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4. HEDGEROWS AS A RESOURCE

M.D. HOOPER

At the end of the 1950s, the national stock of hedges in England and Wales amounted to about 500,000 miles (804,672 km) (Locke, 1962), their character and distribution differing in different parts of the country (Pollard *et al.*, 1974). East Anglia had the fewest hedges, mainly of hawthorn *(Crataegus monogyna)*. There were more hedges in the mixed farming areas of the Midlands, where, although hawthorn was still dominant, elm (*Ulmus* spp) was locally frequent. The greatest density of most diverse hedges occurred in the pastoral areas of the west, with pockets of beech *(Fagus sylvatica)* hedges in the upland areas, eg Exmoor. During the last 25 years, many miles of hedgerow have been lost (Hooper, 1970*b*; Baird & Tarrant, 1973; Davis & Dunford, 1962; Cowie, 1970; Westmacott & Worthington, 1974; Williamson, 1967). The precise rates of loss have been the subject of discussion. In the period from 1945 to 1970, the average loss in England and Wales was 5,000 miles/year (8,047 km/year), with a peak rate, measured over a few years around 1965, approaching 15,000 miles/year (24,140 km/year). Although there were local variations, the impact of these losses has been greatest in eastern England, which initially had fewest hedges. It seems that lengths of hedgerows in the arable lands of eastern England have been halved since 1945.

1. Hedgerow trees

Like hedgerows themselves, populations of hedgerow trees have detectably decreased in recent years. Westmacott and Worthington (1974) showed that only 47% of hedgerow trees present in 1947 remained in 1972. In Huntingdonshire the percentage was 20%, and, in Herefordshire, 80%. From the 1965 census of hedgerow and park timber made by the Forestry Commission, it was estimated that the timber resource amounted to 946 million hoppus feet (34 million m^3), which, at the time, exceeded the volume of Forestry Commission woodlands.

Accepting that Forestry Commission woodlands contain quantities of young developing trees, the hedgerow timber resource is nonetheless appreciable. It is unlikely, however, to sustain itself without intervention, the larger numbers of overmature trees being matched by insufficient young trees (Locke, 1970).

From Table 5 it is clear that only in 1951, after the war period when hedgerow trimming had not been carried out effectively, was there a significant proportion of saplings for recruitment to older age classes. Even the ratio of 2:1:1:1 was held by the FC to indicate that the total volume of hedgerow timber would ultimately diminish through insufficient recruitment of young trees (Forestry Commission, 1953) and the most recent survey indicates an even distribution. There is, however, considerable variation between species, as is indicated by a small survey carried out in north Northamptonshire (see Table 6).

TABLE 5 Proportions of hedgerow trees in 4 age classes in census made by the Forestry Commission.

Dates of Census	Age classes: Saplings	Young	Middle Aged	Mature Trees
1955	24	29	24	23
1951	42	19	19	20
1942	24	30	22	24
1918	33	21	19	27

TABLE 6 Age class distributions of 3 hedgerow tree species in north Northants in 1951.

	Age classes: Saplings	Young	Middle Aged	Mature Trees
Ash	25	25	29	17
Oak	15	15	25	45
Elm	0	20	10	70

The relative abundance of the species varies in different parts of the country. In the 1951 FC census, the sampling frequency was too low to show fine details of species composition and an even lower sampling frequency was used in 1965-67 (Locke, 1970), omitting many areas with relatively few trees. Details in terms of volume are available for 1951 (Table 7).

TABLE 7 Distribution (%) by volume of different hedgerow tree species in England, Scotland and Wales when counted in 1951.

	England	Wales	Scotland
Conifers	6.5	12.5	9.1
Oak	31.4	31.2	24.2
Ash	12.6	11.4	21.6
Beech	8.2	4.4	25.7
Elm	21.3	13.3	2.0
Birch	0.3	1.0	0.5
Sycamore	6.0	14.8	11.6
Chestnut	0.4	-	-
Others	13.3	11.4	5.3

2. Purposes and evaluation

Hedges and hedgerow treees have many uses—to delimit areas of land and control the movement of farm animals, to provide shelter for crops and stock, to act as a timber resource, etc. However, their value for shelter within the UK should not be taken for granted. Although there is a considerable continental literature giving many instances where shelter has increased the profits from crop plants and animals, the evidence from British conditions is less persuasive (Marshall, 1967; Shepherd, 1970). On balance, experimental evidence suggests that shelter is only justified in exceptional circumstances, such as the protection of field crops of valuable bulbs in the south west of England and when seeking early yields of strawberries and raspberries. For example, Waister (1970) found an increase in yield averaging 27% for raspberries and a mean increase of 71% in the yield of strawberries attributable to shelter. In some Narcissus cultivars, the response to shelter was insufficient to justify providing new shelter, but, in other cases, increase in dry bulb yield might justify such provision (MacKerron & Waister, 1975). In conditions similar to those in Britian, Barloy *et al.* (1977) found that shelter decreased yields of rye-grass in some years and increased them in others, but shelter consistently increased the amounts of dry matter produced by maize yet decreased grain yields. The work of Russel and Doney (1970) also calls into question the value of shelter for farm animals, suggesting that hedges have been overvalued as a source of shelter. While exposed animals require more food to maintain body temperature and live weight than do sheltered animals, the cost of the extra food in monetary terms is small compared with the costs of providing shelter. Though hedges undoubtedly affect wind profiles and soil moisture, the effects are rarely of a magnitude in Britain to alter the patterns of erosion of even the most susceptible soils, the fen peats (Sneesby, 1970).

The potential timber value of hedgerow trees has been realized for a considerable period of time (eg Merthyr Report, 1955) and emphasized, together with amenity values, in the Countryside Commission's study of New Agricultural Landscapes (Westmacott & Worthington, 1974). However, despite this recognition, it is generally believed that costs are too high to justify a systematic approach, although there are signs that changes wrought in the landscape by Dutch elm disease may lead to a greater demand for positive action.

It has been alleged that hedges are a source of pest species and provide beneficial insects such as pollinators and predators of pests. Although there is evidence to support all these roles (Lewis, 1969; Deveaux, 1977; Karg, 1977; Mesquida, 1977), each being upheld in specific instances, it is still inadvisable to make generalisations (Pollard, 1971).

3. Resource for conservation

In addition to considerations of shelter and timber, which can be evaluated fairly readily in financial terms, hedges and hedgerow trees are held in high esteem by conservationists, especially those interested in birds, many of which nest in hedgerows and are therefore vulnerable to hedgerow losses. However, it seems that bird densities, in terms of individuals or species, reach a plateau when there are about 8 or more miles (12.9 km) of hedge per square mile (Hooper, 1970*a*). It seems that competition for nesting sites is not a factor limiting birds on farmland when there are many hedges, but, below a critical hedgerow frequency, numbers of bird species and individuals fall rapidly—an indicator of competition for nesting sites. While this interpretation has been criticized (Murton & Westwood, 1974), similar observations have been made in Brittany. In areas with small fields, there were 99 pairs of 40 species on 10 ha. Where fields were of moderate sizes there were 62 pairs and 40 species, whereas, in areas with large fields and low hedgerow densities, there were only 35 pairs of 23 species on 10 ha (Constant *et al.,* 1977). Also, in Brittany, Le Duc (1977) found that populations of the tawny owl *(Strix aluco)* only decreased when fields were enlarged beyond 5.8 ha, although, in this instance, limitation of food supplies (eg the bank vole, *(Clethrionomys glareolus)*) may be of more significance than competition for nesting sites. This evidence is not to deny that Murton and Westwood (1974) made a valid point that, on a larger scale, it is the populations of birds in woodlands which are of importance to the survival of the species in the long term. This observation is supported by individual studies on populations of blackbirds (Parslow, 1969), wrens (Williamson, 1969) and titmice (Krebs, 1971), as well as by Murton's own work on the pigeon.

Much of the work with birds contains an implicit assumption that all hedges are equal, but Moore *et al.* (1967) indicated that hedges with many species of trees and shrubs also have larger populations of birds. In following this theme, it was found that numbers of tree and shrub species in a hedge increased in a predictable manner with the age of the hedge (Hooper, 1970*c*). In hedgerow samples taken over a wide area of southern England, from Devon through Gloucester to Cambridge and north to Lincolnshire, the regression formula was age = (110 x no. spp) + 30, with a correlation coefficient of 0.85, indicating that some 72% of the variation in species richness could be accounted for by the factor of age alone (Figure 9). At least part of the remaining 28% of the variation may be caused by the wide geographic range from which the samples were taken. In a more limited area on the Huntingdon/Northamptonshire border, the correlation coefficient was +0.92 and the regression equation for predicting the age of a hedge from the number of species in a 30 yard length was age in years = (99 x no. spp) - 16. That is a 2 species hedge is 182 years old, a 4 species hedge is 380 years old and a 10 species hedge is 974 years old, but there is still variation not accounted for by the age factor, and it is improper to say that every 10 species hedge is 974 years old. We should say that 95% of 10 species hedges are between 800 and 1150 years old and that their mean age is 974 years. Clearly, a 7 species hedge could be the same age as a 10 species hedge, but it is extremely improbable that a hedge with 5 species or less in a 30 yard length is Saxon in origin. Though this relationship has been queried, the general rule of diversity increasing with age has been confirmed (Hewlett, 1973; Addington, 1978).

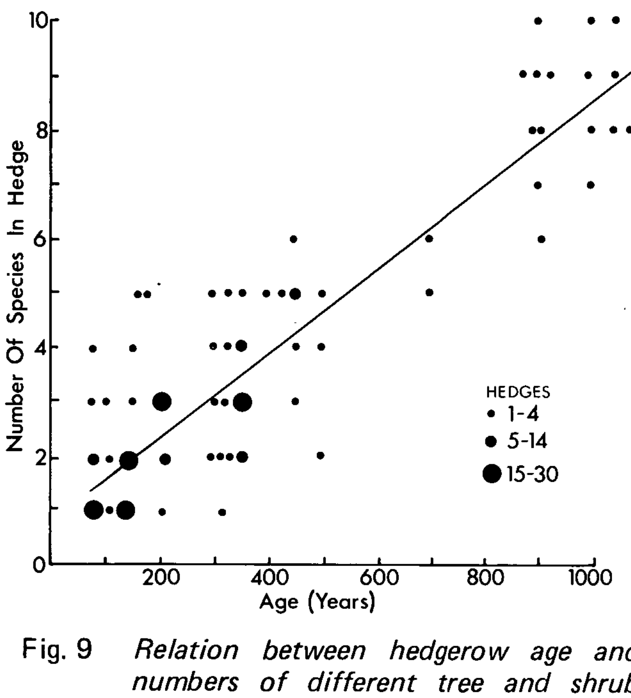

Fig. 9 *Relation between hedgerow age and numbers of different tree and shrub species in 30 yd (24.7m) lengths: the solid circles of different sizes give an indication of frequency distribution in a sample of 227 hedges assessed in Devon, Lincolnshire, Cambridgeshire and Northamptonshire (from Pollard* et al., *1974).*
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The association with herbaceous plants is less well known, but Pollard (1973) discovered that the presence of the woodland dog's mercury *(Mercurialis perennis)* and bluebell *(Endymion non-scriptus)* in hedges is limited to hedges which are, or were, associated with woodlands. From these examples, it is clear that much can be learnt about former land use from studies of the species within hedgerows–they are a source of useful information to the historical ecologist.

The benefits and alleged benefits of hedges and hedgerow trees have at some stage to be set against their costs. In England and Wales the total annual costs of hedgerows, taking into account the land they occupy which is therefore lost to commercial cropping, together with the maintenance costs, must be *c* £25 million. Is this acceptable?

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