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LAND USE CHANGE IN POST-WAR WORCESTERSHIRE

By

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‘The hand of man [sic] has fallen heavily on Worcestershire for the last 150 years and in the last thirty or so it has been heavy indeed … [the] landscape has been rudely shattered in recent times by intensive agriculture, changed farming needs and practices, vast increases in population and accompanying urban development, motorways and pollution’ (Green and Westwood, 1991, p.13). Of all Midlands counties, Worcestershire in particular has been subject to rapid land use change in the post-war period. The county occupies a highly accessible location within the urban hierarchy, with physical characteristics that have facilitated the ready adoption of new national and international policy-driven ideas about land use. This chapter explores some of the recent changes in land use that have occurred in Worcestershire and outlines their implications for the geographical distribution of flora. The focus is intentionally confined largely to the post-war period because Worcestershire has witnessed its most far-reaching set of land use changes during this time. Although brief reference to important historical processes is necessary to grasp fully the consequences of post-war change, events before this time are relatively well documented. For detailed historical accounts, the reader is referred to those provided by Pitt (1813), Willis-Bund and Doubleday (1901), Humphreys (1938), Gaut (1939), Frazer (1939) and Leatherbarrow (1974). Little has been written on land use in Worcestershire since this time; a further objective of the chapter is therefore to correct this deficiency.

Agriculture remains the most widespread activity over the land area of Worcestershire and, as modern practices have accelerated their potency as agents of change, it justifiably occupies the largest section within the subsequent discussion. Forestry, protected areas, urban expansion and the development of infrastructure form the other main themes covered.

1. Agricultural Change In Worcestershire

This section begins with an outline of the application of policy to Worcestershire’s farm sector in the post-war period. It then highlights the spatial changes to specific agricultural enterprises which collectively have reshaped farming patterns across the county.

i) Agricultural Policy in Worcestershire

Agriculture in Worcestershire has been transformed in the post-war period as a consequence of two major applications of policy to achieve essentially the same goal. First, the 1947 Agriculture Act encouraged national self-sufficiency in food production. It was an expansionist policy, giving both economic protection and cheap techonolgy to the farming industry. It set agriculture on a path to achieve the single goal of increasing food production, known as productivism. Second, following the UK’s accession to the then European Economic Community in 1972, the Common Agricultural Policy (CAP) came into full effect in Worcestershire from 1977. This reinforced the productivist policy enshrined within the 1947 Act because a major goal of the CAP was to increase food self-sufficiency on a European scale. The CAP made cereal crops a particularly attractive

proposition by virtue of the high profits that could be made from selling into intervention (the state's guaranteed price on mainstream agricultural commodities).

The drive for productivism was undoubtedly a success as the European Union (EU) moved from being the world's largest importer of food to its second biggest exporter (Le Heron, 1993). In fact, by the 1980s, the CAP had become so successful in raising production that food surpluses became a source of financial and thus political embarrassment. Further, acute negative environmental consequences became evident within the British countryside, the loss of species-rich unimproved grassland in Worcestershire being one such example. The state-sponsored promotion of a productivist culture amongst farmers, shown clearly through an extensive network of grants, subsidies and technologically-based research (Dexter, 1977), meant that there was no easy way for politicians to gain control over agricultural activities once negative effects eventually began to emerge.

ii) Post-war Agrarian Developments in Worcestershire

The benchmark against which to appreciate the magnitude of developments in the arable, horticultural and livestock farming sectors is taken as 1939. At this time, agriculture in Worcestershire was a significant activity and the term 'compact diversity' usefully describes its structure (Woodruffe, 1972). The importance of physical characteristics on agricultural production is usually overstated relative to human factors (political, economic, socio-cultural). Nevertheless, Agricultural Land Classification data compiled by the former Ministry of Agriculture Fisheries and Food (MAFF) in the 1960s demonstrates the natural advantages enjoyed by Worcestershire. A figure of 78.8% of land was deemed to be 'good quality' compared with 47.9% in England and Wales as a whole. Each farming sector identified above is now considered, together with a brief section on 'rough grazing' and common land.

a. The arable sector

Pre-war Worcestershire was overwhelmingly a county of grassland, with 71% of its agricultural area under permanent pasture. The 'Dig for Victory' campaign of World War Two led to a dramatic turnaround from grass to cropping which, despite some return to pastoral agriculture in the early 1950s, has never been reversed. By 1946, the area devoted to arable crops (land excluding woodland and permanent pasture) had risen sharply to 62% of the agricultural area. This stabilised in the mid-1950s at around 55% and remained so into the 1970s. The CAP has further influenced arable production in Worcestershire so that by 1999 40.3% of the agricultural area was devoted to cropping, exceeding the 37.8% of land down to permanent pasture. Although permanent pasture showed a recovery in area by 8078 hectares between 2000 and 2008, this was not at the expense of the cropped area which itself had expanded by 7347 hectares. What is indicated is a reduction in the diversity of Worcestershire agriculture. It should be noted that this shift is not peculiar to the county, but a UK trend encouraged by national and European policy. In fact, compared with England, Worcestershire has an almost identical percentage area under arable production. It is something of a curiosity, then, despite deep-seated post-war land use change, that modern Worcestershire now has a basic

'wheat and sheep' agricultural landscape – one that characterised the county in the mid-19th century.

Table 1 illustrates in more detail changes to Worcestershire arable agriculture, specifically in relation to cereal enterprises and potatoes. In this Table, arable crops are, in accordance with the June Survey of Agriculture and Horticulture (formerly the Agricultural Census), taken to comprise cereals, stockfeed and 'other' (non-combinable) arable crops, but excluding set-aside to effect comparison.

Table 1: Changes in key arable crops in Worcestershire 1939-2008.

	% of arable crops					
	Total Cereals*	**Wheat**	**Barley**	**Oats**	**Other Cereal**	**Potatoes**
1939	57.3	32.8	2.2	21.6	0.7	8.7
1943	69.7	45.6	4.1	16.4	3.6	9.5
1951	66.5	30.5	9.6	16.6	9.8	7.7
1961	67.6	28.2	26.5	11.7	1.2	5.4
1970	77.8	28.8	40.7	7.5	0.8	4.1
1988+	76.7	42.5	30.7	3.4	0.1	3.2
2000	67.7	49.6	14.5	3.2	0.4	2.3
2008	66.7	50.3	10.9	4.7	0.8	2.6

* comprising wheat, barley, oats and 'other cereal'.

+ Local government reorganisation in 1974 combined Worcestershire with Herefordshire, so no separate county figures are available from Agricultural Census data. Parish summaries for the former county of Hereford & Worcester were published up until 1988, so a figure has been calculated for Worcestershire from individual parish summaries using the post-1997 parish structure of the county, making for a close approximation.

Source: Recalculated from Woodruffe (1972), Agricultural Census Parish Summaries for Hereford and Worcester 1988, Agricultural Census data 2000 and June Survey of Agriculture and Horticulture data 2008.

Table 1 demonstrates the wartime shift towards cereal production, with wheat comprising the single biggest growth component within the expanding arable area. From the 1950s, it is evident that farmers' interest in wheat declined in favour of a rapid expansion of barley. From only 2.2% of the arable area in 1939, barley rose to occupy almost 41% of the arable area by 1970. This represents the most radical change in the structure of Worcestershire agriculture in the pre-CAP period. A host of complex and inter-related factors account for this growth, including favourable British government support prices, new plant varieties, technological advances in machinery and increased demand for good quality feed barley for use in intensive livestock systems. Geographically, the expansion of barley and displacement of wheat-based systems throughout the county after the War involved a southward and westward spread from a point of innovation centred on Kidderminster. Until very recently, there was a sustained decline in importance oats, largely as a consequence of improvements applied to barley, contributing to a reshaping of cereal systems in the north-west of the county in particular. From a period of relative

stability during the 1970s, the arable agriculture of Worcestershire has again witnessed a swift and dramatic change. The cause is one firmly centred on government policy towards agriculture and specifically adoption of the CAP in the UK. The CAP introduced highly favourable support prices for wheat in the late 1970s and early 1980s, contributing to a resurgence of wheat production. It surpassed its previous (1943) peak in area of extent in 2000 and continues to expand. Without the introduction of set-aside in 1992 as a temporary land retirement measure to control cereal output, this 1943 total would almost certainly have already been exceeded at an earlier date. This is set within a general expansion of the total area devoted to arable farming, but one that encompasses a sharp decline in the growing of barley. Important other components in the growth of arable farming have been 'new' crops, the most significant of which are maize and oilseed rape (Tarrant, 1975; Wrathall, 1988). Maize accounted for 4.4% of all arable crops and oilseed rape occupied 12.3% of Worcestershire's arable area in 2008, both exhibiting continual expansion year on year.

The environmental consequences of the move towards greater cereal production, with associated changes in land management systems, have been well-publicised (see Westmacott and Worthington, 1974, 1985, 1997 and 2006; Shoard, 1980; Green, 1981). Intensification has been a particularly destructive force on landscapes and habitats (Bowler, 1985), with technology driving hedgerow removal, pond and ditch removal, field drainage, field tree removal, soil erosion and pollution incidents. It is not only an expansion of arable cultivation, but a change in arable husbandry practises themselves that has reduced species diversity in Worcestershire. For example, WBP (1999) note specifically that: 'In Worcestershire 10 out of 17 bird species listed in the Red Data Book under the red list (high conservation concern) are associated with arable habitats'. The same applies to the arable flora with species once widespread in the county, such as Shepherd's Needle (*Scandix pectin-veneris*) and Corn Buttercup (*Ranunculus arvensis*), now reduced to a handful of sites. The Worcestershire Biodiversity Action Plan (BAP) similarly highlights the adverse impact on ground-nesting and seed-eating birds of a shift away from spring sowing towards winter sowing of cereals.

It is also interesting to note from Table 1 that the area under potatoes in Worcestershire has declined significantly since the war. A very modest recent expansion is evident which does not match the growing concern voiced about the environmental impact of potato-growing in the region. Potatoes have emerged as a cash crop following the abolition of area-based quotas formerly operated by the Potato Marketing Board (dismantled 1997). In reality, the current problem is a locational one rather than one of quantity. Producers have actively sought out new areas to grow potatoes. A consequence is that unploughed grasslands have been targeted for their pest and disease-free potato growing qualities. Ancient water meadows adjacent to the River Teme in particular have been subject to conversion to potato production, with serious negative consequences for diversity of grass and floral species. In turn, this has led to concern about the erosion of sediment into watercourses and declining water quality, again with implications for impoverishment of freshwater ecosystems.

b. Horticulture

Worcestershire is renowned for fruit and vegetable production but the sector has undergone a steep post-war decline. The Vale of Evesham has long represented a major national concentration of horticultural production. Despite its reputation, it was not until the 1850s that fruit and vegetable production became established extensively throughout the Vale. This is explained by the availability of new markets (other than Evesham itself) that accompanied the construction of rail links to London, Birmingham, Oxford and Bristol (see Section 3ii). Effectively, this reduced distance from market but concentrated production around the railheads at Evesham and Pershore (Lodge, 1972). The main period of expansion, somewhat ironically, came during the Great Agricultural Depression of the 1860s. There were three significant events at this time that encouraged cereal farmers to convert to horticulture (Robinson, 1983):

i) the prices of cereals fell steeply;
ii) there were a series of poor summers and harvests (1879 was disastrous);
iii) farm labourers were becoming both more expensive and scarce as new opportunities arose in the urban industrial sector.

These events made conditions right for the establishment of five distinctive features which characterised the Vale by the end of the 1940s (Lodge, 1972). First, a large number of smallholdings developed. Many large farms growing wheat were no longer profitable under the conditions of the Great Agricultural Depression, so many were split up. This allowed individuals to buy or rent small plots of land. Small plots were in demand as many people wanted to become independent farmers rather than farm labourers, yet they were unable to afford or manage a large area. About 700 new smallholdings were created between 1875 and 1900. This process was reinforced and quickened from 1908 with the passing of the Smallholdings and Allotments Act which gave County Councils (Worcestershire/Warwickshire/Gloucestershire in this case) the power to undertake compulsory purchase of land and actively create smallholdings. Soldiers returning from the First World War created a further demand for smallholdings. By the late 1930s, there were approximately 2000 holdings under 6 hectares in size in the Vale. Second, a highly fragmented pattern of landownership emerged due to piecemeal acquisition of plots, fields and farms by successful growers over time who were in competition with one another for the best quality land (Ilbery, 1984). Third, a culture of 'growing' (rather than 'farming') emerged amongst the many smallholders, establishing a tradition that became passed down to their offspring. Fourth, a unique system of land tenure, 'Evesham Custom', quickly developed on the Vale' rented smallholdings. Tenants made improvements to their plots without reference to their landlord and these remained his property. A new tenant moving in had to pay the outgoing tenant a sum to cover the agreed value of the improvements (Lodge, 1972). This encouraged investment by tenants who would otherwise have little incentive to improve rented land, also serving to increase horticultural output across the Vale. The Custom was legally recognised in 1895, but by then had become unquestioned practice (Sparrow, 2006). Fifth, the emergence of small grower marketing cooperatives, dominated by Littleton and Badsey Growers (formed 1908) and Pershore Growers Ltd. (1909), was a response to the formation of so many small holdings. Advantages for growers included improving the presentation of products using packing, securing better market prices for produce and reducing costs of inputs through bulk buying.

Detailed consideration of the practice of horticulture, particularly in its traditional form, is important because it has had significant impacts on floristic diversity in south-eastern Worcestershire. The flora here is generally impoverished due to the intensity of cultivation. The Vale has some soil of top quality, but this is not as extensive as the area of horticulture might suggest. Much of the locality is occupied by heavy clays, a physical limitation overcome by the intensity of human inputs. One asset that the smallholders possessed was labour and so they were able to modify the environment through time spent on soil management, including irrigation of dry clays in summer months.

‘Horticulture’ comprises many different individual crops and the decline of each has varied over time. No simple trend of horticultural change in Worcestershire is therefore apparent. The soft fruit component, of which only strawberries were of significance, survived into the 1980s until ‘Pick Your Own’ ventures declined in popularity. In contrast, orchards underwent what can only be described as a ‘crash’ in those areas devoted to production. Pears and plums were a particular speciality of Worcestershire. Between 1952 and 1967, the spatial extent of orchards declined by 40.2%. With changes in consumer tastes (especially away from plum consumption), a lack of support for fruit producers under CAP and the lure of more profitable farm enterprises, the 1980s saw a further round of intense orchard removal. By 1999, orchards (‘top fruit’) occupied just 1609 hectares in Worcestershire. Decline seems inveterate, as figures from 2008 show a further 25% reduction of top fruit, so that just 1208 hectares survive. As the WBP (1999) notes, standard trees survive in the gardens of many rural properties in the county and contribute to the survival of non-commercial fruit varieties, although their extent is difficult to estimate with accuracy. The same is true of plums and pears in hedgerows which are relics of former commercial production.

Vegetable production in Worcestershire has been in steady decline since the immediate post-war years when there was a particular urgency to increase home production (9712 hectares grown in 1948). By 1952, the area devoted to vegetables had fallen significantly to 6736 hectares and then experienced a more moderate fall in area to 5354 hectares by 1970. In 1999, just 2016 hectares remained, again mainly concentrated in the Vale of Evesham. This constitutes a fall from 3.8% of Worcestershire’s agricultural area under vegetables in 1951 to just 1.6% in 1999. However, some recovery is evident by 2008 with 3019 hectares recorded. The pattern of change is complex, but has left two distinct types of producer. First, there is the traditional small grower surviving in the core of the Vale to the east of Evesham. They are few in number and becoming increasingly economically marginalized, so that a traditional part of Worcestershire’s agricultural scene has all but disappeared. Second, there has been some recovery of the area devoted to vegetables in the western part of the Vale centred on a previous core of production around Pershore. Large field scale production is evident in parishes to the south of Pershore, allowing farmers to compete with those in East Anglia who account for the bulk of vegetable production from England. One further component of decline in Worcestershire is glasshouse production, falling from 98.9 hectares in 1988 to 80 hectares in 1999 and 71 hectares in 2008. This has been a spatially uneven process. Many Vale smallholders had raised plants in a greenhouse or under cloches, but have now disappeared. In contrast, there is evidence of localised glasshouse expansion, centred on the parish of Offenham, east of Evesham. The latest development involves industrialized nursery stock production by companies for the wholesale market, usually under contract with large retail chains (DIY stores in particular). Worcestershire is the eighth most important English county / Unitary Authority (out of 93) by percentage area for glasshouse production.

An interesting and inadvertent consequence of horticultural specialisation on Worcestershire flora was the presence of ‘wool aliens’. These were introduced where wool ‘shoddy’, a short-fibred by-product of the wool manufacturing process, was

distributed to horticultural areas as a cheap fertiliser. It was used in the market gardening areas of the Vale of Evesham and, less frequently, in the hop yards of the Teme Valley, spreading seeds of plants that survived the mill cleaning processes. At least 300 mainly Australasian species were recorded, many of which died out shortly afterwards (Lousley, 1961). Over 60 species are still present in the county, although some may have initially disappeared and then been re-introduced by other means.

c. Livestock

Worcestershire has moved from being a pre-war pastoral county to a post-war arable county. This said, a total of 41.8% of the county remained under permanent pasture in 2008, above the average for England. By 1970, Woodruffe (1972) notes that the surviving permanent pasture had become fragmented into three main areas besides that associated with urban fringe areas. All lie at the margins of the county and include the north-east extremity around Wythall, to the east of Worcester city at Flyford Flavell and to the far south-west on common land adjacent to the Malvern Hills (Castlemorton). Woodruffe refers to heavy soils as accounting for the survival of permanent pasture, although the lack of availability of capital to invest in drainage and ploughing technology by farmers in these localities, not to mention local or family traditions and personal preference, may be equally pertinent explanatory factors. Even though pre-war Worcestershire was dominated by grassland and retains a higher average percentage of grassland than for England as a whole, dairying has never been a dominant farming activity. Rather, it has traditionally been practised as part of mixed farming systems. Only a minority of farmers have chosen to specialise in dairying given the other options available (arable, horticultural). Additionally, the Milk Marketing Board (MMB), established in 1933, operated to equalise transport costs for milk across the country, favouring producers in western localities away from the main urban centres. Worcestershire farmers had relatively little to benefit from this structure compared with those in neighbouring Herefordshire and Shropshire for example. In 1999, 8.7% of holdings in Worcestershire had dairy herds compared with 14.5% for England as a whole. Absolute decline in the number of dairy cows in Worcestershire was stimulated by the cessation of collection from milk churns by the MMB in the 1970s (eliminating very small producers) and the introduction of milk quotas in 1984. Further downward pressure on milk prices driven by large supermarkets has speeded the disappearance of dairying from Worcestershire since 2000. In 2008, just 2.4% of holdings were dairy farms. The percentage of the English dairy herd remaining in the county in 2008 is similar to that of 1962 at 1.2%. This is likely to remain static for as long as quotas feature in CAP, currently scheduled to be phased out by 2015. In the meantime, the milk sector remains in severe difficulty and it is unclear whether losses in Worcestershire, as a non-traditional county for dairying, will outstrip the more specialised regions elsewhere in England. Geographically within Worcestershire, the pattern will almost certainly remain fossilised; the main area of production can loosely be described as lying in a band running to the south and north-east of Worcester city. Rather than simply the number of animals, the important factor is the way in which pasture is managed. The trend away from haymaking towards the use of silage will have impacted upon the biodiversity of Worcestershire grasslands, though not to the same extent as in specialist dairying regions of England. Farmers cut green grass for silage early in the season and ‘cure’ it for storage

as a winter feed. It is more nutritious than hay and so encourages improved milk yields. It also reduces the need for good weather associated with haymaking. Unfortunately, cutting the grass early in the season means that many plant species have a greatly reduced opportunity to seed before their removal from fields which leads to a rapid decline in the varietal mix of grassland plants.

Beef and sheep production have also mainly existed in the county as part of mixed farming systems. In more recent times, specialisation in arable enterprises has tended to favour beef cattle as a subsidiary enterprise (until problems with BSE). Beef production is more common in the west of the county, especially around Suckley to the north of the Malvern Hills. The absolute numbers of beef cattle almost doubled between 1968 and 1999, but has since fallen back to 8553 in 2006 when data were last available. The percentage of the national beef herd within Worcestershire has remained low and relatively consistent between 1 and 1.5%. This is true even after the 2001 outbreak of Foot and Mouth Disease (FMD). Sheep enterprises have a limited presence, with a division between the upland sheep that graze the Malverns in the west and the lowland sheep that have featured as part of the replacement of horticulture in the Avon valley, particularly to the south of Evesham. Worcestershire contained 1.9% of the national flock in 2008, identical to the figure evident in the late 1960s. It should be noted that there was a 19.4% decline in the number of animals recorded between 2000 and 2002 due to the 2001 outbreak of FMD, although the percentage of the national flock resident in Worcestershire remains unchanged. In the case of beef and sheep enterprises generally, the increases in animals kept post-war were achieved against a trend of a falling area of grassland in favour of arable cultivation. This has necessitated an intensive approach to grassland management, largely based on the greater application of compound nitrogen fertiliser, an inevitable consequence of which is the pernicious loss of floristic diversity. The Worcestershire BAP demonstrates unequivocally the seriousness of the situation (WBP, 1999). Based on data from Stephen (1997) and Jefferson and Robertson (1996), Worcestershire is shown to possess almost 1000 hectares of lowland hay meadow and neutral pasture, or over 20% of the total remaining in England (a 99% decline nationally since 1945 is noted). Most surviving unimproved grasslands are associated with fringes around higher land, such as in the southern Malvern and Clent Hills, or around the southern edge of Wyre Forest. Elsewhere, blocks over 10 hectares in size are rare, with a scattering of small parcels throughout the county representative of the typical pattern (WBP, 1999). At this juncture, it is interesting to recall the latest (2000-2008) increase, by in excess of 8000 hectares, of permanent pasture. The suggestion is that, against a backdrop of stable livestock numbers, an extensification of animal production is taking place as the politically revised agri-environmental conservation agenda begins to take effect (see Section 3).

d. Rough Grazing and Common Land

'Rough grazing' is identified in the Agricultural Census and is a useful indicator of unimproved land that is used for livestock grazing. It was originally identified as land that was grazed but not assessed for rates by local authorities. Since 1921, farmers in England have been asked to identify rough grazing over which they hold sole grazing rights, a distinction from 'common' land. In 1939, Worcestershire farmers had livestock on 5029 hectares of sole rights rough grazing, with a MAFF-estimated 1276 hectares of common land. By 1959, sole rights rough grazing had declined 45% to just 2762 hectares. The estimated area of common land had fallen about 10% to 1155 hectares. In 1970, rough grazing had decreased to 2126 hectares, a 58% decline on the pre-war total, although the common land estimate remained unchanged. The 1999 figures record that 2197 hectares of sole rights rough grazing remained in Worcestershire, but that this had

decreased to 1695 hectares in 2008, the lowest area since records began (Agricultural Census / Survey data no longer record a figure for common land).

From these data, the period immediately post-war was the main one of intensification in which extensive areas of rough grazing were 'improved' for production using technological innovations and government grant aid. Grazing remaining today is typically of two main types. The first is confined to localised topographical features, such as steep banks, which render land unsuitable for cultivation or intensive grassland management. Hence, this form of rough grazing is geographically dispersed throughout the county. Often only the most awkward topographical features now remain to be 'improved' and require much effort to bring into intensive management. Such a trend is unidirectional; there is no evidence whatsoever that intensively cultivated cereal land is reverting to floristically diverse rough grazing. This loss trend has accelerated over recent years and seems largely due to the decline of the second type of rough grazing in the rural-urban fringe. It occurs in these localities due to the difficult issues arising from farming near to urban centres (see Bryant *et al.* 1982); for example, trespass, vandalism and holding fragmentation by road building. An additional contributory factor is the pressure to meet government targets to provide more homes in the county because developers actively seek neglected land of perceived low agricultural value. The West Midlands Regional Spatial Strategy identified a target of 1200 homes per annum be built in Worcestershire between 2007 and 2011, a figure that was exceeded in 2007/8 by 439 (WMRA, 2009).

Common land in lowland England has generally been in decline since the high-water mark of the 14th century. The Commons Registration Act of 1965 represented the first major challenge to this trend, but by this late stage it seems that Worcestershire had already lost much of its common land. The largest commons in Worcestershire survive at Castlemorton to the south east of the Malvern Hills, Hartlebury near Kidderminster, Defford to the west of Pershore (partially occupied by a former military establishment) and Kempsey to the south of Worcester. In all cases, survival can be partially attributed to the limitations imposed on agricultural exploitation by poor soils. Of the common land remaining today, the threat of enclosure for private farmland has largely subsided, with much being designated as of value for nature conservation and owned by public bodies, trusts and charities. Thus, in the north-east of the county, close to the West Midlands conurbation, sizeable areas of surviving grass-heath common land such as the Lickey Hills, Clent Hills, Waseley Hills and Kinver Edge have been incorporated into country parks. Planning enforcement has also curtailed demands for urban expansion, although lowland commons were often viewed as prime development sites by virtue of their relative lack of agricultural value. Rather, pressure on remaining commons continues to grow from a lack of management. The accessibility of Worcestershire to the West Midlands conurbation has led to urban-based commuters purchasing houses adjacent to commons. Increased traffic and greater recreational use have discouraged active commoners from keeping animals, leading to loss of stock-grazing and an inevitable decline in floral diversity.

2. Forestry and Woodland

Tree cover helps to define 'regional character' within the landscape of Worcestershire. *'Landscape Character Assessment'* systems (see Section 3i below) provide a convenient way of making initial distinctions in the pattern of forestry and woodland across Worcestershire. The Worcestershire Draft Landscape Character Assessment (WCC, 1999a) identified 11 'Regional Character Areas' (which, it should be noted, do not correspond to Natural England's National Character Areas) and these help to summarise the different historical development and surviving amount or structure of forest and woodland.

i) Arden represents the western edge of the medieval Royal Forest of Arden centred on neighbouring Warwickshire. Little remains, although it is still more wooded than many other parts of the Midlands, an impression enhanced by the high number of hedgerow oaks that survive within the field pattern.

ii) 'Mid-Worcestershire Forests' defines a network of smaller Royal Forests, including the following four main 'blocks':

- Malvern Chase, south east of the Malvern Hills, was privately owned from the 14th century until largely enclosed from the mid-17th century.
- Ombersley Forest, between Worcester and Kidderminster, was small and dominant in the landscape for a relatively short period in time, although small-leaved lime (*Tilia cordata*) survives as a locally dominant species.
- Horewell Forest, between the Avon and Severn, suffered deforestation in 1229 because it was not protected as a demesne of the Crown.
- Feckenham Forest, was relatively large and its heart lay to the south-west of Redditch. From the 13th century, it was progressively cleared around its periphery, at first for open fields and then for deer emparking, until 1629 when the core area was deforested. It encompassed Chaddesley Woods, the largest surviving wood in the county outside the Wyre Forest.

Additionally, the area contains the 'West Worcestershire Woods' between the Teme and Severn rivers, abutting the Wyre Forest. It contains Shrawley Wood which has the largest stand of small-leaved lime remaining in Britain.

iii) Kinver Sandlands in the north of the county contained the southern extension of Kinver Forest that lay mainly in Staffordshire.

iv) Wyre Plateau extends into neighbouring Shropshire and is one of the most extensive areas of semi-natural ancient woodland in England. It was a Royal Forest, dominated by oak, rowan and birch. Despite recent introductions of conifer plantations, broadleaves remain significant in maintaining a rich diversity of wildlife.

v) Teme Valley and the Abberley Hills contain ancient woodland in the incised valleys of the River Teme and its tributaries, together with mixed replanted secondary woodland on the valley sides.

vi) Bromyard Plateau is a largely deforested area of moderate height (150-250 metres) with patches of game cover, small plantations and ornamental gardens.

vii) Malvern Hills is a heavily wooded area with significant surviving expanses of ancient woodland. Oak woodlands in this locality received particular attention from Tansley (1939).

viii) & ix) North-west Gloucestershire Sandlands and Vale of Gloucester are areas that extend from neighbouring Gloucestershire into southern Worcestershire. Intensive agricultural use means that they are characteristically unwooded.

x) Cotswolds and Bredon Hill represent a small area of the Cotswolds limestone escarpment that extends into the south-east of the county. It contains ancient woodland heavily modified by forestry. Bredon Hill is a Cotswold outlier with an outstanding limestone flora and is important for veteran trees within parkland (associated beetle fauna are regarded as nationally outstanding).
xi) Vale of Evesham is a locality remarkable for its lack of trees, especially since the outbreak of Dutch elm disease. Hedges derive largely from enclosure awards made at the end of the 18th century so there is a planned character to the landscape, although the abundance of orchard trees serves to make this less obvious.

The Worcestershire BAP provides an excellent account of the importance of woodland in the county (WBP, 1999). Hence, only the main elements of change are covered here. The BAP classifies woodland into six main types:

i) ancient semi-natural woodland;
ii) plantations on ancient woodland sites;
iii) broadleaved deciduous plantations;
iv) recent woodland which has developed on grasslands;
v) pure conifer or mixed broad-leaved deciduous/conifer plantations;
vi) shelter and view-screening belts.

None of these woodland types is truly extensive in Worcestershire, with an estimated total woodland cover of 7.4% in 1997 compared with an average figure for England of 7.9% extrapolated from Forestry Commission data (WBP, 1999; Forestry Commission, 2001). Post-war pressures for extending the area of arable cultivation and the development of intensive livestock pastures has led to a continuing decline of older woodland. This has been arrested more recently through purchase of ancient woodland sites by nature conservation organisations and an extension of protected area status. Simultaneously with these trends, government assistance through voluntary schemes, such as the Woodland Grant Scheme, Farm Woodland Premium Scheme and the English Woodland Grant Scheme, has encouraged replanting. The Worcestershire BAP records that, since 1979, Forestry Commission grant-aided schemes have been successful in increasing woodland by 1,347 hectares, an expansion of about 12% by woodland cover. The trend appears to have continued since 1999, with the June Survey of Agriculture and Horticulture showing a 600 hectare increase in woodland (14.9% by 2008). However, the BAP suggests that for ancient semi-natural broadleaved (plus yew) woodland, Worcestershire contains over double the British average for this type (WBP, 1999). Survey work by the former Nature Conservancy Council in the mid-1980s revealed that ancient woodland tended to be more common in the west and north of the county than in the south and east (NCC, 1986). As the BAP notes, ‘most ancient woodlands in Worcestershire are small, with only 50 of 1108 of them being larger than 25 hectares’ (WBP, 1999).

As with rough grazing, most existing woodland seems to survive where agricultural intensification has been made difficult by localised physical factors. Topographical features and pockets of poor soil, together with the unwillingness of landowners to invest in their improvement or modification, are the most significant reasons. Some parcels of woodland also remain from the medieval Royal Forests and Chases described earlier. For

example, Malvern Chase remained unchanged for 500 years because a special licence was required to clear forest. Only after 1632, when Charles I sold off the Chase, did major land reorganisation (and deforestation) occur (see Hurle, 1986). Most of the surviving woodland has itself been intensively managed, with coppicing once a common practice (WBP, 1999). For example, reserves run by the Worcestershire Wildlife Trust at Trench Wood, to the east of Worcester city, and Monkwood, to the north-west, were both formerly owned and coppiced by Harris the brush makers to their factory near Bromsgrove. However, coppicing is rarely practised now and it is fair to say that many woods receive no active management in today's landscape, other than as a secondary concern of pheasant-rearing. This 'neglect' includes more recent plantation woodland planted predominantly in the 1960s and then again in the early 1990s. In Worcestershire, the poplar was a popular plantation species, as advocated by Jobling (1990).

3. Protected Areas

Protection of the countryside in England has traditionally been based on separate measures for landscape and nature conservation. Termed the 'great divide' by MacEwen and MacEwen (1987), this approach dominated the years between the passing of the 1949 National Parks and Access to the Countryside Act and the 1986 Agriculture Act which made provision for the designation of Environmentally Sensitive Areas (ESAs). The formation of Natural England from English Nature and the Countryside Agency in 2006 represents a relatively recent attempt to heal this divide. Hence, landscape, nature and integrated measures for the protection of the Worcestershire countryside can be considered in turn, together with brief reference to the conservation of historic estates.

i) Landscape Conservation

No part of Worcestershire has National Park status, with only fringes of the county to the west (Malvern Hills) and south-east (Cotswold Hills) lying within Area of Outstanding Natural Beauty (AONB) designations. The Malvern Hills AONB, designated in 1959, has the most extensive land area of the two specifically within Worcestershire. However, compared with other AONBs, it is a small in area (only seven AONBs in England and Wales are smaller), yet dramatic in its visual impact. At its heart lies an eight-mile north-south ridge of high land rising to 425 metres, projecting a prominent, serrated skyline into an otherwise lowland situation. Old Pre-Cambrian rocks define the geological composition of the Hills, and are similarly exposed only in Scotland. The Malvern Hills Act of 1884 constituted a body of local people as the Malvern Hills Conservators and gave them jurisdiction over approximately 200 hectares of land. The central aim was, in the interests of 'natural beauty, 'to protect undeveloped countryside from urban encroachment and from piecemeal enclosure by private landowners. A further Act of 1924 addressed the problem of quarrying igneous rock for roadstone. The catalyst for protection was that Tank Quarry (North Hill) had broken through onto the horizon of the Hills, threatening to change their distinctive outline in the landscape. Together, these tougher controls reduced quarrying as a threat, but one that only finally ceased in 1977. Although mainly concerned with upholding commoners' rights, a further purpose of

management is to ensure that the Hills are kept ‘bare’. This is because the name ‘Malvern’ is a corruption of the Welsh ‘moel bryn’, meaning ‘bare hill’. This objective was crystallized in a forward-looking management plan (Alma, 1999) addressing the problems of a lack of exercising of commoners’ rights, a cessation of coppice woodland management and high recreational demand (HWCC, 1996). Recreational pressure has been evident since Victorian times when Malvern became a health spa, leading to a period of substantial urban expansion (see Section 4i). Since this time, the Hills have become a popular area for day-walking, leading to congestion around the main car parks, erosion of footpaths and potential damage to ancient sites of archaeological importance. The Conservators have responded by surfacing some paths with tarmac and concrete as a method to cope with very high visitor numbers, although this approach has not always met with approval (for example, see HWCC, 1996).

In addition to work undertaken by the Conservators, a management plan has been produced for the AONB since the mid-1990s by its Joint Advisory Committee (see Malvern Hills AONB Partnership, 2009). The document is updated on a five-year cycle as a requirement of the CRoW Act 2000 which reasserted the importance of AONBs as protected areas and delivered significantly increased funding for their management. The Worcestershire fraction of the large Cotswolds AONB contains a very small area of visually striking limestone escarpment confined mainly to the parish of Broadway in the far south-east. This AONB also includes Bredon Hill, situated wholly within Worcestershire, which is the largest of five outliers that were once part of the Cotswold escarpment. Bredon Hill is a distinctive landscape feature, holding blocks of woodland, veteran trees in parkland, an iron-age hill fort, an elevated field pattern of Anglo-Saxon origin. Originally designated in 1966, the AONB has been run by a Conservation Board since 2004 in an attempt to achieve more integrated management over such an extensive area. Recreational pressures and neglect of landscape features, especially drystone walls, specifically continue to affect the Broadway locality (GCC, 1994).

Since the late 1990s, there has been a break with the approach to landscape conservation enshrined in the 1940s legislation. This promoted the designation of areas largely upon visual appearance, the scenic beauty of which being derived from a greater cultural valuation of ‘upland’ and ‘wilderness’ (Warnock and Brown, 1998). Now, the emphasis is on the identification of natural and human features existing within *all* landscape using a methodology known as Landscape Character Assessment (or LCA). A central aim of LCA is to permit landscape change that maintains or enhances individual distinctiveness and character. It is a reaction against previous planning policy that has tended to make places similar to one another. The former Countryside Agency’s Countryside Character Initiative (CCI) represented a large-scale application of this new philosophy. It has been applied to all England to create ‘National Character Areas’, with parts of six covering Worcestershire. These are identified as: Severn & Avon Vales; Arden; Herefordshire Plateau & Teme Valley; Mid Severn Sandstone Plateau; Malvern Hills; and Cotswolds. Within this broad framework, 267 very small, localised building blocks of landscape have been identified, known as ‘Landscape Description Units’ or LDUs (WCC, 1999a). In summary, LCA methodology represents the principal way in which landscape is taken into account in the modern planning process.

ii) Nature Conservation

Nature conservation post-war in Worcestershire has been largely effected through the network of Sites of Special Scientific Interest (SSSIs) first created within the 1949 National Parks and Access to the Countryside Act. At the time, the principal aim was to protect areas of valuable flora, fauna, geology and geomorphology from loss to urban and industrial development. SSSI designations in Worcestershire serve in particular to protect unimproved grassland flora, invertebrate communities and woodland. Amongst the earliest Sites to be designated were Castlemorton Common and the Wyre Forest. However, as initially conceived, SSSIs offered no regulation over changes in farming and forestry practice until the introduction of the 1981 Wildlife and Countryside Act. The CRoW 2000 Act strengthened the protective powers of SSSIs, with all owners and occupiers required to seek permission from Natural England to undertake actions likely to damage the scientific value of a Site. In 1994, there were around 80 SSSIs in Worcestershire, the majority of which were less than 100 hectares in size. Of these, four are also National Nature Reserves (NNRs), selected as 'textbook' examples of valuable habitat for educational purposes. They are located at:

i) Bredon Hill – a wood pasture habitat;
ii) Chaddesley Woods – ancient semi-natural woodland (see Section 2);
iii) Foster's Green Meadows – unimproved lowland neutral grassland;
iv) Wyre Forest – ancient semi-natural woodland and lowland grassland.

Bredon Hill and Lyppard Grange Ponds within the city of Worcester are the county's two Special Areas of Conservation (SACs), designated under the EU Habitats Directive (1992), within the Natura 2000 European conservation network. The former seeks to protect the violet click beetle *(Limoniscus violaceus)* and the latter the great-crested newt *(Triturus cristatus)*. Worcestershire has also been at the forefront of defining Biodiversity Action Plans (WBP, 1999). First published in 1999, a comprehensive plan identifies action for the maintenance and enhancement of 19 habitat types and detailed objectives and targets for 20 individual species. These include the nationally rare Early Gentian *(Gentianella anglica)* and True Service Tree *(Sorbus domestica)*, together with the declining Black Popular *(Populus nigra)*. At least 14 areas have been designated as Local Nature Reserves in Worcestershire (WRBC, 2009). Hartlebury Common in the north of the county is one of the most significant, owned and managed by the County Council. It is a sandy lowland heath remnant of a much larger common, but at approximately 90 hectares in size is relatively extensive in the modern landscape. Nature conservation objectives in the county are also pursued through the landholding and management activities of the Worcestershire Wildlife Trust (WWT). This organisation cares for over 70 reserves covering about 800 hectares of three main habitat types: ancient and coppice woodland, unimproved pasture and marsh / wetland (the latter including a rare inland salt marsh at Upton Warren, near Droitwich. In addition, Feckenham Wylde Moor, in the north-east of the county, was once a thick bog fed by base-rich (gypsum) springs, being sufficiently waterlogged to allow fen peat accumulation; a rarity in the county. Extensive drainage and enclosure around 1850 led to the extinction of many county-rare flowering plants (WWT, 2010). Since its acquisition by WWT in 1981, the drainage network is

silting up, slowly restoring a fen habitat. A large pool has been excavated to extend the fen and hay-meadow management re-introduced.

Woodland has long been recognised as something of a rarity in lowland England and has received relatively good post-war protection through the SSSI system. Hence, it is the disappearance of floral rich pastures, proceeding stealthily until the 1990s, that has attracted most recent concern. Botanically rich meadows have been eroded by modern agricultural practices. Natural England has redirected efforts into protecting the remaining fragments of unimproved pasture in Worcestershire. As WWT note in their literature about the declaration of Fosters Green Meadow as a NNR in 1994, 'So great have been the changes in our countryside in the last fifty years that a field full of flowers, once considered commonplace in England, is now a rarity and warrants national recognition'.

iii) Integrating Landscape and Nature Conservation

From the mid-1980s, the UK moved towards a more integrated approach to landscape and nature conservation. The ESA programme offered farmers and landowners incentives to undertake voluntarily environmentally-friendly land management practices. It had a marginal impact on Worcestershire, with only a few hectares of land eligible for support within the Cotswolds Hills ESA (designated in 1993). This was a small area of ancient Jurassic limestone grassland comprising a steep scarp slope leading up to the limestone plateau of the Cotswolds. The topography largely dictated the survival of grassland, being unsuitable for conversion to arable land.

Between 1992 and 2004, Defra's Countryside Stewardship Scheme (CSS) was the main support mechanism for Worcestershire landowners who wanted to undertake conservation. Applications to enter the scheme, especially in later years, were evaluated according to their contribution to landscapes and habitats identified as distinctive to the county. The most significant specific objectives for CSS in Worcestershire related to the conservation of unimproved meadows and pastures (Worcestershire contains the largest area of this grassland in England, yet 97% of the 1945 county area had since disappeared), traditional orchards of large-sized fruit trees (typically comprising scarce and neglected old varieties) and historic parklands (see iv below). The CSS proved popular, although exact figures on uptake are unavailable as they were combined with the neighbouring county of Herefordshire. Between them, Herefordshire and Worcestershire accounted for 419 agreements in 1999 which represented over 40% of all agreements made in the West Midlands Region.

CSS and ESAs (and other conservation schemes too) were replaced in 2005 by a single Environmental Stewardship Scheme (ESS). Its principal aim was to simplify the array of environmental voluntary schemes offered to landowners and draw a greater number of them into practising conservation on a day-to-day basis. ESS is implemented through the Rural Development Programme England 2007-2013 (RDPE) as part of CAP's 'second pillar' and accounts for 85% of all funds allocated (some £3.3 billion over seven years) to assist the economy and society of rural areas. Entry into the scheme is more likely to be

successful if a contribution is made to biodiversity, landscape, natural resource protection, public access and historic interests. In Worcestershire, the target areas are clustered in the south of the county and by the end of 2009 45% of farmland had been entered into the least demanding (or 'entry level') part of the ESS. The more exacting 'organic' and 'higher level' parts of ESS exhibited far more modest uptake rates (2.9% and 3.1% of land respectively).

iv) The Conservation of Estates

The significance of crown landholdings in relation to the Mid-Worcestershire forests has already been highlighted (Section 2). Croome Park (south of Worcester) and Hanbury Hall (north-east of Worcester) are owned by the National Trust and include excellent examples of late 18th century landscape gardening. Croome Park is of historical importance as Lancelot 'Capability' Brown's first complete work, setting a template for the landscape gardening movement. Similarly, Witley Court was constructed during the 17th century and landscaped in the late 18th century. Now run by English Heritage, it has undergone extensive restoration following a disastrous fire in 1937 which destroyed the house. Kemerton Estate, Bredon Hill, is particularly notable because the cultivation of a large arable area is combined with conservation. The use of conservation headlands in fields has allowed the survival of arable weed flora that has largely disappeared elsewhere. Formed in 1989, the Kemerton Conservation Trust represents one of the earliest examples of a new form of estate management.

Estates have also been active in the acquisition of land for the purpose of conservation. The Cadbury family were deeply concerned by the inexorable spread of Birmingham into the county, so initiated the purchase of land to create an early form of 'green belt'. Parcels of land were acquired at Clent Hills, Kinver Edge, Lickey Hills, Waseley Hills and Wast Hills to form a ring of land at the edge of Birmingham. Over time, the ownership of this land has been transferred to a variety of organisations, including Birmingham City Council, Bournville Village Trust and Worcestershire County Council. Together with the National Trust and WWT, the land is managed as open space for the people of Worcestershire.

4. Urban and Infrastructural Development in Worcestershire

i) Urban Structure and Population Change

The city of Worcester lies at the centre of the county with small market towns around it, including Evesham, Pershore, Upton upon Severn, Great Malvern, Droitwich and Tenbury Wells. The north-east of the county is adjacent to the West Midlands conurbation and much more heavily urbanised. Sizeable towns include Kidderminster Stourport-on-Severn, Bewdley, Bromsgrove and Redditch. Table 2 shows changes in population in Worcestershire between 1971 and 2008. Totals for Birmingham and the West Midlands are provided for comparison. It demonstrates a dominant trend of counter-urbanisation as people move out of the West Midlands conurbation, with Birmingham falling back to contain less than one million inhabitants by 2001 (an 11.0%

decline). Worcestershire has clearly become a target for migrants, increasing its population by an estimated 27.9% (121,708 residents) in the 37 years between 1971 and 2008. Both urban (such as Worcester city and Redditch) and rural districts have experienced significant population growth. Redditch is a special case in that it was designated as a New Town in 1964 to accommodate population overspill from Birmingham. Its development has not only removed land from agricultural production, but led to extensive landscape and habitat change in north-east Worcestershire. Barker and Reddie (2000) estimate that three million trees had been planted by 1982 which greatly increased the presence of amenity tree species in the county. Redditch reached its planned size in just over 30 years and so its major phase of expansion is now concluded (Table 2).

Table 2: Population Changes in the West Midlands and Worcestershire 1971-2001

	Population present 1971: Total persons	**Population present 1981: Total persons**	**Population present 1991: Total persons**	**Population present: 2001: Total persons**	**Population change 1971-2001 (%)**	**2008 Mid-Year Estimate: Total Persons**	**Estimated population change 1971-2008 (%)**
West Midlands	5107970	5098661	5264342	5267337	+3.1	5411100	+5.9
Birmingham	1097837	1006800	937763	977087	-11.0	1016800	-7.4
Worcestershire*	435892	497800	530930	542107	+24.4	557600	+27.9
Bromsgrove	77149	88000	90481	87837	+13.9	92800	+20.3
Malvern Hills*†	77023	81800	87477	72172	-6.3	74800	-2.9
Redditch	40839	66600	77304	78807	+93.0	79900	+95.6
Worcester*	74648	76000	81538	93353	+25.1	94100	+26.1
Wychavon*	81161	93900	100403	112957	+39.2	117300	+44.5
Wyre Forest*	85072	91500	93727	96981	+14.0	98700	+16.0

* includes boundary change since 1981.
† includes boundary change in 1997 when Hereford & Worcester reverted to its pre-1974 structure of two separate counties.

Source: *Office of National Statistics* and *A Vision of Britain Through Time, 2009*.

Out-migration from the West Midlands conurbation has necessitated the expansion of existing towns and villages. However, this is not the sole contributory process to a growth in house building in Worcestershire. Changing societal structures have also contributed a demand for more houses and the consequent loss of open countryside surrounding Worcestershire's towns. A sudden growth in migration from Eastern European countries after EU accession in 2004 has also increased housing demand. The planning system has rigorously operated a green belt policy since 1975 (Law, 2000) to help prevent the merger of settlements in north-east Worcestershire with the West Midlands conurbation.

This has also been applied to prevent Worcester and Droitwich merging. Nevertheless, building land is still required, meaning that urban growth has been concentrated in the fringe of existing settlements, especially the city of Worcester and its satellite market towns which have good transport connections, with some infill and additions in villages.

Although house building leads to the creation of more gardens and amenity planting schemes from which alien plants can escape and become naturalised, this is small compensation for the loss of semi-natural habitats. New housing also results in indirect demands for an expansion of infrastructure, zoning for the provision of services and employment, and increased recreational pressure. For example, at least 22 golf courses had become established in Worcestershire by 2003, with a significant concentration in the more urbanised north-east of the county.

Industrial development has been largely confined to designated zones adjacent to areas of urban expansion, with the exception of aggregate extraction. Worcestershire is not a major source and producer of minerals in England. Sand and gravel pits occur mainly in the lower Avon and Severn Valleys in the south of the county to exploit glacial deposits. There are solid deposits associated with sandstone in the north of the county, with rock resources confined to the Malvern and Abberley Hills in the west and the limestone escarpment of the Cotswolds in the south-east. Brick clay is found at Hartlebury, south of Kidderminster (WCCb, 1999). In the light of new thinking about the desirability of using local material for building to retain landscape character and distinctiveness, the need for locally extracted aggregates continues. It is likely that sand and gravel pits will continue to be worked, with restoration to recreational use through their conversion to lakes. Quarrying of granite in the Malvern Hills ceased by 1977 and it is extremely unlikely that there will be a resumption due to its AONB status Redundant quarrying sites at North Hill, Earnslaw (Wyche) and The Gullet (the last to be worked) provide unique cliff habitats and are examples of the positive impact on flora that can result from a cessation of industrial use.

ii) Infrastructural Development

a. Roads

Worcestershire's central location and proximity to the West Midlands conurbation means that there is a continual demand for improved transport routes. This has led to the construction and subsequent enlargement of the M5 motorway since its opening in July 1962. The north-east of the county has also witnessed the construction of a southern orbital route around Birmingham (M42) motorway completed to the north of Bromsgrove in 1985. The bypasses around the southern edges of Worcester (completed 1990) and Evesham (mid-1990s) are notable. The latter is constructed across land of the highest quality for agriculture and has only been permitted since a change in planning policy in the late 1980s (Blacksell, 1987). Road straightening and improvement have also been widespread throughout the county. The actual loss of land from road building is eclipsed by that which ensues when viable farm units are fragmented by the routes chosen. Newly isolated parcels of land become targets for house building and zoning for industrial uses (see Bell *et al.*, 1978). This has happened at Worcester (M5 and southern link road), Droitwich (M5) and Evesham (southern bypass). However, roads can have a positive effect on flora, acting as sites of refuge from intensive agriculture. The lack of local authority funds in

the early 1990s and subsequent growth in the use of contractors has reduced roadside management to both the benefit and detriment of individual flora.

b. Railways

Worcestershire once possessed a dense rail network (Table 3 and Figure 1). Perhaps the most significant developments came with the opening of a station at Evesham in 1852 by the Oxford, Worcester and Wolverhampton Railway (OW&WR, see Oppitz, 1990). A connection to Bristol, completed in 1864, and a northern link through Redditch direct to Birmingham, created in 1868, proved important to the nascent horticultural area of the Vale of Evesham. It provided the locality with direct access to major markets, acting as a significant stimulus to the expansion of land devoted to market gardening. Due to the predominance of unprofitable rural lines in Worcestershire, a large mileage of track has been dismantled since its heyday in the early 20th century (Figure 1). Unlike neighbouring counties in which the decline of the rail network began in earnest under nationalisation from the late 1940s, most scaling down of services within Worcestershire can be dated to the early 1960s (see Table 3).

Table 3: Construction and closure of Worcestershire's railways.

Line	Date opened	Date closed to Regular Passengers	Date of Final Closure	Remarks
Bristol – Birmingham	1841	- -	- -	Open
Oxford – Worcester	1850	- -	- -	Open
Stratford – Honeybourne	1859	1969	1976	
Worcester – Hereford	1860	- -	- -	Open
Severn Valley	1862	1963	1970	Reopened to steam
Malvern – Ashchurch	1864	1961	1963	Partial closure 1952
Ashchurch – Evesham	1864	1963	1963	
Bewdley – Tenbury Wells	1864	1963	1965	
Evesham – Redditch	1868	1962	1962	
Worcester – Leominster	1897	1952	1964	Partial closure 1952
Cheltenham – Honeybourne	1906	1960	1976	Planned partial reopening to steam

Source: Derived from Oppitz (1990) and Boynton and Widdowson (2000).

Final closure is attributable to the implementation of recommendations from the Beeching Report *Reshaping of British Railways*. Table 3 summarises the closure programme implemented across Worcestershire's railways. There are just two routes remaining in operation (Figure 1): the oldest north-south line in the east of the county connecting Bristol with Birmingham, including the 1850 Worcester loop; and the Hereford to Paddington line across the Cotswolds, opened in 1860, remaining as an east-west link between Evesham and Great Malvern. Redditch has retained its link with Birmingham because of its New Town status.

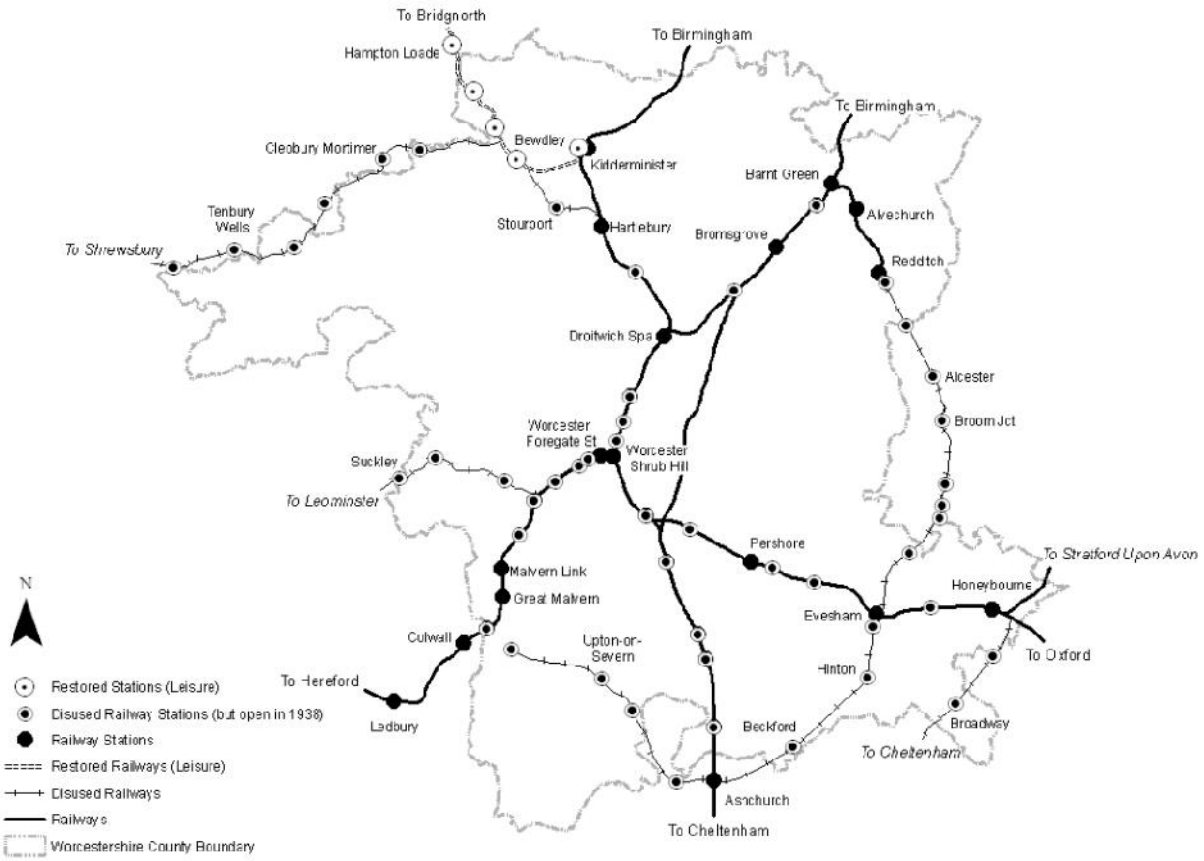

Figure 1: The rail network of Worcestershire, past and present.

With such an extensive mileage of disused track, old railways represent important wildlife corridors. For example, the closure of Honeybourne station in 1969, with its four platforms and seven signal boxes, provided an initial ruderal refuge for some flora. This has since become less significant due to partial re-use and a lack of vegetation management which has led to the shading out of species. In contrast, active management along the former Bewdley - Tenbury Wells route through the heart of the Wyre Forest SSSI has contributed to habitat diversity within an area already important for conservation.

c. Waterways and Canals

The first major canals in the county extended transport from the River Severn and were the Droitwich Canal, opened in 1771, and the Staffordshire and Worcestershire Canal (S&W), completed in 1772. The Worcester and Birmingham Canal (W&B) was completed in 1815, with an extension to Droitwich (the Droitwich Junction Canal) added in 1853 to secure trade from the salt industry based in the Salwarpe valley. By this time, railways had become a major competitor and so the costs of construction of the W&B were never truly justified (Hadfield, 1969). Both the Droitwich Barge and Droitwich Junction Canals were finally abandoned in 1939 after falling into disuse in the 1920s and

much of the maritime flora which had once flourished in the saline conditions slowly disappeared as the canals became clogged-up with an overgrowth of vegetation. Following the post-war nationalisation of canals in 1948, falling traffic led to proposals for closure of either the S&W or W&B canal. The S&W Canal Society was formed in 1959 to fight for its preservation, although both canals eventually survived intact. Selective and slow canal restoration has been underway in the county since the formation of the Droitwich Canals Trust in 1973. However, there has been a conflict of interests over restoration between canal enthusiasts who were keen to complete it, and those who wished to preserve important reed-beds which had developed (see WBP, 1999). The Worcestershire BAP states emphatically that the impact of regular boat traffic on reed-beds would be 'unacceptable'. Nevertheless, £11.5million funding was secured to rebuild locks, dredge the canal and overcome the major obstacles caused by the later construction of the M5 motorway and A449. To compensate for the loss of species feared by conservationists, adjacent reed-beds were created as part of the restoration process, where valuable species have been relocated.

Worcestershire also has three large reservoirs for water storage for the W&B canal, at Tardebigge near Bromsgrove and the Upper and Lower Bittell reservoirs near Barnt Green in the north-east extremity of the county. Upper Bittell is still an important ornithological site and has the most diverse assemblage of wetland plant species in the county, including some that are nationally scarce. There are also a number of smaller lakes and pools of which Great Pool in Westwood Park near Droitwich, formally part of a much larger estate, is outstanding. It is important for wild fowl and as a gull roost, containing two Red Data listed plant species.

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