

The Red Kite (*Milvus milvus*) in Warwickshire – a short report

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Summary

The Red Kite was re-introduced to England in the late 1980's and early 1990's. It has spread across the country from release sites but has yet to establish a breeding population in Warwickshire. The habitat is suitable for the species but data from the BTO Breeding Bird Survey indicates a pattern of dispersal that has left Warwickshire as one of the few counties yet to be fully colonised. With sightings clustered in the south-east and north of the county it is indicative of individuals moving up the M40 from the Chilterns population and south and west from those in Leicestershire. It is predicted from West Midland Bird Club data that both the frequency and abundance of the species is increasing year on year. It is estimated that a successful breeding pair will be recorded in the next two to three years with a stable population similar in density to that in the Chilterns be reached by 2022.

Introduction

The Red Kite (*Milvus milvus*) was once an endemic species extant throughout the United Kingdom. The bird was a common sight in both the town and country. Its highly generalist nature allowed its adaptation to many habitats. Primarily a scavenging bird it has a strong association with the waste tips and spoil mounds of mankind (Brown and Grice, 2005). During the Middle Ages when it was common for left-over's and waste to be left in the street the kite was often found in inner city areas (Brown and Grice, 2005).

As town sanitation improved during the 17th and 18th Centuries these urban areas became less suitable and the prime habitat became wooded hills especially near sheep pasture. In the 19th century the advent of accurate firearms and the Victorians predilection for collecting and shooting began to sound the death knell for many species of raptor, the kite included. Some raptors were shot as pests or for sport, others had their eggs taken remorselessly whilst the kite had an additional commercial value, Its tail feathers being favoured for fishing flies (Evans *et al*, 1997).

By 1870 the density of Red Kites was so low that breeding ceased in England making them functionally extinct and fully exterminated in 1871. Scotland followed in 1879 (Evans *et al*, 1999). The species survived with a tentative hold in west Wales in the countries of Cardiganshire and Cymarthenshire where wooded hill sides and upland sheep rearing and little persecution helped proved a stronghold for the species (Brown and Grice, 2005). In Warwickshire itself the last pair bred in 1825 in Allesley (Norris, 1947).

Reintroduction Programmes

Although a population of Red Kites had survived in Wales their density and numbers were too low to hope for a natural re-colonisation of England. DNA evidence of Welsh birds reveal a genetic bottleneck in the 1930's. A single female was present at this time and bred with a German migrant. By 1992 85% of the individuals in Wales were from this pair (Davis, 1993). The Welsh population was hamstrung by low immigration rates and low breeding success possibly due to the quantity of rainfall in the region which is known to affect raptor productivity or possibly as a result of the bottlenecks low genetic diversity (Davis, 1993 and Evans *et al*, 1997).

In 1986 the NCC (now Natural England) and the RSPB set up the UK Red Kite Project Team to investigate the viability of using reintroduced birds to establish an English population of Red Kites (Brown and Grice, 2005). After 3 years of research and planning the programme began with a release of birds in the Chilterns and North Scotland. Between 1989 and 1994 93 birds from Spanish, Welsh and Swedish populations were released with a 76% survival rate in their first year in the wild (Brown and Grice, 2005). A pair did attempt to breed in 1991 only two years into the programme but failed. Success came the following year in 1992 with 4 pairs raising 9 young (Brown and Grice, 2005).

Figure 1 – Table showing English Re-introduction Programmes 1989-2003 (Brown and Grice, 2005 and Evans *et al*, 1997).

Region	Location	Years of Programme	Birds Released	Origin of released birds
South England	Chilterns AONB (Oxfordshire/Buckinghamshire/Bedfordshire/ Hertfordshire)	1989 – 1994	93	88% Spanish 8% Welsh 4% Norwegian
East Midlands	Rockingham (Leicestershire/Lincolnshire)	1995 – 1998	70	50% Chilterns 47% Spanish 3% Welsh
Yorkshire	Harewood Estate (Leeds)	1999 – 2003	69	100% Chilterns

Following on from this success a second programme was established in 1995 with birds being released in Rockingham Forest in the East Midlands. These releases used birds from the Chilterns and Spain. Again breeding was fast with success coming in 1997. A third programme was set up in 1999 on the Harewood Estate in Yorkshire using birds from the Chilterns population. They successfully first bred in 2000 (Brown and Grice, 2005).

Species Metrics

The Red Kite is a generalist and adaptive network forager and scavenger (Carter and Grice, 2000 and Wootton *et al*, 2002). Its feeds mostly on carrion and has less dependence on the rabbit population compared to the Common Buzzard (*Buteo buteo*) (Snow and Perrins, 1998). Its survival in the Wales suggests a habitat preference for hills and mountains however the species is more closely associated with an agricultural mosaic of farmland and woodland. Woodland, particularly Oak and Beech, is favoured for breeding whilst both arable and pasture is required for foraging (Wootton *et al*, 2002).

Nests are typically built in tall trees an average of 70 m from a woodland edge (Wootton *et al*, 2002). In south England nest sites were recorded to be up to 0.5 km apart (Evans *et al*, 1997) whilst the continental populations in central Europe nest on average up to 3-5 km apart whilst in Wales nests can be as little as 200 m apart and in parts of the Chilterns just 100m (Carter and Grice, 2000 and Snow and Perrins, 1998)

A single brood is usually laid of between 1 to 3 eggs (Snow and Perrins, 1998). Productivity is extremely variable with Wales having the lowest in Europe (See Figure 2). Survival to their first year in the Chilterns is as high as 80% (Brown and Grice, 2005) with 50% reaching the breeding age of 2 (Wernham *et al*, 2002).

The species can be highly conservative to well established core sites (Snow and Perrins, 1998) but can move up to 270 km (Brown and Grice, 2005) during dispersal. 35% of birds disperse in their 1st autumn and exhibit natal philopatry with juveniles typically ending up within 9.44 km of the natal site (Brown and Grice, 2005 and Wernham *et al*, 2002). There is evidence of an interchange of individuals between England and continental populations (Wootton *et al*, 2002).

From these data a list of core species metrics can be derived for an imaginary individual helping to provide some framework to assess the viability and spread of a population and its likelihood of success in Warwickshire. These metrics include home and foraging ranges, breeding density and productivity, dispersal characteristics and survival rate.

Figure 2 - Red Kite Species Metrics

Metric	Details	Reference
Home Range	2-3 km	Carter and Grice, 2000
Foraging Range	2-15 km	Carter and Grice, 2000
Breeding Density	0.25 pairs per km ² (Chilterns)	Brown and Grice, 2005
Productivity	2.0 young per pair	Carter and Grice, 2000
Dispersal	35% Disperse in Autumn Movements of up to 270 km Males Disperse 11.7 km to 1 st Breeding site Females Disperse 13.7 km to 1 st Breeding site Non-Breeders move average of 30.5 km	Brown and Grice, 2005 Carter and Grice, 2000 Wernham <i>et al</i> , 2002 Wernham <i>et al</i> , 2002 Wernham <i>et al</i> , 2002
Survival Rate	80% in first year (Chilterns) 50% to breeding age (2 years) 90% in years after reaching breeding age	Brown and Grice, 2005 Wootton <i>et al</i> , 2002 Wootton <i>et al</i> , 2002

The spread of the Red Kite

Since the start of the reintroduction programme the Red Kite has been spreading across England. It is possible to look at these movements and attempt an extrapolation of them to estimate the Kites continued spread and the possibility of their return to Warwickshire as a breeding species.

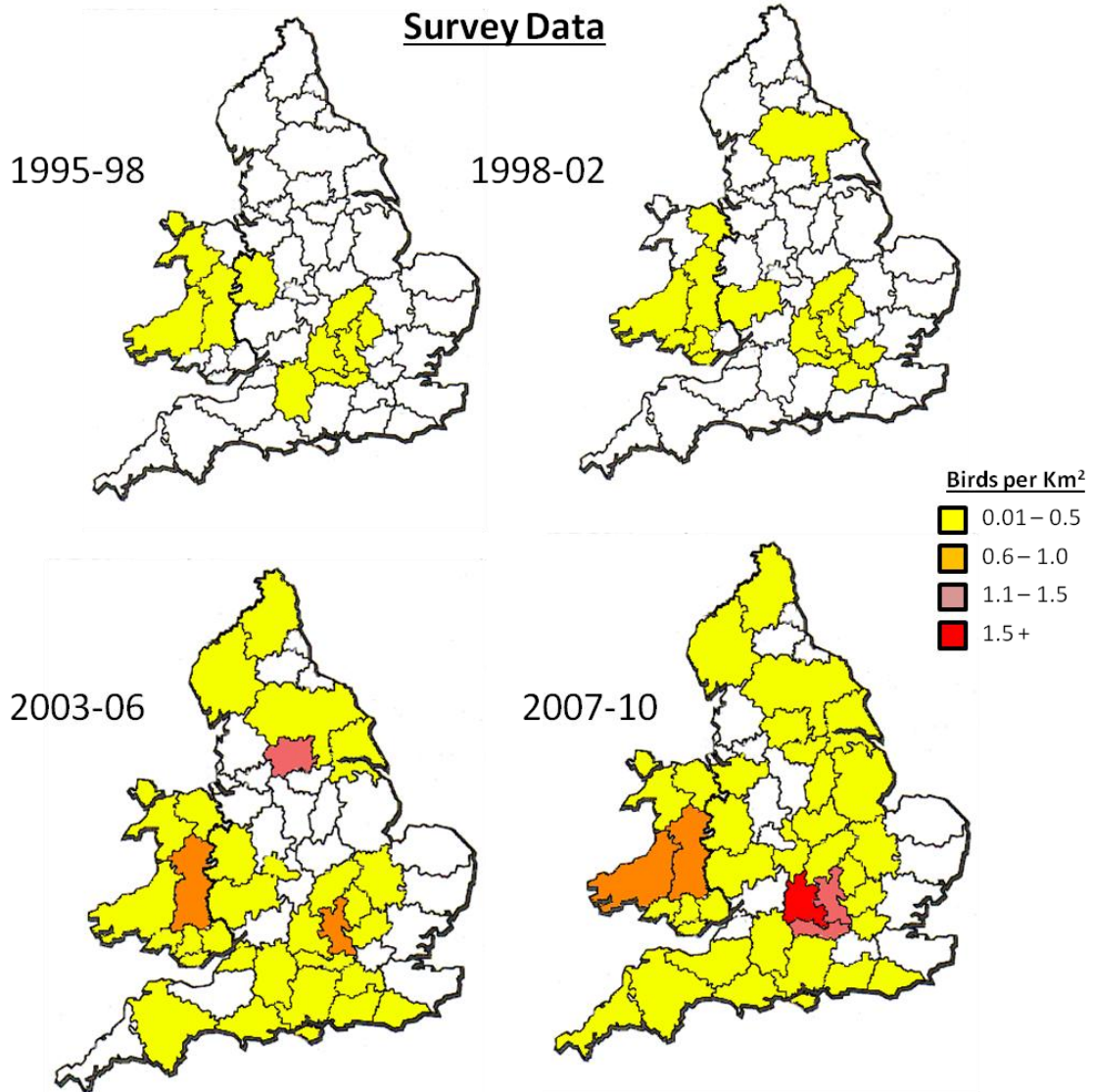
Data on the Red Kite is somewhat sparse on a national level. There have been regional surveys and each reintroduction programme has had a monitoring programme to assess its success. The most readily available data source as far as all bird species go is the Breeding Bird Survey run by the British Trust for Ornithology (BTO, 2012). This flagship scheme took over from the Common Birds Census in 1994 and uses volunteers to survey birds in the breeding season in 1 km squares. Data from 1994 to the present day is available on their website and can be used to calculate the density of Red Kites in England and Wales each year. The data at the national and regional level is incredibly robust however becomes less so at the county level where the number of squares covered can fluctuate considerably between counties. Nevertheless bearing this in mind a general pattern of the Red Kites dispersal between 1994 and 2010 can be explored.

Figure 3 illustrates how the species has spread from the introduction sites and Wales into the rest of the country as re-colonisation takes place. The first map illustrates the established Welsh population and the initial re-introduction programme in the Chilterns that had been started in 1989. The subsequent maps show the Yorkshire release programme and the spread from these sites. The data indicates that movement from Wales has been limited as suggested by Evans *et al* (1997). It also shows that between 1995 and 2006 the Chilterns populations spread south rather than north like the Yorkshire population this pattern of movement is backed up by the BTO Migration Atlas (Wernham *et al*, 2002). Between 1995 and 1998 there exist two distinct meta-populations increasing

to three in 1999. These populations remain distinct until by 2007-2010 when the meta-populations have merged to create a single population with greater potential genetic diversity.

Figure 3 - Mapping Red Kite Density from Breeding Bird Survey data (1995- 2010)

Red Kite Density between 1996 and 2010 (using Breeding Bird



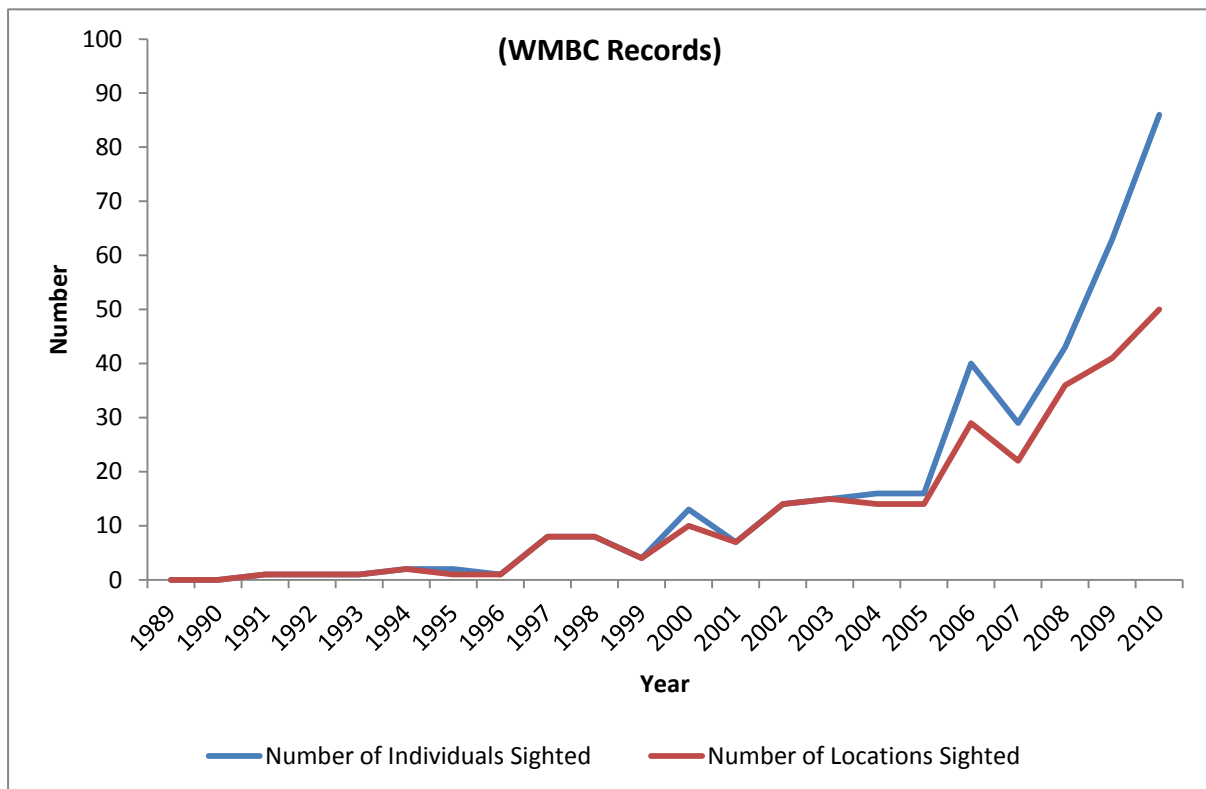
In the Midlands the Red Kite has been slow to take hold. Populations released in the East Midlands seem to have been either largely sedentary or dispersed northwards. The Chilterns released birds moved south and west and the Welsh populations made only a small move into the border counties and perhaps contributing to the colonisation of Cornwall and Devon. This left the central midlands isolated in terms of mass movements of individuals this is possibly as a result of the unsuitable urban territories in and around Birmingham and the potteries. Red Kites were once associated with towns and cities but today's metropolises are much less suitable than those of medieval times.

There remain two significant pockets where the Red Kite has failed to register in the Breeding Bird Survey, East Anglia and the North-East. This is perhaps due to the flat nature of the East and again the urban populations in Liverpool and Manchester. By 2010 Kites were however being seen in Greater London and so it is likely that given time and increased densities in the surrounding regions that these areas will also be re-colonised once more making the species a truly national one.

The Red Kite in Warwickshire

Having bred in 1825 the Red Kite has been absent from the county for several generations. It begins to appear in the county record again in 1991 with a single sighting from Avon Dassett. In the following 19 years sightings had risen to 86 observations at over 50 different sites across the county. Figure 4 illustrates this almost exponential rise.

Figure 4 - The increase in the number and locations of the Red Kite in Warwickshire since 1989



Before estimating the possible patterns and numbers of the Kites return it is first necessary to assess the counties suitability for the species and whether its characteristics match any of the locations of established populations thereby providing a baseline example.

Habitat suitability

Warwickshire is predominantly an agricultural landscape with farmland constituting 76% of the county (Harrison and Harrison, 2005). Essentially flat, the south eastern edge of the county and a small portion of the north rise to between 122 and 244 metres above sea level. Five main English Nature Natural Area Characteristics fall with Warwickshire's boundary. The bulk of the county is the Arden region of the Midland Plateau. This is a densely populated and urbanised area set on a series of sandstone and limestone outcrops. It is characterised by a mosaic of farms small woods and commons.

The next most important region is Dunsmore and Feldon. This comprises the bulk of the central and south eastern part of the county and includes a raised plateau upon which woodlands are scattered across large rectangular fields and mature hedgerows. The south eastern upland is part of the Cotswold Fringe and contains low fertility calcareous soils with mostly rough pasture for sheep farming and small woods. On the north eastern border the Mease and Anker Lowlands are thinly populated and dominated by arable farming with few trees. Lastly there are the Avon and Tame

Valleys both of which are dominated by rivers and productive farmland (Natural England, 2012 and Harrison and Harrison, 2005).

Figure 5 Map illustrating the biogeographical regions of Warwickshire (Smith, 2006 after: Harrison and Harrison 2005)

(note: the Tame valley is present in SP29 across the Midland Plateau and the Mease and Anker Lowlands)

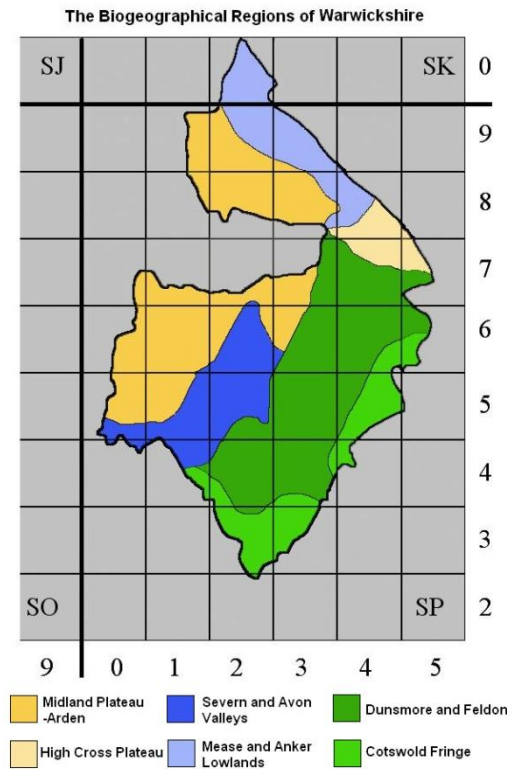


Figure 6 – Comparing Habitat Types and Requirement (Harrison and Harrison, 2005, Natural England, 2012)

Habitat Type	Red Kite Preferred Habitat Mix	Warwickshire Habitat Mix	Chilterns Habitat Mix
Arable (Foraging Habitat)	62	66.1	54
Grassland (Foraging Habitat)	26	37.4	37
Woodland (Nesting Habitat)	11	4.8	14

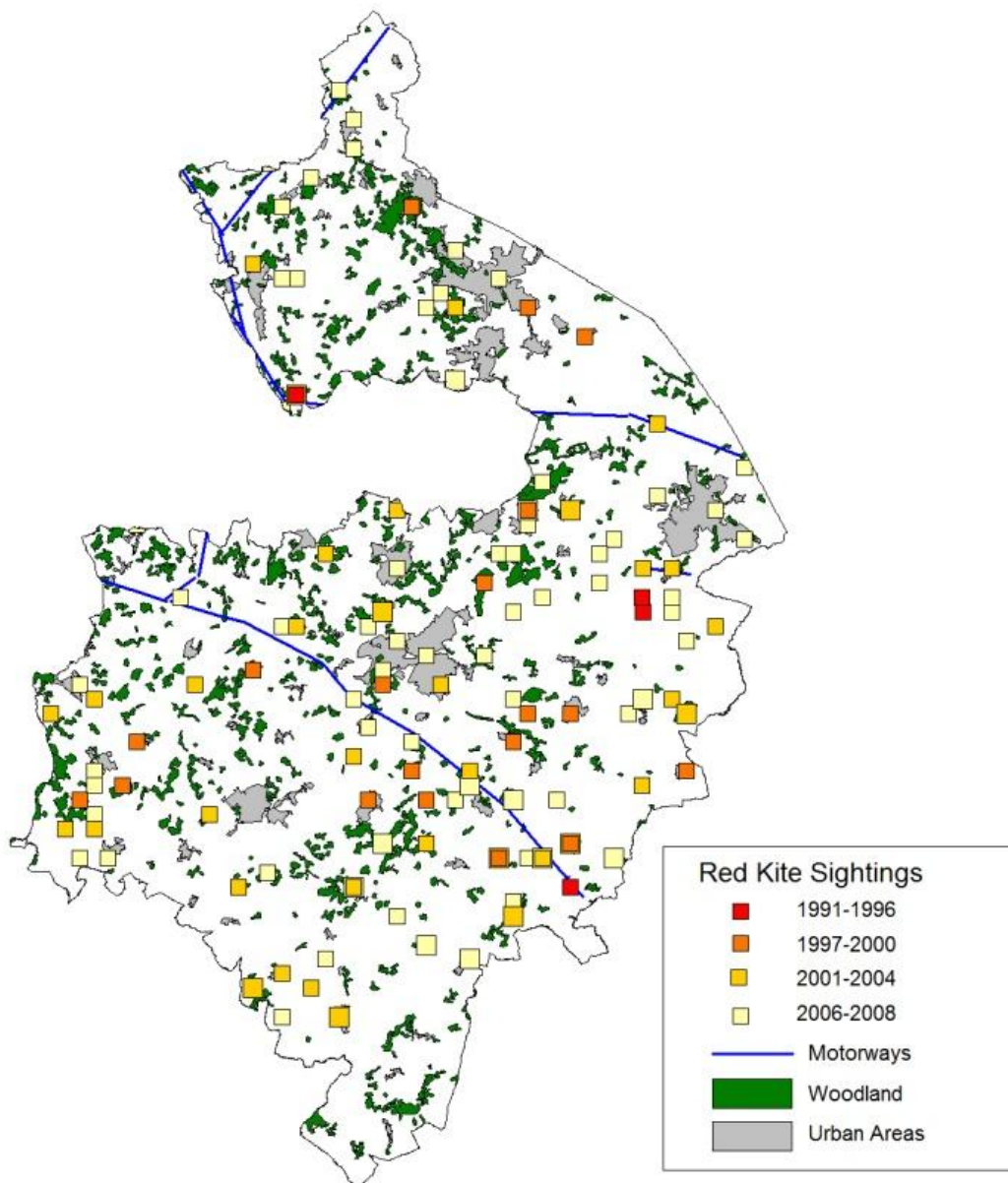
Figure 6 shows that the habitat preferred by the Red Kite is very close to both the Chilterns and Warwickshire. Obviously the Red Kite being a successful generalist means that its success is almost guaranteed in most of England. Its productivity and carrying capacity however is going to be more dependent on the availability of suitable nest sites that in turn is dependent on the size and distribution of woodland. Despite cores areas of woodland in Dunsmore and Feldon 4.8% woodland cover is significantly lower than both that recorded in the Chilterns and in the general species requirement, this is therefore likely to present the greatest limiting factor to the re-establishment for the Red Kite to Warwickshire.

The distribution of sightings – patterns of re-colonisation

Figure 7 shows the distribution of Red Kite observations over this period. Nearest Neighbour analysis of the distribution of sites where Red Kites have been recorded in the breeding season show that the sightings are clustered ($R_n = 0.77$, $p < 0.05$). This clustering seems to indicate that Red Kite sightings are mostly in the south east of the county and show a close affinity to the M40 motorway corridor. It is now nearly impossible to travel through Oxfordshire on this motorway and not see Red Kites in substantial numbers. It is believed the motorway that supplies both a linear corridor to many species but also a ready source of road kill is an important factor in re-colonising the county.

There is also a cluster of sightings in the far north near the M1 and another south west of Rugby in the Princethorpe Great Woods Project area. Colonisation from the west via Welsh birds spreading into the Marches seems non-existent.

Figure 7 - The distribution of the Red Kite in Warwickshire 1991-2008 (WMBC Records)



The future of the Red Kite in Warwickshire

The exponential rise in numbers and sightings exhibited in the WMBC Annual Reports mean that it is inevitable that the Red Kite will colonise this county. The question therefore is when and in what numbers

Estimating populations

Using the species metrics and the data collected by the re-introduction programmes it is possible to attempt to predict the future of the Red Kite in Warwickshire. Analysis of the correlation of the number of territorial pairs in 2005 with their Breeding Bird Survey density indicates a positive correlation ($r_s = 0.77$, $p < 0.05$) that there are currently 10-12 territorial pairs in the county. This is not entirely borne out by the evidence (Figure 8).

Figure 8 - Comparison of territorial pairs and BBS data. A mechanism for estimating territorial pairs.

County (Year)	Number of Territorial Pairs	Density of Birds in BBS survey (Birds per km ²)
Dyfed (2005)	237	0.45
Gwynedd (2005)	10	0.07
Powys (2005)	85	0.27
Glamorgan (2005)	12	0.05
Berkshire (2006)	51	0.33
Yorkshire (2005)	40	0.30

In 2010 that a single pair held a territory with both displaying and nesting observed. Sadly no evidence of successful breeding was recorded and after the 26th June no further sightings were made at the site (WMBC). It is possible that the 10-12 pair estimate is an over estimation due to the fact that the data is based predominantly on Welsh individuals where the habitat is significantly different to Warwickshire, it is also true to say that West Midland Bird Club records whilst the soundest data set in the area may not have the full coverage a planned regimented survey would and could easily underestimate the frequency and abundance of the species in the county.

With a single pair recorded exhibiting nesting behaviour in 2010 (WMBC) it is indicative from re-introductions in the East Midlands and the Chilterns that very often successful breeding occurs in the following year. This therefore suggests that in 2011 the county saw its first young reared in the country. First breeding in the county is perhaps one of the most important factors. Red Kite demonstrates, like many raptors, natal philopatry and the species although capable of great movements actually extends its own breeding range in a more creeping fashion (mean= 9.44km) (Wernham *et al*, 2002). The species unlike other native raptors is highly social, preferring winter communal roosts and congregations on non-breeding individuals (Carter and Grice, 2002 and Wootton *et al*, 2002). In this regard it is more akin to the Raven outside of the breeding season. Such groupings confer a group foraging advantage but also means that dispersal as breeding population is slower. A core population needs to be established before a site becomes successful. In this way it is unlikely that a lone pair would travel deep into the county and establish a new breeding site, it is more likely that there will be a slow spread from the south-east.

Each of the landscape characteristics used to describe the county can be compared to the preferred habitat matrix of the Red Kite and of the Chilterns Natural Area Character (Natural England, 2012) which can act as an example of optimum habitat for the Red Kite in England (See Figure 9) If one assumes that the Chilterns is three time as suitable as Warwickshire for breeding because of the difference in woodland cover then one can set an estimate of 0.08 breeding pairs per km² in

optimum areas and 0.04 in sub-optimal regions. These are highly conservative values as until the Red Kite begins to establish itself in the county it is difficult to accurately predict its success in the area.

Figure 9 – Table evaluating the potential carrying capacity in Warwickshire.

Landscape Character Area	Area of County (km ²)	Value as Habitat *	Estimated Carrying Capacity in Breeding Pairs
Cotswold Fringe	272	Optimum	22
Dunsmore and Feldon	705	Optimum	56
Avon and Tame Valleys	287	Sub-optimal	11
Arden- Midlands Plateau	1354	Sub-optimal	54
Mease and Anker Lowlands	260	Sub-optimal	10
Total	2878	-	153

**Value is determined to be based on the availability of nesting habitat and foraging territory as positive factors and the amount of urbanisation as a negative factor.*

These estimations suggest that the county could support a minimum of 153 breeding pairs. Not all birds in the county will be successful breeders but will still hold territories. In the Chilterns in the 1990's the ratio between breeding and territorial pairs was 0.87 (Carter and Grice, 2002). This would give a population estimate of 176 pairs. Using data of the rise of breeding pairs over time outlined in Carter and Grice (2002) it is possible to project that it would take approximately 10 years to reach this point giving Warwickshire a predicted Red Kite population of 176 territorial pairs by 2022/23.

Conclusions

Much of this report is based on estimations and extrapolations of previous work conducted on different populations. The species itself is extremely variable in its nature and the coverage of sightings in Warwickshire is less than complete. Having mentioned these caveats one is left with a series of data sets that are the only ones available. It is important to note therefore that the predictions regarding the population increases are best guesses. Nevertheless a number of salient points can be drawn from this analysis.

The Red Kite will re-colonise Warwickshire. The habitat is compatible for the species and much of the county is suitable for nesting. It is possible at time of writing a pair has already successfully bred in the county or will do so in the next year or so breaking the initial barrier of the species natal philopatry.

It is clear that the re-colonisation of the county will occur from the Chilterns and East Midlands populations establishing breeding territories initially in the south-east of the county along the Cotswold fringe before moving into the Arden region.

It is likely that this new population will be stable. It is unlikely to suffer competition from other Raptors or the Raven its only restriction being intra-specific competition, something that will only encourage the species spread across the county. Threats in the county are no worse than any other although local landowners and game keepers may need to adjust to the arrival of the species and education should ensure that they do not see the species as a threat.

It is hoped that the prediction of 153 breeding pairs in the county by 2022 is reached and that the county is once more home to this species.

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