amphibian spawning behaviour which could be addressed by small scale research projects, as considered below (section 4.4.3).

4.4.5 *Research & Development* - In 2012, LARN offered suggestions for R&D projects/small investigations that might be taken up by LARN members to increase knowledge of our suite of species [L20]. Items suggested included: Great Crested Newt – the priority is survey for new sites; Smooth Newt – fill in gaps in maps; Palmate Newt – surveys/any records; Toad – monitor good populations; Frog – fill in gaps in maps; Lizard – surveys/any records, and habitat / population studies; Slow-worm – surveys / any records, and habitat/population studies; Grass Snake – monitor populations, study feeding; Adder – study population size, feeding (this was highlighted as a specialist activity!). This list of projects is probably worth looking at again, with greater input from the conservation community, and it needs to take on board broader topics (such as impacts of alien species, and of large gull concentrations at tips) [L20]. LARN has also always emphasised the value of long-term studies. One minor example was given in the form of this author’s study of numbers and dates of frogspawn in a garden pond in Ashby de la Zouch, but there must be many more examples around the two counties (not least Rob Oldham’s long-term investigations of Toads and GCNs in Coleorton) [L27]. Fortunately, wild herpetofauna provide good models for long-term investigations, as populations can be monitored by means of relatively easy observations (by noting, for example: dates of first frogspawn clumps; date and number of Adders emerging from hibernacula; high counts of frogspawn, which are directly related to Frog populations). LARN is keen to see suggestions such as these taken up as student projects at Leicester, Loughborough and De Montfort Universities and other appropriate educational establishments, to add to the body of knowledge on amphibians and reptiles in our two counties. A one-off meeting to discuss these ideas on potential R&D projects could prove fruitful. [L20].

5. Species Accounts/Checklist of Amphibian and Reptile Species in Leicestershire and Rutland

This section serves as a checklist of amphibian and reptile species currently or recently present in Leicestershire and Rutland, as well as an indication of trends over time, from the assessments made in the Victoria County Histories of the situation around 1900, through the mid-Twentieth Century, up to the present day.

Information given in this section is set out for each species as follows.

Status:	Current situation on the species' status in L&R: native/introduced; common/rare, trends, etc
Mat:	Status in mid-1970s (amphibians only), from Mathias (1977).
Bell:	Status in late 60s (amphibians only), from Bell (1970)
LHSG:	Status in mid-1960s, from Leicestershire Herpetological Study Group newsletter (1966).
VCH(R):	Status in Rutland Victoria County History (Page, 1908)
VCH(L):	Status in Leicestershire Victoria County History (Browne, 1907)
RDB:	Red Data Book – summary of Threats and Conservation measures given for species highlighted in the county RDB. For the full details (including Ecology, Habitat and Status for each listed species), see the revised Lower Vertebrates RDB (Heaton, 2012).
Notes:	Other narratives, including presence in Wildlife Trust nature reserves.

5.1 Amphibians

5.1.1 **Common Frog** (*Rana temporaria*)

Status:	Native. Widespread and common; populations stable.
Mat:	Commonest of the Leicestershire amphibians, breeding in almost any water except fast flowing streams.
Bell:	Generally distributed in Leicestershire, and common in many places. Bell had no evidence to prove or disprove a suggested decline in the previous decade (the 1960s).
LHSG:	Present throughout the county.
VCH(R):	Common but not very numerous in any one place.
VCH(L):	Resident and common.
RDB:	Not listed.
Notes:	Probably the commonest amphibian or reptile in L&R, Frogs readily take to garden ponds, and so feature in the various garden amphibian studies which have been carried out in Leicestershire. Frogs return to their ponds earlier in the year than other amphibians, and there are at least two accounts of Frogs swimming beneath ice (Burton Overy in 1964, Saddington Reservoir in 1965). Bell (1970) categorises types of spawning sites for Frogs in Leicestershire, including unusually, quite a high proportion of sites in flowing waters (streams, flowing ditches) – Frogs are generally more thought of as breeding in still waters. Present in 26 Wildlife Trust reserves, more than any other amphibian/ reptile. See map, 5.1.13.

5.1.2 **Moor Frog** (*Rana arvalis*)

Status:	Introduction. Reported from a couple of sites over the years (Melton and Oadby
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areas), but never confirmed.

Mat: Not mentioned.

Bell: Not mentioned.

LHSG: Not mentioned.

VCH(R): Not mentioned .

VCH(L): Not mentioned.

RDB: Not mentioned.

Notes: The Moor Frog has been reported on a couple of occasions over the years, but there has been no confirmed sighting. Claims have been made for its presence at Lakeview fishery, Melton Mowbray, and at the Leicester University Botanic Garden on the Leicester/Oadby border. In fact, the Moor Frog appears never to have turned up in the wild in any part of Britain.

5.1.3 **Pool Frog** (*Pelophylax lessonae*)

Status: Native to Britain (though probably not in L&R). Recently reported from Rutland Water, but no firm evidence.

Mat: Not mentioned.

Bell: Not mentioned.

LHSG: Not mentioned.

VCH(R): Not mentioned.

VCH(L): Not mentioned.

RDB: Not mentioned.

Notes: Only recently identified as a native species, shortly before becoming extinct in Britain (where it had been confined to East Anglia in recent times). Now reintroduced from Scandinavian stock to that part of England. No evidence that it was ever found in Leicestershire nor Rutland.

5.1.4 **Marsh Frog** (*Pelophylax ridibundus*)

Status: Introduction. One population at Lakeview fishery near Melton Mowbray. In June 2017, a report of a Marsh Frog in a garden pond in Earl Shilton was backed up by photographs and a video of the specimen inflating its cheek sacs, and the species was confirmed by a member of the Warwickshire Amphibian and Reptile Team. There may also have been a record of the species at Rutland Water. The Earl Shilton specimen was apparently brought into the pond with a bunch of aquatic plants purchased at a local nursery.

Mat: Not mentioned.

Bell: Not mentioned.

LHSG: Not mentioned.

VCH(R): Not mentioned.

VCH(L): Not mentioned .

RDB: Not mentioned.

Notes: The presence of Marsh Frog in our counties has always been a bit mysterious – it may have been present at the Melton fishery for quite a long time (or for quite a short period!).

5.1.5 **European Tree Frog** (*Hyla arborea*)

Status: Introduction. One record in Leicester city centre in 1985.

Mat: Not mentioned.

Bell: Not mentioned.

LHSG: Not mentioned.

VCH(R): Not mentioned.
VCH(L): Not mentioned.
RDB: Not mentioned.
Notes The Leicester record probably involved an escape from a collection.

5.1.6 **American Bullfrog** (*Lithobates catesbeianus*)

Status: Introduction. Reported from Leicestershire but no firm evidence.
Mat: Not mentioned.
Bell: Not mentioned.
LHSG: Not mentioned.
VCH(R): Not mentioned.
VCH(L): Not mentioned.
RDB: Not mentioned.
Notes: Never confirmed in the two counties, but if it were so, the (very large) Bullfrog would be a major threat to native species.

5.1.7 **Common Toad** (*Bufo bufo*)

Status: Native. Widespread and common; no apparent decline in recent times (as there has been elsewhere in the Midlands).
Mat: Even but thin distribution, numerous where well established, but new colonies slow to build up.
Bell: “Not as universally distributed as the Frog, but probably no large area in the county, even in the centre of Leicester, is devoid of Toads”.
LHSG: Widespread but present in fewer localities and exists in fewer numbers than the frog.
VCH(R): Sparingly distributed throughout county, but present in great numbers breeding in the Oakham Canal.
VCH(L): Resident and commonly distributed.
RDB: Highlighted species. **Threats** – loss and deterioration in condition of ponds; road casualties on migration; climate change bringing various pressures – water resources impacts, susceptibility to new diseases. **Conservation** – UK BAP species; limited protection under Sch 5 WCA81 (from sale only); appropriate nature reserve habitat management should be undertaken (Charnwood Lodge, Narborough Bog); toad patrols on migration routes.
Notes: There are some significant Toad populations in Leicestershire – notably counts of 7000 adults at Coleorton (Oldham and Swan 1991) and an estimated 1000 adults at Sawley Marina, with other good counts at Dunton Bassett and Wymeswold. Toad crossing patrols (see section 4.4.3) have run at several sites – Coleorton, Ashby Magna and Stockerston (Uppingham) were registered with Froglife; Cropston and Swithland were organised by Severn Trent Water) [L29]; and there seem also to have been patrols at Glenfield and Thurmaston. There may have been a few other crossing patrols – the initiative was never very well documented in Leicestershire – but whatever the number, it seems that none are still operating. The toad crossing at Coleorton has been replaced by a tunnel running under the newly-built A512, though its effectiveness is debatable. Bell (1970) identified Toad migration routes at sites including Swithland Wood and Waltham on the Wolds (noting also earlier work by AE Squires on Toad migration in Charnwood). Present in 18 Wildlife Trust reserves. See map, 5.1.13.

5.1.8 **Natterjack** (*Epidalea calamita*)

- Status: Native to Britain (but probably not to Leicestershire). Introduction attempted, before 1889, to the Leicester Museum grounds.
- Mat: Not mentioned
- Bell: Mentions Montagu Browne's attempt to introduce Natterjacks to the museum grounds, and concludes "They were never seen again".
- LHSG: Not mentioned
- VCH(R): Not mentioned
- VCH(L): Introduction to Museum grounds (undertaken by the VCH(L) author, Montagu Browne, a noted Leicestershire naturalist).
- RDB: Not mentioned.
- Notes: Of all the British amphibian and reptile rarities, this is the only one to be present in the Midlands, found on the Lincolnshire coast, and as a introduction in Staffordshire (not within its native range), forming a small population on Cannock Chase).

5.1.9 **Smooth Newt** (*Lissotriton vulgaris*)

- Status: Native. Widespread and common; populations stable.
- Mat: Widely distributed, common in many places, and colonising garden ponds and urban standing water successfully.
- Bell: Generally distributed in the county, and known to be common in many areas.
- LHSG: Present throughout the county.
- VCH(R): Very common everywhere.
- VCH(L): Resident and generally distributed.
- RDB: Not listed.
- Notes: Will breed almost anywhere there is a little water - see map at 5.1.13. Because of its familiarity, it is a species which has attracted rather little attention over the years (except perhaps in the context of garden studies – see 4.4.4). It seems strange that the Smooth Newt and Palmate Newt were not identified as separate species in the VCH volumes, given that the two had been distinguished a hundred years earlier (in 1789), by the dashing Count Razoumovsky of Poland (later Russia). Montagu Browne, who drafted the VCH(L) section, was a noted naturalist in Leicestershire, and should have known of this development. Newts generally return to their breeding ponds later than Frogs and Toads. Bell (1970) reported activity early in the year (8th February) when a Smooth Newt "found under a discarded sock on the banks of a pond at Coalville swam off under the ice still covering part of the pond." See map, 5.1.13.

5.1.10 **Palmate Newt** (*Lissotriton helveticus*)

- Status: Native. Rare; there was thought to be only one definite site extant (Beacon Hill), but surveys have recently confirmed a number of other existing sites, including Old John Watering (Bradgate Park), Stinking Wood (Markfield), the new National Trust site of Stoneywell, and the Wildlife Trust's Charnwood Lodge (with possibly two other reserves, Holwell and Lucas' Marsh, holding populations of these newts in the past). There are also a few sites around the counties at which Palmates have been reported previously, but which need confirmation as to the present situation (eg Moira). Conversely, the species has been lost recently from a number of sites, especially in quarrying areas in North-West Leicestershire, such that a complete map showing all records for the species (as in 5.1.13) gives a rather over-optimistic picture of the current situation. This is the only native amphibian (or reptile) which

is present in Leicestershire but not found in Rutland.

- Mat: Only found on high ground in Charnwood Forest. One old record from Fleckney.
- Bell: “Reliably recorded from five localities in the county (all within Charnwood Forest); also a number of less reliable records.”
- LHSG: Confined to a small group of infertile artificial ponds on high ground in the Charnwood Forest.
- VCH(R): No record.
- VCH(L): Not mentioned (though distinguished as a separate species by 1789).
- RDB: Highlighted species. **Threats** – pond loss and especially terrestrial habitat loss. **Conservation** – limited protection under Sch 5 of WCA81 (from sale only). The few remaining sites need to be managed appropriately, preventing overshadowing by adjacent vegetation; Reintroduction to suitable Charnwood ponds may be considered.
- Notes: Essentially a north-western, upland species of markedly acidic habitats, this newt is generally not found in the agricultural lowlands, being most frequent in heathland, moorland or woodland, often with flowing water close by. Given these habitat requirements, it is not surprising that, locally, Palmate Newts are largely confined to Charnwood Forest. The population dynamics of the Palmate Newt in Leicestershire seems quite fluid, with sites coming and going over the years, including some sites away from Charnwood Forest. Present in just three Wildlife Trust reserves. It appears that the county of Rutland has never had the Palmate Newt as a native species locally present. See map, 5.1.13.

5.1.11 Great Crested Newt (*Triturus cristatus*)

- Status: Native. Fairly widespread, though nowhere common, and declining; some large populations lost to development in recent years, especially in North-West Leicestershire.
- Mat: Population centre to east of Leicester, in arc from Kilby in the SE to Hungerton to NE of city.
- Bell: Sparsely distributed in the county, abundant in very few locations.
- LHSG: Widespread but present in fewer localities and exist in smaller numbers than the Smooth Newt.
- VCH(R): Fairly common in all the ponds and pools.
- VCH(L): Resident and generally distributed.
- RDB: Highlighted species. **Threats** – ponds in urban areas lost to development; in rural areas, lost to tipping/ infilling, drainage and natural succession; loss of terrestrial habitat also significant. **Conservation** - UKBAP species; full legal protection under Sch 5 WCA81; listed in Annexes II and IV of the European Habitats Directive; thus planning system must seek to protect GCN sites from development. Sites where conservation bodies have management control (Cribbs Meadow, Nature Alive): GCN breeding ponds should be positively managed to retain balance of open water/submerged plants, keep the pond free of fish, avoiding excessive shading of the water; also maintaining optimum terrestrial habitat (rough grassland, woodland), ensuring the pond is protected from effects of agrochemicals. Creation of new ponds close to existing sites may establish new breeding populations.
- Notes: Since Matthias’ assessment, the importance of GCN populations in NW Leics has become known – these large populations were probably always there but unrecorded. Given huge losses of ponds, it is not surprising that GCNs, the only locally- native herpetofauna species with full legal protection, are declining. Some significant populations have been noted, especially in NW Leics: over 120 counted at Coalville and Coleorton, 800 trapped at Albion Landfill at Albert Village, and 200 at the Lounge site (near Ashby de la Zouch) with total numbers possibly into the

thousands. The Coleorton site provided the basis for seminal work on the habitat preferences and population ecology of GCN, leading to a methodology for assessing habitat suitability for the species (Oldham 1994). Yet despite this supporting theory for projects dealing with GCNs, recent translocation projects in advance of developments do not appear to have been a great success. Surveys have turned up few new sites, and have highlighted the poor condition of many ponds. Present in nine Wildlife Trust reserves. See map, 5.1.13. This species is known also as the Warty Newt and simply the Crested Newt (as used by Bell).

5.1.12 **Italian Crested Newt** (*Triturus carnifex*)

Status: Introduction. Reported at one site in Oakham in 2013.
Mat: Not mentioned.
Bell: Not mentioned.
LHSG: Not mentioned.
VCH(R): Not mentioned.
VCH(L): Not mentioned.
RDB: Not mentioned.
Notes: The sole record came in via iRecord , and needs confirmation.

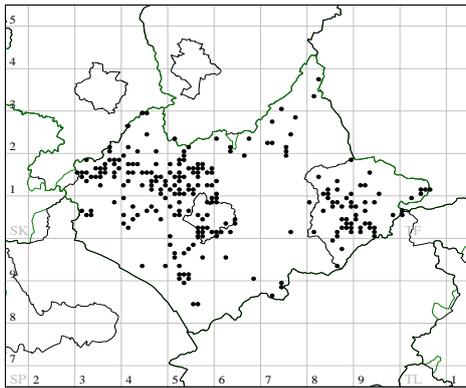
5.1.13 **Alpine Newt** (*Ichthyosaura alpestris*)

Status: Introduction. Two populations recorded: three gardens in the SE corner of Leicester city, together with the nearby University of Leicester Botanic Garden, and a separate population at Kirby Muxloe.
Mat: Not mentioned.
Bell: Not mentioned.
LHSG: Not mentioned.
VCH(R): Not mentioned.
VCH(L): Not mentioned.
RDB: Not mentioned.
Notes: There seems to be a slow expansion of garden populations on the Leicester/Oadby border.

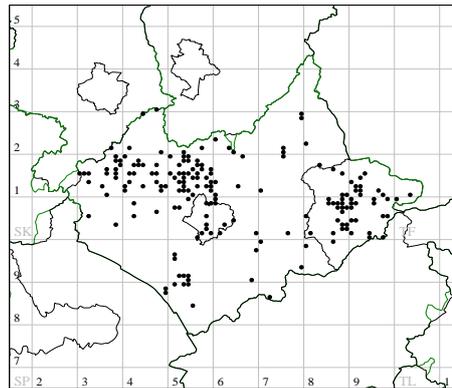
5.1.13 Distribution Maps for Native Amphibian Species

The commoner species essentially show a general distribution of each animal across the two counties, the gaps in dot-distribution being a result of lack of recording rather than a paucity of animals. These maps, produced by the County Recorder based on records available from the 1980s to 2017 (though some recent records have not yet been plotted) are intended to give an impressionistic view of the distribution of each species. They will not identify every grid square occupied (see 1.2.3). Ironically, rare species mapped in this way allow a more accurate picture.

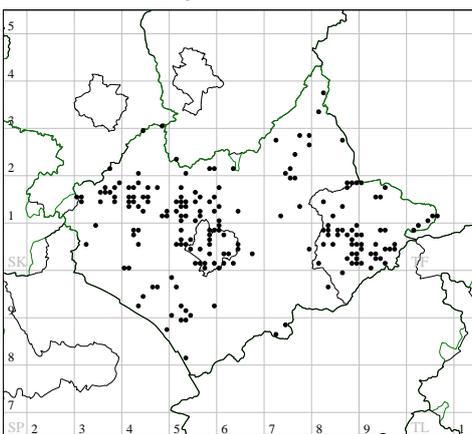
Common Frog (*Rana temporaria*)



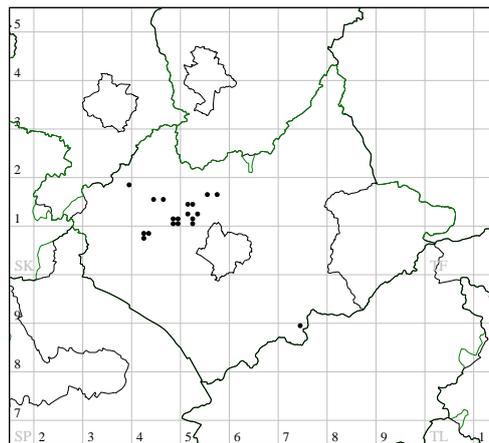
Common Toad (*Bufo bufo*)



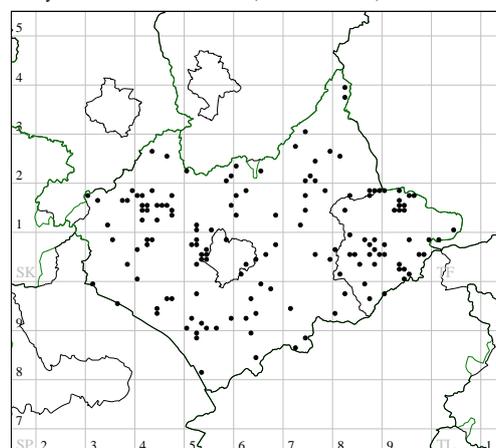
Smooth Newt (*Triturus vulgaris*)



Palmate Newt (*Triturus helveticus*)



Warty Newt / Great Crested Newt (*Triturus cristatus*)



It is helpful to note that the Leicestershire situation, in terms of status, distribution, trends, etc, is similar also for herps in South Derbyshire, an area adjacent to and ecologically similar to NW Leicestershire, as confirmed by the excellent work of Derbyshire ARG over the years (Chris Monk, pers comm).

5.2 Reptiles

5.2.1 **Slow-worm** (*Anguis fragilis*)

- Status: Native. Uncommon; few scattered records in Charnwood, West Leicestershire and Rutland. Possibly under-recorded rather than rare.
- Lat: (Not applicable – amphibians only).
- Mat: (Not applicable – amphibians only).
- Bell: (Not applicable – amphibians only).
- LHSG: Found in a few places on the Forest, being common only in Bradgate Park.
- VCH(R): Sparingly distributed
- VCH(L): Resident and commonly distributed
- RDB: Highlighted species. **Threats** – agricultural intensification bringing loss of favoured dry grassland and heathland; urban development. **Conservation** – UK BAP species, partially protected under Sch 5 of WCA81 (from killing, injury and sale only). Apart from Rutland Water, it is not known to occur in any Leicestershire nature reserve. Best conservation measures may be education, to inform garden-owners of their beneficial nature. Survey may turn up additional sites, especially in urban areas.
- Notes: The Slow-worm tends to be an urban species, frequently found in gardens, allotments and post-industrial habitats, though the tendency appears to be less strong in Leicestershire, where it is mainly found in urban fringe areas. There may have been a decline in Leicestershire since the VCH Assessment, though recent records may indicate the (re-)discovery of further occupied sites. Present in three Wildlife Trust reserves. See map at 5.2.10

5.2.2 **Common Lizard** (*Zootoca vivipara*)

- Status: Native. Uncommon; records concentrated in Charnwood Forest, East Rutland and the Moira area of North West Leicestershire; odd records elsewhere, and new sites keep turning up. The 25 records since 2000 have been widespread, though with a concentration in Charnwood, and include a count of 30 at Ketton Quarry.
- LHSG: Present throughout the Forest and possibly occurs in East Leicestershire.
- VCH(R): Seldom seen near Uppingham; commoner at Ketton and probably elsewhere in the County.
- VCH(L): Occurs commonly in the Forest and in other places in the county.
- RDB: Highlighted species. **Threats** – habitat loss due to urban developments, agricultural improvements and forestry. **Conservation** - UK BAP species, partially protected under Schedule 5 of the WCA81 (from killing, injury and sale only). Survey and publicity needed. On protected sites (eg Ulverscroft, Wymondham Rough), management retaining varied habitat is essential. Heathland restoration may increase populations.
- Notes: The presence of lizards outside Charnwood Forest has been confirmed dramatically in recent years, with sightings cropping up in East Rutland, Moira and elsewhere in Leicestershire. The now quite numerous Moira records indicate that this is one species which has certainly taken to the new habitats created in the National Forest. Present in 13 Wildlife Trust reserves, a surprisingly high number. See map, 5.2.10.

5.2.3 **Sand Lizard** (*Lacerta agilis*)

- Status: Native (but probably not in Leicestershire). Reported as formerly present by the Victoria County History for Leicestershire (Browne1907), referring back to Harley's

manuscript dated 1842, but no firm evidence given.

LHSG: Not mentioned.

VCH(R): States “not been recorded but probably occurs”!

VCH(L): Notes the species as “Rare” in Leicestershire, based upon Harley’s reports from 1842 and 1843 (location not clear), but Browne, writing the VCH reptiles entry, does not seem entirely convinced that it was a good record.

RDB: Not mentioned.

Notes: Native to southern heaths and sand dune systems (Dorset, Sussex, Surrey), together with a population on the NW coast. Despite a few attempted introductions around the Midlands, the sand lizard has never, apparently, been a species of Leicestershire nor Rutland, and it seems strange that the likelihood of turning up a native population in either of the two counties was taken so seriously by the VCH authors.

5.2.4 Grass Snake (*Natrix natrix*)

Status: Native. Widespread and fairly common, recorded particularly in river valleys (especially the Soar and Wreake), along canals (Ashby, Grand Union) and around Rutland Water. The grass snake is much the most common of the four reptiles in Leicestershire and Rutland, and there appears to be no evidence of a change in its status.

LHSG: Widespread throughout the county but rare on the Charnwood Forest.

VCH(R): Common, especially at Ridlington.

VCH(L): Resident and commonly distributed, especially throughout Charnwood Forest.

RDB: Highlighted species. **Threats** – any threats to wetlands: climate change brings pressures on water resources and water quality, and effects on populations of the snake’s favoured prey, amphibians and fish. **Conservation** – UK BAP species, partially protected under Sch5 of WCA81 (from killing, injury and sale only). Protected sites need appropriate habitat management, including provision of egg-laying sites and hibernacula.

Notes: Grass snakes are inhabitants of wetlands, strong swimmers which prey on amphibians and fish, frequently seen near water, even in garden ponds. Present in 20 Wildlife Trust reserves, with a September 2017 sighting at Kelham Bridge being the first for that site (though it has long been recognised as potential Grass Snake habitat). See map, 5.2.10. The significance of the recent recognition of a second species of Grass Snake, the Barred Grass Snake *Natrix helvetica*, probably present (or even ubiquitous) in Great Britain, has yet to be fully assessed. Further information on ecology and identification of the new species is required, though already there are suggestions that some populations of Grass Snake in L&R carry a distinctively barred pattern, and may be amongst the first to be given the new specific status: the Grass Snakes of Frisby-on-the-Hill are said to comprise one hotspot of heavily barred patterning, for example.

5.2.5 Adder (*Vipera berus*)

Status: Native. Rare; only two definite populations (Bradgate and Ketton); occasional reports from elsewhere are often misidentifications, though there are suggestions of a few small populations around Leicestershire, as at Oadby, Launde, Anstey and Shawell. Beacon Hill, a traditional Adder site, but one which had not seen any confirmed records since the late 1980s, produced a good record of a female Adder in 2016.

LHSG: The rarest Leicestershire reptile and is present only in two main localities on the Forest.

VCH(R): “Not common, in the southern part of the county”

- VCH(L): Resident and commonly distributed, especially about Charnwood Forest “but not so common, fortunately, as its harmless relative.”
- RDB: Highlighted species. **Threats** –forestry plantations on dry habitats such as heathland; public pressure; agricultural improvement; neglect of woodlands, leading to overgrowth of open areas; direct persecution is probably less of an issue than it used to be. **Conservation** – UK BAP species; partially protected under Sch 5 WCA81 (from killing, injury and sale only). Protected sites where adders occur (eg Ketton Quarry) need to be managed appropriately, preventing scrub encroachment; they also provide a means of informing the public about this species. Heathland restoration provides opportunities to increase populations.
- Notes: This is the rarest reptile in the two counties, and the question of just where the adders are in Leicestershire and Rutland is a rather fraught one. Our two well-established, apparently sustainable and much-studied populations are at Bradgate Park and Ketton Quarry. Elsewhere there have been many reported occurrences of Adders over the years, but few of them have been able to provide confirmation through physical or photographic evidence. Many of these reports must be Grass Snakes, when the Adders concerned are said to be “swimming in my garden pond”! There seems often to be a desire to have dangerous animals close at hand. However, there have been a few apparently good records in recent years which have been backed up by evidence: photographs of Adders at Oadby, 2013; a squashed specimen at Stoke Golding in 2015; and a dead Adder at Shawell in 2006. There have also been definite reports of Adder bites at South Wigston, Kibworth golf club, and Anstey in 2017 (in the last instance, the local vet reported he had identified the venom as coming from an Adder - is such an analysis possible?). Rather convincing descriptions of Adders have come from such places as Stathern and Launde Abbey, and Beacon Hill was certainly once an Adder site, though only one recent record has surfaced, in 2016. There are persistent rumours of Adders at Heather, whilst from Measham in 2018 comes a story of someone writing on Facebook to announce her discovery of a shed snake skin in the town, and urging all her “Friends” to “watch out for Adders”: There have never been any records of Adders in the Measham area, and the snake skin, shown in a photograph, looks much like a Grass Snake skin. The problem with many of these sightings is that there is no indisputable evidence, the sites concerned nearly always having no historic records of Adders and, after the initial report, they are rarely seen in the area again! Some photographic evidence would be useful – and should be possible if the sightings are good ones [L30]. There are Adder records for two Wildlife Trust reserves (still present at Ketton Quarry, possibly past records for Holwell). The Adder is a highlighted species in the National Forest BAP. All remaining Adder populations in our counties are small and isolated, and are thus vulnerable to all the problems of a limited gene pool. Interim results from NARRS emphasise a worryingly-low occurrence of Adders in the Midlands in particular, indicating a recent sharp decline in our part of the world. RDB species.

5.2.6 Kingsnake (*Lampropeltis sp.*)

- Status: Introduction. One record from a garden in Wing in 1995.
- LHSG: Not mentioned.
- VCH(R): Not mentioned.
- VCH(L): Not mentioned.
- RDB: Not mentioned.
- Notes: Several other species, kept by reptile collectors, may escape from time to time.

5.2.7 **Pythons** (*Python sp*)

- Status: Introduction. Several dead specimens retrieved from River Soar/Grand Union Canal near Aylestone Meadows in Leicester city, possibly as many as 12 between 2003 and 2017.
- LHSG: Not mentioned.
- VCH(R): Not mentioned.
- VCH(L): Not mentioned.
- RDB: Not mentioned.
- Notes: Astonishingly, in 2015, it was reported by Leicester City Cleansing Department that, during the course of the year, three large pythons, all dead, were retrieved from the waters in the Aylestone Meadows area of the city [L27]. One which was photographed was tentatively identified as a Burmese python (*Python molurus*), over two metres long. A second specimen was an albino, lacking markings and difficult to identify: it was thought to be another Burmese python or a reticulated python (*Python reticulatus*). It was further suggested by Cleansing Dept. staff that a total of 10 dead pythons had been found in a period of 12 years (and further single Dead specimens were reported in 2016 and 2017). There was no explanation for this – presumably a reptile collector wanted to get rid of some sickly specimens, or establish a local population by releasing live snakes which were subsequently unable to survive in the centre of Leicester. Whatever the reason, such action would be quite illegal, and the Police Wildlife Liaison Officer was informed, but there seems to be, as yet, no solution to the mystery. There are probably a large number of people in Leicester who keep pythons, as no licence is needed to do so.

5.2.8 **Red-eared Terrapin** (*Trachemys scripta elegans*)

- Status: Introduction. Occasional records, mainly of single animals (eg Cossington, Ashby Canal, Blackbrook Reservoir, Eyebrook Reservoir, Oakham Canal) and larger numbers of up to 5 (Groby Pool).
- LHSG: Not mentioned.
- VCH(R): Not mentioned.
- VCH(L): Not mentioned.
- RDB: Not mentioned.
- Notes: Inspired by Teenage Mutant Ninja Turtles, mainly in the 1980s, these terrapins were often purchased as pets when small, and abandoned in the countryside when they grew bigger than expected. It is suggested that, though they prey on native species, they cannot breed in Britain and will not cause long-term problems, dying out when the current specimens die. Present in possibly two Wildlife Trust reserves (Cossington, Syston Lakes).

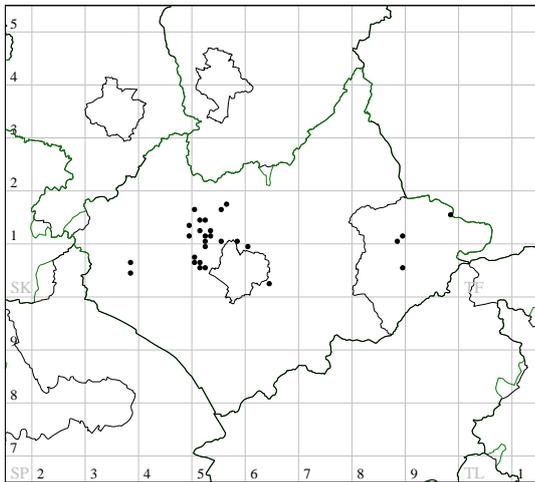
5.2.9 **Alligator** (*Alligator mississippiensis*)

- Status: Introduction. Press reports in 1964 suggested the presence of two canal-dwelling alligators in Leicester.
- LHSG: Not mentioned.
- VCH(R): Not mentioned.
- VCH(L): Not mentioned.
- RDB: Not mentioned.
- Notes: Press reports may have been an exaggeration.

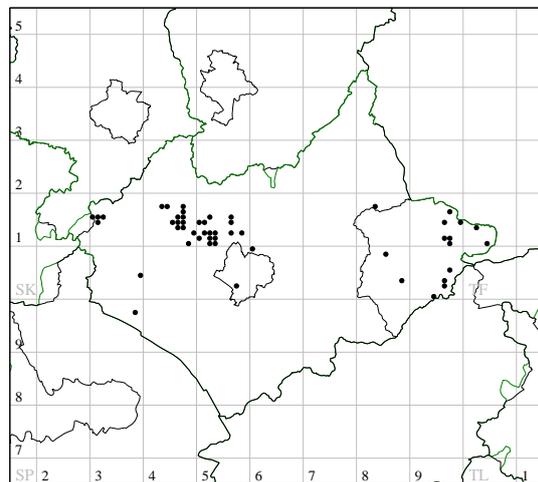
5.2.10 Distribution Maps for Native Reptile Species

Reptile distribution tends to be better defined than amphibians – because the species, by and large, are less numerous and people sighting them are more likely to be moved to submit the record to the relevant recording bodies. Also, reptiles are more constrained by habitat edges, whereas amphibians are perhaps more inclined to “leak”, spilling over from one habitat unit to an adjacent one.

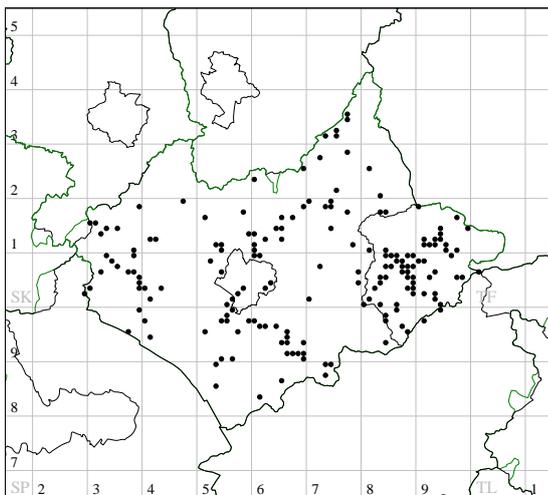
Slow-worm (*Anguis fragilis*)



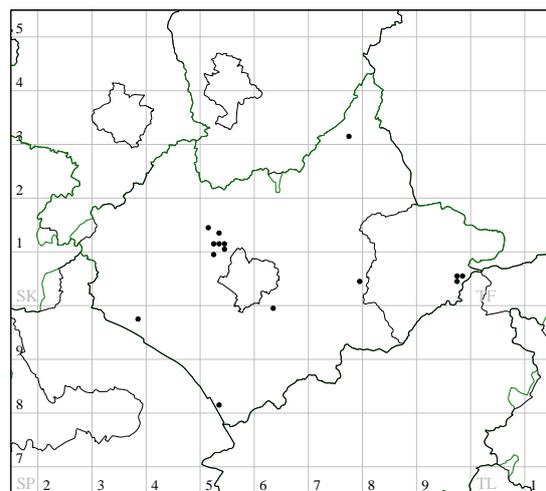
Viviparous Lizard (*Lacerta vivipara*)



Grass Snake (*Natrix natrix*)



Adder (*Vipera berus*)



As for the amphibians, studies of reptiles in South Derbyshire, adjacent and ecologically similar to North West Leicestershire, have shown very similar characteristics to the same species in Leicestershire (status, distribution, etc). (Chris Monk, pers comm).

6. The Future

6.1 Likely Future Pressures on our Herpetofauna

6.1.1 *Extinctions* – If we are indeed facing the sixth great extinction event globally, it will take a huge effort to avoid collateral losses at a local level – hence the need for positive, well-resourced conservation action across our two counties. This “perfect storm” of environmental pressures comes at a time when political structures are shaky (with, in the UK, confusion/instability over the EU referendum and implications for conservation legislation, such as the Habitats Directive, which provides protection for key sites) and thus less ready to respond to the problems. These problems include: habitat loss and fragmentation (probably the major concern on a continuing basis); nutrient loading on sensitive habitats; introductions of invasive species; development; various kinds of pollution; disease; persecution (of snakes, amphibians in gardens), and apparently, some loss of interest in wildlife by the general public (despite the acclaim given to Attenborough’s TV epics and the Springwatch family of programmes), and certainly amongst political thinking, where the environment has declined to “also-ran” status amongst political issues. Looming large over all of these are the likely critical impacts of climate change.

6.1.2 *Developments* – There is reason to be concerned, in Leicestershire, about the effects of new developments. Major developments have disrupted several large populations of GCN in recent years – Albion landfill at Albert Village, Bosworth Battlefield visitor centre, Coalville’s Stephenson College, Minorca opencast near Measham. Mitigation measures are generally applied, often with the intention of moving GCN populations wholesale to new sites, but these appear to be only marginally effective. Developments of various kinds are a particular threat in the west of Leicestershire: the location central to the country as a whole, together with good communications to all points of the compass, and, ironically, the increasingly attractive and sought-after environment of the developing National Forest, means there is great pressure to build housing; many wish to live in the attractive countryside and small towns of Leicestershire, whilst working in Leicester, Derby, Nottingham or Birmingham. The proposed route of HS2, the high-speed train between Birmingham and Leeds, runs through North West Leicestershire, skirting and inevitably impacting upon five SSSIs, some with herpetofauna populations (eg Lockington Marshes); five GCN breeding sites fall within 1 km of the line (Railway Pond near Ashby de la Zouch, right on the line of the route, has a good GCN population which has been monitored by Rob Oldham); amphibians are present along the route (including good Toad numbers at Stanny Pond and Frogs at Diseworth), and Grass Snakes may be present in the river valleys. This new railway line will not even help reduce the increasing road commuting, as it will have no stops/stations in Leicestershire!

6.1.3 *Climate Change* - Considering it is acknowledged as the greatest threat facing wildlife (with amphibians especially vulnerable), it is surprising how few times the issue of climate change has cropped up in the LARN newsletter – perhaps it is just too big an issue to address at the local scale, though this is where adaptation principles come into play (see 6.1.8). Early thinking on climate change rather simplistically suggested a wholesale movement of populations northwards, in an attempt to stay within their specific “climate space” [L13]. This might have generated rather little impact in Leicestershire and Rutland: being at the centre of the British range of commoner British amphibians and reptiles, VC55 would have seen the loss of northern populations moving further north (into Nottinghamshire), balanced by a migration of southern populations in from Warwickshire. However, it now appears likely that the effects of climate change will be more subtle and less predictable than originally thought, including a number of secondary impacts as well as the primary impacts of higher temperatures.

6.1.4 *Climate Impacts* - Predictions for the UK future climate include a rise in temperatures, decrease in precipitation, wetter winters and drier summers, and more severe storm events. For the

herpetofauna, this will undoubtedly impact on favoured habitats: water resource and quality problems will hit wetlands, affecting amphibians especially, whilst the dry habitats favoured by reptiles will be susceptible to fire damage and insensitive management. There is likely to be an increased incidence of disease in amphibians (a group which seem particularly susceptible to disease), exacerbated by high temperatures and other stresses. In Britain, this has been expressed in the form of outbreaks of disease such as Ranavirus (see the Coleorton example in section 4.2.5) and even more severe problems in other countries – strict biosecurity measures will be needed to prevent infections coming into the UK, perhaps taking a lead from the preventative actions carried out by Australia and New Zealand. Conversely, the reptiles, being a warmth-seeking group, may actually see some benefits from global warming.

6.1.5 Impacts on Amphibians - General effects on amphibians may be the disruption of established life cycles, with shorter hibernation periods, a longer active season, and earlier breeding. The drought threat to breeding ponds and related wetlands may have impacts on prey. The greater incidence of diseases and parasites has already been mentioned. Warmer conditions may benefit non-natives such as green frogs. Some broad comments can be made in relation to the locally-native species: regarding their need for the appropriate climatic conditions – the “climate space” required by each species – it seems likely that the Frog, a northern species as indicated by its distribution in Europe, will lose climate space; for the Toad and Smooth Newt, being in the middle of their range in L&R, there should be no climate space implications; whilst the Palmate Newt, in European terms a southern species despite its northerly/westerly distribution in Britain, may actually benefit from warmer temperatures.

6.1.6 Impacts on Reptiles – Reptiles are likely also to see a shorter hibernation period, bringing earlier breeding and a longer active season, thus putting stress upon the animals physiological functioning – though, being warmth-loving creatures, this may bring positive effects. Ambient temperatures can influence the development of reptile eggs, bringing a predominance of one or other gender. The fire threat to drier habitats brings not only direct danger but also impacts on prey. Warmer conditions may favour non-natives such as terrapins. In terms of climate space, the Common Lizard and Adder are northern species which lose climate space; Slow-worms and Grass Snakes, both southern species on a European scale, may benefit from warmer conditions, though the Grass Snake clearly faces the same drought threat to wetland sites as do the amphibians.

6.1.7 Adaptation Principles – A set of adaptation principles has been developed to cope with the impacts of climate change on vulnerable wildlife. Firstly, there is a need to conserve existing protected areas, so that they will always serve their function as a reservoir of wildlife, a source of species to recolonise damaged areas. In L&R this means looking after sites such as Beacon Hill, Bradgate Park and Charnwood Lodge. It is essential to reduce sources of harm not linked to climate change, such as pollution of various types, which can impact directly on the herpetofauna as well as impacting on prey populations. There is a need to develop ecologically resilient landscapes, and establish ecological networks, through which organisms can move to find optimal climatic conditions. For our herpetofauna, this means a landscape which does not block movement by having extensive areas of arable farmland, dense plantations, or other sub-optimal habitats such as rivers and dense urban settlements (these latter categories being less easily managed). Finally, conservation bodies need to use adaptive conservation targets and priorities, flexible enough to adapt to conditions changing at rates or in ways which had not been predicted. The Living Landscapes approach, as adopted by LRWT and applied in half-a-dozen areas around the two counties, picks up all of these points and applies them in an integrated way.

6.1.8 Living Landscapes – The way forward, the Living Landscapes approach (see Sands 2012), is well illustrated by the Black to Green project in the National Forest. The Heart of the National Forest, a 10 square mile area around Moira, North West Leicestershire, has undergone dramatic

landscape change over recent decades. “Black to Green” (funded by the Heritage Lottery Fund and run in partnership between The National Forest Company and Leicestershire and Rutland Wildlife Trust) aims to connect people with this rapid change and encourage local communities to work together to survey the wide range of wildlife now using this area, to better understand local populations and their response to the newly-created habitats of the National Forest [L27]. This project has a strong emphasis on amphibian and reptile populations. Existing records from before the National Forest, including instances of breeding Great Crested Newts and Common Lizards found around Moira in surprising numbers, have been added to by surveys in recent years, and this data will provide the basis for management advice. Common Lizard is a particular success, spreading within both existing and new habitat around Moira at the Heart of the Forest. Further information on the development of the National Forest, a flagship environmental restoration scheme which we are lucky to have in our area, is given in Parry (2006).

6.2 Recording Future Changes

6.2.1 Monitoring - Just at a moment when long-term monitoring of trends is vitally important, against the background of climate change and the need to monitor impacts over time and to track conservation successes and failures, resources for undertaking such studies are being reduced, with environmental organisations, both government and voluntary, suffering funding cuts. The Environment Agency and Natural England, both government agencies having suffered “austerity” cutbacks, are having to focus much more sharply on their survey priorities (related to water quality and protected species respectively); monitoring of commoner species goes by the board, even though such surveys often identify trends that would not be noticed in species with smaller populations. Voluntary conservation bodies are also losing out, usually indirectly, as the local authorities which used to support their work quite generously, now find themselves strapped for cash. The strict criteria which determine local or national government funding for conservation projects often makes it difficult to continue funding for those long-term projects which are so valuable in identifying trends, such as relate to herpetofauna species range and status. As noted above, such trends may involve declines in amphibian health with decline in water quality and quantity impacting on wetland habitats. Dry habitats may not suffer so badly, so such areas will still be available to reptiles. Neither group has great powers of dispersal – even a road can be a barrier for the creeping amphibian or reptile – so fragmentation of populations and of habitats is a major problem, and probably likely to be so into the future. However, the National Forest indicates a possibly more optimistic future (as detailed in 6.1.9 above) with Lizards providing a good model for colonisation of newly-created habitat.

6.2.2 Recording in the Future - For each taxonomic group, with few exceptions, in L&R there is a County Recorder (sometimes known as a County Coordinator, with little apparent difference in job description), who has the overview of survey work for his/her speciality, together with general knowledge of the species found in L&R, their distribution and status. Other activities will depend on the county expert: they may give conservation advice, produce newsletters, generate maps, and more, depending on their particular strengths and interests. For the serving Amphibian and Reptile County Recorder (probably strictly a County Coordinator, but not losing sleep over it), the current recording priorities are: GCN populations (it is important to know where populations exist in order to protect them with the full legal provisions available); noting sites for the rarer species (all the reptiles, especially the Adder, and also Palmate Newt); and filling in significant gaps in the species distribution maps. The current holder of the County Recorder post is likely to give it up in the near future, which raises the question of succession planning – in many instances, the outgoing recorder may need the assistance of LCC and/or the Wildlife Trust to effect a smooth transition. Other issues are the use of new techniques and technology in recording (such as the expanding use of eDNA analysis), the appearance of web-based repositories for distribution data, such as NatureSpot, and the bringing-on of new young recorders. The Wildlife Trust is developing a Recording Strategy

which should pick up all these items, and there should be a strong amphibian and reptile input to its production. One way forward might be local distribution atlases, which could include more material than simply maps, and which might be published either in paper form or electronically – or most likely both. Examples of this type of publication are available in the form of the herpetofauna atlases which have been produced for several counties close to L&R – those for Nottinghamshire, Lincolnshire, Warwickshire and Birmingham/Black Country – see the reference list for details of Wright et al (2004), Johnson (1982), Clemons (1996) and Hughes (2005) respectively. There is currently an intention to document all the lower vertebrates of Leicestershire and Rutland, bringing together the information available on the lampreys, fish and herpetofauna (see Heaton 2017, Heaton 2014, and this paper), in the form of a county atlas for these, often misunderstood, groups.

6.3 Conclusions - the Future for Leicestershire and Rutland's Amphibians and Reptiles

6.3.1 *Status* - The herpetofauna populations of Leicestershire and Rutland appear to be in a reasonable state considering the pressures upon them, though, undoubtedly, the pressures are great and increasing. Although there are few species, (two each of native snakes, lizards and frogs/toads, with three newts) all those species which might be expected in an English Midlands county are present. The majority of these species appear to have stable populations, though there are concerns about the decline of Great Crested Newts and perhaps Toads, and at the precarious state of Adders and Palmate Newts, each of the last two being found at very few sites in our counties.

6.3.2 *Pointers to the Future* -

- Future pressures on these populations will be many; amongst the most significant will be habitat loss/fragmentation, pollution/nutrient loading, and the impact of alien species (so that biosecurity will become a much better known and applied concept). Over and above all of this, climate change brings its own pressures, as well as magnifying the effects of these other factors. Climate change brings physical destruction (by fire and drought) as well as encouraging diseases, to which amphibians are especially prone. Measures to cut emissions driving climate change need to be taken quickly and effectively.
- Positive conservation action is needed, working at a landscape scale, protecting core areas and linking other habitats through habitat creation, in collaborative partnerships which are adequately resourced.
- Systems of recording species and habitats need to be robust and well applied, putting emphasis especially on applied aspects, monitoring the responses to these pressures and the success of conservation measures ; new technology will help, but efforts are also needed to bring on new generations of recorders and interpreters of biological data.
- The new generations of herpetofauna-lovers will have to speak up – ever more loudly – for the Frogs, Toads, Newts, Snakes and Lizards of Leicestershire and Rutland!

EPILOGUE – The conservation battles of the future may be different to those in the past. We may be fighting not so much outright antagonism, but, rather, indifference. The current political generation appears little moved by conservation matters. Their priority is to avoid spending money, making use instead of volunteers to do things cheaply. (The Wildlife Trust must be wary here – they are a voluntary body, but not a cost-free body). At the same time, the public seem to be moved by the tremendous images delivered to their laps by television (Blue Planet, Springwatch, etc), but are less inclined to engage with the muddy reality of the countryside – and so will not be offering themselves as the volunteers sought by Government. On top of this comes Brexit, possibly the biggest threat to nature conservation since the Second World War. Again, ignorance rather than dislike is the problem, with the danger of “throwing the baby out with the bathwater” when divesting ourselves of European legislation – including the provisions for protecting wildlife (species, habitats and sites), which were essentially produced in the first place through the interest of continental politicians rather than our own indifferent governments. The problem for LARN is that amphibians and reptiles already come well down the list of best-liked wildlife, some way behind birds, butterflies, and mammals. They will need a strong champion to fight their corner in the future.

7. References

- Arnold, HR (1995) "Atlas of Amphibians and Reptiles in Britain" JNCC/ITE, 40pp
- Arnold EN & Ovenden DW (2004) "Field Guide to the Reptiles and Amphibians of Britain and Europe", Collins, 288pp
- Baker J, Beebee T, Buckley J, Gent T and Orchard D (2011) "Amphibian Habitat Management Handbook" ARC, 69pp
- Beebee T (2013) "Amphibians and Reptiles" Naturalists' Handbook 31, Pelagic Publishing, 170pp
- Beebee T and Griffiths R (2000) "Amphibians and Reptiles" HarperCollins (New Naturalist), 270pp
- Bell GAC (1970) "The distribution of amphibians in Leicestershire" Trans. Leic. Lit. & Phil. Soc., 64, 122-142
- Brown A G and Hatton J (2002) "Pollen Analysis and Vegetation History of Narborough Bog, Leicestershire"
- Browne M (1907) "Reptiles and Batrachians" in "The Victoria History of the County of Leicester", Vol 1, pp 112-113
- Clemons J (1996) "A Provisional Atlas of the Amphibians and Reptiles of Warwickshire", Warwickshire Museums Service, Warwick.
- Edgar P, Foster J and Baker J (2010) "Reptile Habitat Management Handbook" ARC, 76pp
- Field Studies Council "Guide to the reptiles and amphibians of Britain and Ireland" (2003) AIDGAP
- Gent AR and Gibson SO (2012) "Herpetofauna Workers Manual" Pelagic Publishing, 152pp
- Heaton A M (1998) "Rare Wildlife in Leicestershire: a Red Data Book for Leicestershire, Leicester and Rutland", Kairos Press, 80pp
- Heaton A (2012) "Leicestershire and Rutland Red Data Book: Lower Vertebrates (Reptiles, Amphibians, Fish)" Leicestershire and Rutland Wildlife Trust website:
<http://www.lrwf.org.uk/news-events/news/149-leicestershire-and-rutland-rare-species-update/???>
- Heaton A (2014) "Birds and Herpetofauna." The Grebe No 562, January 2014, 5-6
- Heaton A (2013) "Amphibian and Reptile Conservation Manifesto for Leicestershire and Rutland"
- Heaton AM (2014) "Freshwater fish in Leicestershire and Rutland: An overview and checklist" Leicestershire and Rutland Recorder 10, 35-38
- Heaton AM (2017) "Lampreys – the neglected vertebrates" Leicestershire and Rutland Recorder 13, 20-22
- Hughes M (2005) "A Provisional Atlas of Reptiles and Amphibians in Birmingham and the Black Country", Wildlife Trust for Birmingham and the Black Country, 28pp
- Inns, H (2009) "Britain's Reptiles and Amphibians", Wildguides, 164pp

- Johnson M (1982) "Atlas of the Mammals, Reptiles and Amphibian of Lincolnshire and South Humberside" Lincolnshire Naturalists Union, 48pp
- Kwet A (2009) "New Holland European Reptiles and Amphibians Guide" New Holland, 252pp
- Latham D, Bowen J and Jeffcote M (1994) "The Leicester Garden Pond Survey", pp 5-15 in "Wildlife in Leicester: report on the one-day conference held at Vaughan College, Leicester, on Saturday 30th October 1993, organised by Environ"
- LCC CHI (2008) "Discoveries Great and Small: findings from the community wildlife surveys promoted by the Community Heritage Initiative 2004-2008" LCC Birstall, 16pp
- Mathias, J H (1975) "A survey of amphibians in Leicestershire gardens", *Trans Leic Lit & Phil Soc* . 69, 28-41
- Mathias, J (1977) "Leicestershire Amphibians", Leicestershire Museums Art Galleries and Records Service information sheet 16
- Mclean, N (2010) "Silent Summer: the State of Wildlife in Britain and Ireland", CUP
- Oldham RS (1994) "Habitat Assessment and Population Ecology", in Gent and Bray, 'Conservation and Management of Great Crested Newts', English Nature Report No.20, 45-67
- Oldham RS (1999) "Amphibians and Agriculture: Double Jeopardy". Pp105-124 In: "Aquatic Life Cycle Strategies. Survival in a variable environment". Ed. Whitfield M, Matthews J and Reynolds C, MBA, Plymouth
- Oldham RS and Swan MJS (1991) "Conservation of Amphibian Populations in Britain". In 'Species Conservation: A Population-Biological Approach', A Seitz & V Loeschcke (eds), Birkhauser Verlag, Basel
- Owen, J (2010) "Wildlife of a Garden: a 30-year study" Royal Horticultural Society, 276pp
- Page, W (1908) "Reptiles and Batrachians" in "The Victoria History of the County of Rutland", Vol 1, p54
- Parry, J (2006) "The National Forest: Heritage in the making", National Forest Company, 176pp
- Sands, T (2012) "Wildlife in Trust: A hundred years of nature conservation", RSWT, 780pp
- Speybroek J, Beukema W, Bok B, Van Der Voort J and Velikov I (2016) "Field Guide to the Amphibians and Reptiles of Britain and Europe", Bloomsbury, 432pp
- Squires A and Jeeves M (1994) "Leicestershire and Rutland Woodlands Past and Present" Kairos Press, 160pp
- Swan MJS and Oldham RS (1993a) "Herptile Sites, Volume 1: National Amphibian Survey Final Report" English Nature Research Report no. 38, 232 pp (Appendices in separate volume)
- Swan MJS and Oldham RS (1993b) "Herptile Sites, Volume 2: National Reptile Survey Final Report" English Nature Research Report no. 39, 36 pp + appendices
- Wright S, Osborne J, Pursglove C (2004) "Frogs and Friends: the Distribution of Amphibians and Reptiles in Nottinghamshire", Nottingham Nat Hist Mus, 72pp

8. Explanation of Abbreviations

Am & Rep	Amphibians and Reptiles
ARC	Amphibian and Reptile Conservation (formerly HCT)
ARG-UK	Amphibian and Reptile Groups UK
BAP	Biodiversity Action Plan (see also SAP and HAP)
Bell	See reference “Bell GAC 1970”
CHI	Community Heritage Initiative (LCC project)
GCN	Great Crested Newt
HAP	Habitat Action Plan
HCT	Herpetofauna Conservation Trust
Herps	Herpetofauna (ie amphibians and reptiles)
HS2	High Speed Train, second phase (Birmingham to Leeds, passing through NWL)
[L]	Edition number of the LARN Newsletter (see note below), as in [L26], reference to LARN Newsletter no. 26, published in 2015
LARN	Leicestershire (and Rutland) Amphibian and Reptile Network, the equivalent of ARG (Amphibian and Reptile Group) in other counties
LCC	Leicestershire County Council
Leics	Leicestershire (ie not including Rutland)
LHSG	Leicestershire Herpetological Study Group
L&R	Leicestershire and Rutland
LRERC	Leics and Rutland Environmental Records Centre
LRWT	Leicestershire and Rutland Wildlife Trust
LWS	Local Wildlife Site (next tier down from SSSIs)
Mat	See reference “Mathias J 1977”
NBN	National Biodiversity Network
NE	North-East (ie of Leics)
NWL	North West Leicestershire (sometimes “NW Leics”)
Pers comm	Personal communication, (ie info received directly from the quoted person, not picked up from a publication)
R&D	Research and Development (also includes survey for these purposes)
RDB	Red Data Book
RNHS	Rutland Natural History Society
SAC	Special Area of Conservation – a European designation, identifying a site of pan-European importance for habitats or for species other than birds (cf SPA)
SAP	Species Action Plan
Sch5 WCA81	Schedule 5 of the Wildlife and Countryside Act 1981 (listings of protected animal species)
SE	South-East (ie of Leics)
SINCS	Sites of Importance for Nature Conservation (name given to LWS in most counties other than L&R)
SPA	Special Protection Area - a European designation, identifying a site of pan-European importance for birds (cf SAC)
SSSI	Site of Special Scientific Interest
UK	United Kingdom (pre-Brexit!)
UKBAP	Biodiversity Action Plan for the UK, first published in 1998
VC55	Vice County No. 55 (Leicestershire with Rutland)
VCH	Victoria County History

VCH (L)	Victoria County History for Leicestershire
VCH (R)	Victoria County History for Rutland
WATCH	Not an acronym/abbreviation, but the title of the Wildlife Trusts' junior branch
WCA81	Wildlife and Countryside Act 1981
WT	Wildlife Trust
*	Reported but not satisfactorily confirmed (regarding alien species in L&R)

Note: References in the text to [L14], etc, refer to the edition number of the LARN Newsletter where further information can be found. The Naturespot website (<http://www.naturespot.org.uk/>) carries copies of all newsletter editions (from No.1 in 1999 to the latest, No. 30, which came out in 2017), together with a complete index to all issues, and much other information on amphibians and reptiles in Leicestershire and Rutland.

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