

## The distribution of the Wild Service Tree, *Sorbus torminalis* (L.) Crantz, in the British Isles

P. ROPER

*South View, Sedlescombe, Battle, East Sussex, TN33 0PE*

### ABSTRACT

The results of a survey of the Wild Service tree, *Sorbus torminalis* (L.) Crantz (Rosaceae), in the British Isles initiated by the Botanical Society of the British Isles and the Biological Records Centre in 1974 are summarised and analysed. It is confirmed that the tree is a useful indicator of ancient woodland and hedgerows and that it shows a marked preference for two kinds of soil: those derived from clays and those derived from harder limestones. The reasons for this are discussed as well as the occurrence of the species on other soils. It is suggested that the very low rate of reproduction from seed is mainly the result of seed predation and that the northerly limits of its range are influenced by the lower rate of seed production in places with cooler, less sunnier summers.

The pattern of modern records in England and Wales reflects to some extent the part the tree has played in the life of the countryside over many centuries. It has been conserved and planted in some areas for its fruit, its wood and for ornament, but in other areas it is scarcely known by local people and held in little regard. Today it is usually much commoner in the first of these areas.

Areas where the Wild Service tree grows have been divided into three types: those where it is relatively abundant, those where it is scattered but widespread and those where it is rare. These often, but not always, show a correlation with the solid or drift geology. Mapping in this way also shows that there are large areas of England and Wales where conditions appear suitable but from which the tree has not been recorded.

### INTRODUCTION

In 1974 the B.S.B.I. and the Biological Records Centre, Monks Wood (B.R.C.), organised a national survey of the Wild Service tree, *Sorbus torminalis* (L.) Crantz (Rosaceae) and in the same year I became coordinator of the survey.

The purpose of the survey was given by the Biological Records Centre as follows:—

“Wild Service is typical of ancient and undisturbed lowland primary woodland. Whilst the *Atlas of the British flora* gives a good idea of its general distribution it may have been overlooked in some areas. It will be of great use in recognising primary woodland for conservation to associate its occurrence with individual woods, not just grid squares, and to trace its distribution in hedgerows.”

The initial phase of the survey was conducted by the distribution of standard record cards (see Fig. 1) from the B.R.C. to B.S.B.I. members, foresters, reserve wardens and others likely to have an interest. On return to the B.R.C. these were forwarded to me. Appeals were also made on radio, television and in the press to members of the general public which resulted in much further information not only on the distribution of the tree, but on its economic and folkloric roles. Many of these latter records came from people who were uncertain of the tree's identity, but leaves or fruit were sent for confirmation. Over 1000 records, both on cards and from other sources, were received, many from areas where the tree had not hitherto been reported and even after an interval of nearly 20 years records still occasionally arrive.

A comprehensive search of appropriate literature was also undertaken and this indicated areas where the tree had once occurred, and might still exist, but the data have not found their way into county Floras or other published material. In Pembrokeshire, for example, the tree was clearly well known to local people long before any formal record appeared in the botanical literature.

# B.S.B.I. Wild Service-tree Survey



*Sorbus torminalis* (L.) Crantz

## NEED FOR SURVEY

Wild Service is typical of ancient and undisturbed lowland primary woodland. Whilst the *Atlas of the British Flora* gives a good idea of its general distribution it may have been overlooked in some areas. It will be of great use in recognising remaining primary woodland for conservation to associate its occurrence with individual woods, not just grid squares, and to trace its distribution in hedgerows.

Apart from its distribution generally and in individual woodlands, notes on the size of the trees and on the presence of seedlings and suckers will be useful, but this information is not essential. Please send details of location of populations even if the additional sections are incomplete.

Return completed cards to:

B.R.C.,  
Monks Wood,  
Huntingdon

From where further cards may be obtained.

Grid Reference 

--	--	--	--	--	--	--	--	--	--

Vice-County 

--	--	--

Locality (name): ..... Date .....

Habitat (ring): Woodland Hedgerow Park Tree

Woodland/Park name: ..... Area .....Acres

Soil (ring): Clay Loam Sand Wet Dry

Distribution (ring): Scattered Local Boundary

Sketch of occurrence — show distribution (indicate North and Scale)

Number and size of trees\* —

Less than 3" diam.	3-6" diam.	6-12" diam.	More than 12" diam.

Measure at 5ft. from ground and put the number of trees in each size class in the appropriate column.

Reproduction (ring): Flowers Fruit Seedlings Suckers

Notes —

Recorder:

Address:

\* Do not include suckers unless established as separate trees.

FIGURE 1. The standard record card used in the survey of the Wild Service tree.

## GEOGRAPHICAL DISTRIBUTION

The Wild Service almost certainly entered Britain from the Continent after the last Ice Age, although it was probably one of the later arrivals, and spread north and west along river valleys (avoiding wetlands), or through the forests with which much of the country was covered. Its current altitudinal limit in Britain is around 300 m and it has forked east and west at the southern end of the Pennines and skirted the higher hills of the West Country and Wales. The northern advance, so far as modern records show, continued to the southern Lake District in the west and, following the Magnesian Limestone, to North Yorkshire in the east.

Deciding how best to present the geographical distribution of the Wild Service has not been easy. Many prefer a national or Watsonian vice-county dot map method, but this is only useful for giving a broad indication of the distribution across the country or in a vice-county. It also gives a potentially misleading picture of a species that is occasionally found at quite high densities, but also occurs as isolated plants in widely scattered locations. At first glance the species seems to be associated with certain geological areas, but closer inspection reveals that this presents only a partial picture with some baffling anomalies. The best explanation of its distribution in the wild is derived from an analysis of its occurrence in relation to both solid and drift geology coupled with as much data as one can obtain about socio-historical factors. The tree is widespread on the Weald Clay of Kent, Sussex and Surrey for example, but almost absent from an area east of Tonbridge where the Weald Clay is overlain by sand and gravel. Further east still it reaches one of its highest densities in an area where its fruit were once in much demand as food (Hanbury 1770; Maynard 1925; Pratt 1854–57; Roper 1975) and where it is still widely known by a dialect name (Chequer Tree) and cultivated to a greater extent than elsewhere. Its economic history, which has a considerable bearing on its present distribution, is reflected in its vernacular name 'Wild Service'. (Originally the species was known simply as the Service – in many alternative spellings – and Wild Services were simply those growing wild rather than in gardens or orchards. The usage is the same as in terms like 'wild blackberries' or 'wild boar'. When *Sorbus domestica* L. was introduced in the 17th century it was called '*sorbus legitima*' and this was translated as 'true service' to indicate that it was the *Sorbus* to which classical authors referred.)

I have based my observations largely on the ten mile (1:625000) solid and drift geology maps published by the British Geological Survey. The maps give a broad indication of the type of substrate and in some instances provide a very useful picture. However, drawing too many inferences from cartography at this scale is unwise and as accurate a picture as possible of local conditions should be obtained before reaching any firm conclusions on a particular site. The Wild Service, although favouring particular habitats and areas, will survive almost anywhere in lowland Britain, but this is quite a different matter from its being able to establish itself without any help from man and to reproduce successfully.

Bearing all these provisos in mind I have illustrated the present distribution by considering the more or less discrete areas in the British Isles where the species has been recently recorded (Figs 2 and 3) and its relative abundance within these areas. This distribution may reflect recording activity to some extent, but generally there seem to be other reasonably satisfactory explanations for the presence of the species and its density in a particular area. Equally interesting is its absence from large areas that appear suitable and often lie adjacent to places where it is relatively abundant.

#### 1. WEST CORNWALL

There are a few scattered records from the area west of Bodmin. All are confined to the Lower Devonian and are often associated with the lower reaches of river valleys. Britain's most westerly record is from the Loe Pool south of Helston, although there is a planted tree at Castalack in Penwith.

#### 2. CAMEL VALLEY, CORNWALL

The area surrounding the Camel estuary and the Camel river and its tributaries in central northern Cornwall had, in the recent past, a concentration of Wild Service trees of which a few remain (Hamilton Davey 1909; Thurston & Vigurs 1922). The area is rather complex geologically, but most locations are on the Upper and Middle Devonian formations.

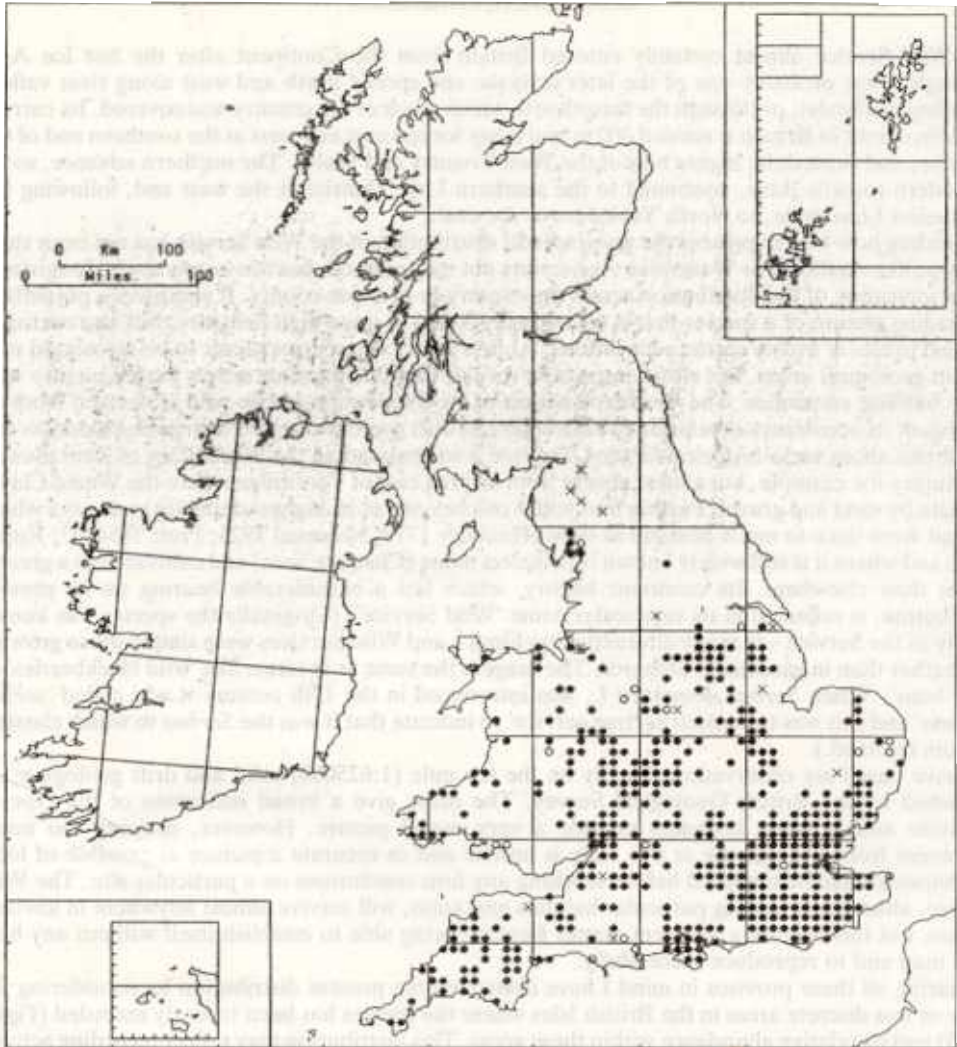


FIGURE 2. Distribution by 10-km squares of the Wild Service tree in England and Wales. This map, though useful, presents a potentially misleading picture due to the fact that some 10-km squares may contain only a single tree whilst others may have hundreds often growing together in suitable areas (cf. Fig. 3). ● 1950 onwards, ○ before 1950, × introductions. Planted trees in Irish gardens have not been included as there are few precise locations.

### 3. LOWER TAMAR VALLEY

The tree is widespread along the river Tamar that divides Devon from Cornwall in the south. In some places it has spread away from the river, in particular on to the soils derived from the Culm Measures of the Upper Carboniferous in south east Cornwall. Old records from the south east of Plymouth can be considered part of this grouping.

### 4. CENTRAL & NORTH DEVON AND NORTH EAST CORNWALL

The Culm soils that stretch right across this area have a thin scatter of Wild Services, often in hedges or on roadsides, although they are absent from a large tract of country west of Tiverton.

The association with the Culm Measures is marked and there are very few records from the

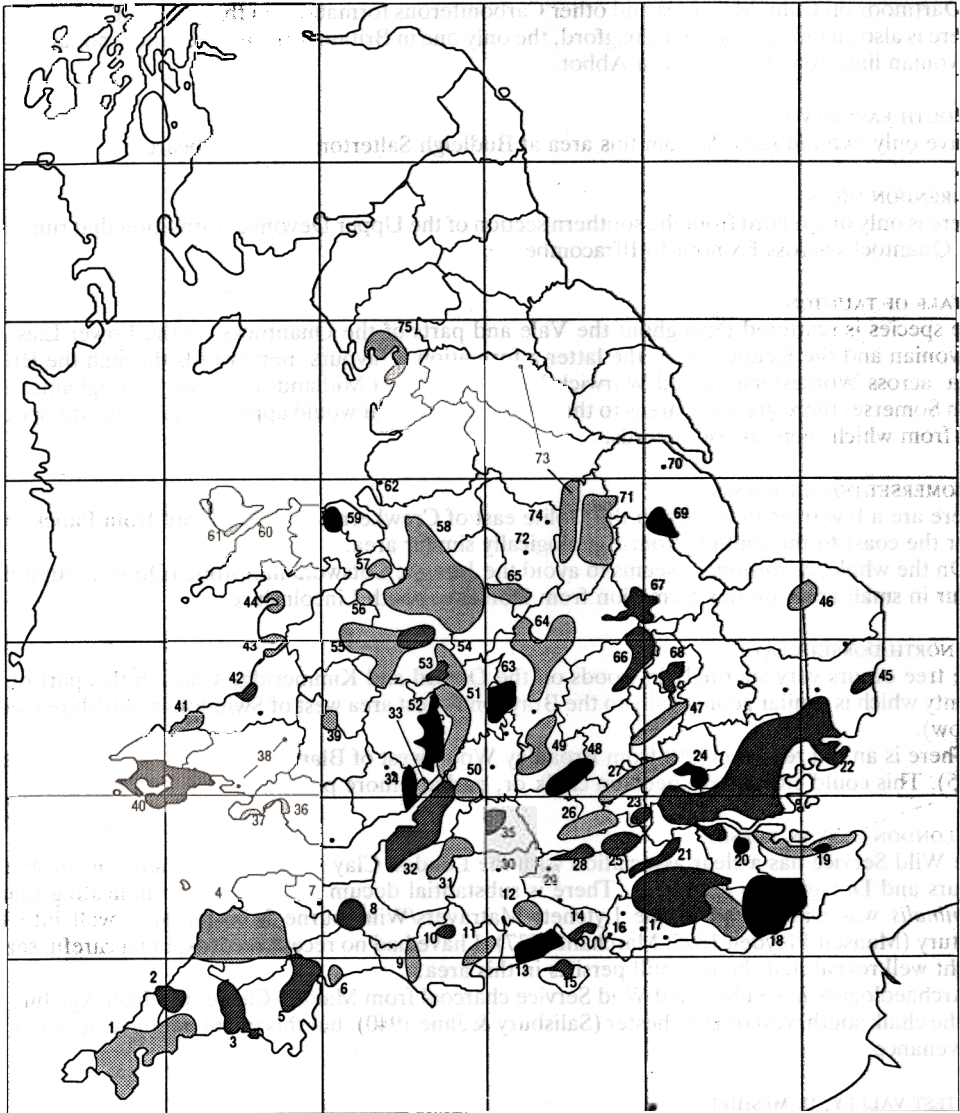


FIGURE 3. Relative density of distribution of the Wild Service tree. The map shows each of the areas covered in the text with isolated records as single dots. As well as these areas it is important to note that there are many apparently suitable places where the Wild Service has not been recorded. Boundaries are those of Watsonian vice-counties. The numbers refer to the sections in the text. ■ Areas where the species is generally not infrequent and, in places, reaches its highest concentrations. ▨ Well-established but at lower concentrations. ▩ Vulnerable or, in a few cases, apparently recently extinct (widely scattered, mainly as isolated trees with data often based on a high proportion of old records).

extensive formations of granite, Middle Devonian or New Red Sandstone that lie adjacent. The explanation is probably that the soils of the Culm are mainly clayey and water retentive, whereas the others drain more freely.

##### 5. SOUTH EAST DARTMOOR

This is perhaps an extension of 4 above. There is a concentration of locations to the east and south

of Dartmoor on Culm Measures and other Carboniferous formations in this still well-wooded area. There is also an old record from Chagford, the only one in Britain from granite, and a population c Devonian limestone near Newton Abbot.

#### 6. SOUTH EAST DEVON

I have only two old records from this area at Budleigh Salterton and Aylesbeare.

#### 7. BRENDON HILLS

There is only one record from the southern section of the Upper Devonian formation that runs from the Quantocks across Exmoor to Ilfracombe.

#### 8. VALE OF TAUNTON

The species is scattered throughout the Vale and parts of the Quantocks on the Lower Lias, the Devonian and the Keuper Marl, the latter a formation it favours, northwards through the Bristol area, across Worcestershire and Warwickshire to the north Midlands as far as Nottinghamshire.

In Somerset there are some areas to the south and east that would appear suitable for the species, but from which there are no records.

#### 9. SOMERSET/DORSET JURASSIC

There are a few trees in woods on the Oolite east of Crewkerne. An old record from Puncknowle near the coast to the south is from a geologically similar area.

On the whole, *S. torminalis* seems to avoid the Jurassic Cotswold limestone (Oolite), but it does occur in small areas on this formation from Dorset to south Lincolnshire.

#### 10. NORTH DORSET CLAYS

The tree occurs very sparingly in woods on the Oxford and Kimmeridge Clays in this part of the county which is similar geologically to the Braydon Forest area west of Swindon in Wiltshire (see 35 below).

There is an old record (1799) from Broadley Wood west of Blandford Forum (Mansell-Pleydell 1895). This could either have been on chalk or, perhaps more probably, clay with flints.

#### 11. LONDON CLAY IN DORSET

The Wild Service has a clear association with the London Clay almost everywhere this formation occurs and Dorset is no exception. There is substantial documentary evidence indicating that *S. torminalis* was widespread in the Lytchett Matravers/Wimbourne Minister area well into this century (Mansell-Pleydell 1895; Marchant 1937). I have had no recent records, but a careful search might well reveal that the tree still persists in this area.

Archaeologists have identified Wild Service charcoal from Maiden Castle, the Iron Age hill fort on the chalk south west of Dorchester (Salisbury & Jane 1940), but this might not have been of local provenance.

#### 12. TEST VALLEY, HAMPSHIRE

There are scattered records from the valleys running from Redlynch and Alderbury south east of Salisbury eastwards to the River Test and in the Test Valley itself south of Romsey. These are largely associated with the London Clay and earlier Tertiary formations, although one site is on chalk south west of Broughton and in the area south of Romsey the London Clay is much overlain with alluvium, gravel and river terrace deposits.

#### 13. NEW FOREST

The distribution of the Wild Service in the New Forest is one of the most difficult to interpret and it perhaps reflects the way in which the forest has been managed as well as other factors. The trees are concentrated in three areas:-

a. The south east of the Forest between the Beaulieu River and Lymington. This is partly on the Tertiary period Hampstead Beds and Bembridge Marls and partly on the overlying glacial gravels and sands from the more recent Quaternary period.

b. An area between Totton and Beaulieu Heath on the eastern fringes of the Forest. This is largely

on the complex series of Tertiary gravels and clays comprising the Barton, Bracklesham and Bagshot Beds that overlies the London Clay.

c. The area around Cadnam, again on the eastern outskirts of the Forest. Geologically this is similar to b above.

The tree occurs on the clay soils over the Hampstead Beds and Bembridge Marls in the northern part of the Isle of Wight and here it clearly flourishes on this type of terrain. The Barton, Bracklesham and Bagshot Beds, however, cover not only large areas of the New Forest, but extend westwards nearly to Dorchester and over many square kilometres where Surrey, Hampshire and Berkshire meet. The Wild Service is absent, or very rare, in all these places although there are several records from the formation to the east of Southampton Water and in the Pamber Forest area around Silchester on the Hants./Berks. border.

#### 14. SOUTH EAST HAMPSHIRE

There is a well-defined grouping of Wild Service in south east Hampshire almost entirely on soils associated with the London Clay, the Barton, Bracklesham and Bagshot Beds and overlying glacial gravels. Some of these trees are probably relicts from the Forest of Bere.

#### 15. ISLE OF WIGHT

The tree has been recorded, at one time or another, from many woods in the northern part of the Isle of Wight and it still grows there, particularly beside estuaries and where there are low cliffs with landslips. All these locations are on the clay soils derived from the Tertiary Oligocene as in the south eastern New Forest.

There is one record from the Lower Greensand north west of Sandown in an area of complex post-glacial geology. It was quite close to here at Nunwell that Sir John Oglander, in the early 17th century, "planted above a hundred young elms and ashes, some chestnuts and service berries in the grove of my house" (Bamford 1936).

The fruit also used to be sold, mainly to children in Ryde (Bromfield 1856), and it would therefore seem that the distribution has been modified by human activity on the island, although it is undoubtedly a native plant.

#### 16. WEST ITCHENOR, WEST SUSSEX

The tree has long been known from a location by Chichester Harbour where glacial gravels overlie London Clay. This is some 16 km from the nearest locations in Hampshire and 32 km from the substantial populations in the Weald.

#### 17. WESTERN WEALD

The Wild Service has one of its strongholds in the Weald of Kent, Sussex and Surrey and there are concentrations on both the eastern and the western sides. In the west it is largely confined to the Weald Clay but spills over on to the Hastings Beds between Haywards Heath and Horsham and here and there on to the Greensand. There are two records from the chalk at Findon and near Amberley, but the status of these needs further investigation.

In the west, records stop abruptly at Petworth, although the Weald Clay continues for some 24 km along the Rother Valley.

The tree is also relatively scarce on the Weald Clay between Pevensey and Chailey in Sussex and between Yalding and Hildenborough in Kent. In the latter instance it is missing from the extensive river terrace gravels associated with the Medway that overlie the Weald Clay.

#### 18. EASTERN WEALD

There is a strong concentration of Wild Services in the area north west of the Romney Marsh between Ashford in Kent and Robertsbridge in East Sussex. They grow on Weald Clay and the Wadhurst and Guestling Clays of the Hastings Beds, but are almost entirely absent from the sandstones and other light soils. I have searched many suitable looking woods on Gault Clay and on the clayey soils overlying the Purbeck Beds in areas close to strong Wild Service populations without locating a single tree, although the Midland Hawthorn, *Crataegus laevigata* (Poiret) DC., another indicator of ancient woodland that often grows alongside Wild Service, is abundant in these places.

This Wealden group of records spreads, at a thinner density, southwards and westwards almost to the coast at Hastings and Fairlight and to the Ashdown Forest area.

It is in this part of the Weald that the species is still widely known as the Chequer Tree, as it is in some other parts of south east England, and it has entered into the life of the rural community to a greater extent than anywhere else in Britain. There are several farms, houses and one wood named after the species and there is a clear association with the many Chequers Inns in the area (Maynard 1925; Roper 1975). The fruit, known as Chequers, were widely eaten within living memory (Pratt 1854–57 and D. Baird *et al.*, pers. comm., 1975) and were probably used to make a cider-like drink, hence their association with public houses. Because of this the tree is frequently planted in the area and has clearly been given preferential treatment that it has seldom received elsewhere in woods, hedges and on roadsides. The social history of the tree here and elsewhere in Britain and Europe has been covered by Roper (1975, 1987).

#### 19. BLEAN, KENT

The species is plentiful in woods on the London Clay in the Blean area of north Kent. There are also a few records from the Sittingbourne and Rochester area of the London Clay and its underlying Tertiary beds further to the west, and older references (Hanbury & Marshall 1899) indicate that the trees were probably more widespread in the north Kentish clays.

#### 20. SOUTHFLEET, NORTH WEST KENT

An area where the species occurs covering several square kilometres has been on record since the 16th century – “in Kent it groweth in great abundance, especially about Southfleet and Gravesend” (Gerarde 1597) – and it is still flourishing. Some trees grow on London Clay or associated Tertiary gravels, but others appear to be on clay with flints or chalk. Careful investigation of individual sites and the history of land management would be needed to establish why the trees are found here but are absent from similar places nearby.

#### 21. SURREY COMMONS

There are scattered records from the London Clay commons of central and west Surrey from Wimbledon to just north of the Hog’s Back. The species closely follows the narrow belt of clay between the sands and gravels to the west and north and the chalk to the south.

#### 22. LONDON AND ESSEX

This is a larger geographical area than many considered here, but records spread in a continuum, with some local concentrations, from the Essex coast to the borders of Buckinghamshire and Berkshire in the west and Kent and Surrey in the south. Virtually all are associated with London or Boulder Clays and the gravelly soils that overlie them. Many represent survivors, or descendants, of trees from the large forests of Essex and Middlesex which encompassed the smaller forests of Epping, Hatfield and others.

The earliest record I have from anywhere in Britain (other than the report of Iron Age Wild Service charcoal from Maiden Castle, Dorset) is from Havering Park, Essex (enclosed as a royal park in the Middle Ages). In 1260 two Wild Service trees (described in the text as “alyeras”) were brought from the park to the Tower of London for the manufacture and repair of crossbows, a purpose for which the wood was renowned. Owing to a mistranslation of the Latin text these trees have been considered by some authors to be hawthorns, but this is incorrect.

Today there are concentrations of records from the Basildon area and to the south east of Chelmsford and these are associated with the Tertiary and Quaternary gravels overlying the London Clay. It has also been noted that trees here tend to be associated with places where the water supply is increased by the effect of differential percolation through the bedded strata.

In Epping Forest the trees grow mainly on London Clay, but north eastwards from Chipping Ongar to the Ipswich area records are scattered across the Boulder Clay, or its associated gravels. It is curious that, although the Boulder Clay sheet continues much further to the north, Wild Service records become very scattered indeed beyond the Suffolk/Essex border. I am inclined to think this is due to land and forest management over the last several thousand years rather than natural factors and in earlier times the Wild Service could have been much more widespread in East Anglia.

To the west the tree is still remarkably well-distributed within the London Clay triangle of north



west London, often in urban situations such as on Hampstead Heath and in Ken Wood (Gilmour 1972). There are also scattered records from south east London and an old record from Wimbledon Common, again on London Clay.

If these London and Essex records are plotted on a Quaternary geology map, their absence from hundreds of square kilometres of glacial river terrace deposits along the valleys of the Thames, the Lea and the Wey is very marked. It is remarkable that there are sufficient trees left to give such a clear indication of the ecology of the primaevial wildwood that once covered what is now one of the world's largest cities. It also highlights the Wild Service's ability to survive in unfavourable circumstances for long periods.

#### 23. SOUTH EAST BUCKINGHAMSHIRE

In the well-wooded area around Burnham Beeches that lies in the rectangle between the M40 and the M4, and the A412 and the Thames at Cookham, there are a number of records from the river terrace deposits that the species seems to avoid elsewhere. Careful investigation of individual sites might provide the reason as might the history of woodland management in the area.

#### 24. SOUTH EAST HERTFORDSHIRE

To the south west of Hoddesdon and the east of Welwyn, with an outlier west of Hatfield, there is a concentration of records in a county where the species is otherwise rare. Most are on Boulder Clay or associated gravels, with a few on London Clay.

In the 18th century the Wild Service tree was well-known in Hertfordshire: Miller (1768) said "in many parts of Hertfordshire there are large trees now growing". He may have been referring to the area north of Barnet where the tree still occurs in some quantity or to south east Herts. (Harper 1981). 92 years earlier M. Cook was planting them for the Earl of Essex on his estates at Hadham and Cassiobury. Apparently they fruited well on the Boulder Clay at Hadham, but at Cassiobury (Cook 1676) "we have them on a sharp gravel, the Fruit naught, and the trees bear very badly".

#### 25. WINDSOR FOREST, BERKSHIRE

There is a strong concentration of the trees in the London Clay area of Windsor Forest, Berkshire. The trees are closely associated with the clay, avoiding the river terrace deposits to the north and the gravelly or sandy Tertiary beds to the south.

#### 26. SOUTHERN CHILTERN

From the Reading area north across the Chilterns there are scattered records of the species over a 12 × 18 km. well-wooded, geologically complex area typified by clay with flints, river terrace deposits and other gravels cut by rivers down to the underlying chalk or, on the southern fringe, the London Clay. As with the trees in south east Buckinghamshire (see 23 above), a study of individual sites is needed to determine the conditions that favour the species in this area.

#### 27. CENTRAL AND NORTHERN CHILTERN

There are very few records from the more elevated parts of the Chiltern range in Hertfordshire, Buckinghamshire, Oxfordshire and Berkshire. As far as I can determine the trees are confined to the clay with flints cappings on the hills.

#### 28. PAMBER FOREST, HAMPSHIRE/BERKSHIRE BORDER

There is a group of records from the wooded area, formerly Pamber Forest, around Silchester on the Hants./Berks. border. They are mainly on Quaternary sands and gravels that overlie the London Clay.

The Tertiary formations running from the Kent, Essex and Suffolk coasts and with which the Wild Service is so closely associated reach their westerly limit immediately beyond Newbury before reappearing to the south of the chalk. There is one record from the area west of Newbury, then a long gap before the species is found again in any quantity in the Cotswolds near Bradford-on-Avon.

#### 29. HAMPSHIRE CHALK

The Wild Service is recorded from three places on the Hampshire chalk, one of which, near Hurstbourne Tarrant, possibly refers to a clay with flints site. The locations are widely separated and

untypical and, in my view, do not constitute adequate evidence that the species once grew more widely on chalk soils under British conditions.

### 30. SOUTH WILTSHIRE

The only modern record I know of from v.c. 8 is of a Wild Service in a hedge between Wilsford and Beechingstoke. This is on the Gault Clay in the Avon Valley south east of Devizes. If the tree is growing on Gault, it is the only current record of which I am aware from a formation which, in many respects, seems well-suited to its requirements.

Aubrey (1685) said that "cervise-trees" grew at the foot of Heddington Hill and at Whitesheet (I presume the one at Mere) and the trees here may have grown either on Gault Clay or on chalk.

### 31. WILTS./AVON BORDER

There is a concentration of records, mainly from the Greater Oolite and Cornbrash, but spilling over on to the Oxford Clay along the Cotswold line from Castle Combe to Frome and roughly associated with the old forest of Selwood. Most of the records are from the lower lying parts of the River Avon catchment, but otherwise seem to have little in common. They lie in the counties of Wiltshire, Avon and Somerset although they only extend over an area of some  $32 \times 12$  km.

There are outliers to the east on an area of Kimmeridge Clay and the Lower Greensand near Calne, and to the south on the Upper Lias near Evercreech.

### 32. WESTERN AVON

The Wild Service is widespread and sometimes fairly abundant from the Mendip Hills, through the Bristol area and northwards along the Vale of Berkeley. It occurs on the Keuper Marl, the Upper and Lower Lias and the Upper and Lower Carboniferous formations, in the latter instance sometimes on the limestones that make up much of the Mendip Hills and the Avon Gorge. In this it displays its two main habitat preferences: for open and often steep rocky areas and for nutrient rich, heavy clays.

Towards the north of the Vale of Berkeley the concentration of records increases in an area of complex Silurian and Cambrian geology. Similar areas occur across the River Severn to the north and these are more fully considered in 52 below.

### 33. FOREST OF DEAN

As Rackham (1986) has pointed out, the Forest of Dean was subjected to management regimes, largely in the 19th century, that have altered the existing tree composition almost beyond recognition. This is reflected in the virtual absence (very unusually for our ancient lowland forests) of the Wild Service. There are only a few near Brean and more on the outskirts of the forest in the Cinderford area. These belong, however, to the group of records running northwards away from the forest on the Silurian formations of the Malvern Fault.

Wild Services grow on the cliffs bordering the Severn Estuary at Chepstow and Lydney and in the Lower Wye Valley, but these again are not strictly part of the Forest of Dean.

### 36. LOWER WYE VALLEY

The Carboniferous Limestone of the Lower Wye Valley is renowned for botanical diversity and boasts a large number of *Sorbus* species. Wild Services are found in the open rocky woods and on cliffs from the Goodrich area to Chepstow, though not on the stretch where the river flows through Devonian strata. This and Weston Big Wood near Weston-super-Mare are the only areas in Britain from which the hybrid (*S. × vagensis* Wilmott) between the Wild Service and the Whitebeam, *Sorbus aria* (L.) Crantz, has been recorded.

There are two Wild Service records close together from Llanfihangel Ystum Llywern in the valley of the River Trothy in Gwent. This site is only 10–12 km from the River Wye, but the tree is found almost nowhere else in the very extensive Lower Devonian countryside through which much of the upper River Wye and its tributaries run, although it has its densest populations in some of the woods immediately adjacent to the eastern boundary of this area and reappears beside the Wye on the Wenlock Series in Radnorshire (Powys) (Anon. 1976).

## 35. FOREST OF BRAYDON, WILTSHIRE

Between Swindon and Malmesbury in north western Wiltshire there is a concentration of records from the woodland remnants of the Forest of Braydon, which lie mainly on the Kimmeridge Clays of the Upper Jurassic.

In general the species seems to be commoner on Oxford Clay and it is of note that the 50 km gap in records between Braydon and Wychwood on the Oxon/Bucks. border is largely across an area of the Thames Valley where the clay is overlain by river terrace deposits similar to those from which the tree is absent in south west London and the Medway Valley, Kent.

## 36. SOUTH WALES

There are very few current records for South Wales and if the species has ever been commoner there it could well have been largely restricted to the coast between Cardiff and the Gower and the immediate hinterland.

Many *Sorbus* species grow on cliffs close to the sea and their fruits fall on to the beach or into the water, sometimes in considerable quantities. They can also be washed down rivers into estuaries and must be able to travel for some distance by this means. From the beach to the cliffs is only a short distance for a bird or fructivorous mammal and some coastal colonies may have originated through seed being spread in this way rather than by overland routes.

Outside the Gower there are a few old records of probably planted trees in the Swansea area and another at Wenvoe south west of Cardiff. If they were indeed planted they could, as in some other places, have originated from wild trees in the area.

## 37. GOWER PENINSULA

There are several trees in the woods along the limestone cliffs on the southern side of the Gower Peninsula growing in similar circumstances to those in the Wye Valley, the Avon Gorge and the Arnside area of Westmorland.

Inland the Gower is almost covered in a sheet of Boulder Clay and there are no *S. torminalis* records.

## 38. CARMARTHENSHIRE

V.c. 44, now part of Dyfed, has records from three scattered locations that imply that the tree was once more widespread in lowland Wales. It is found at two sites in the heavily wooded Cwm Mawr valley on cliffs of Pennant Sandstone capped by Boulder Clay into which suckers are spreading. Further west there are five trees on a wooded estuarine Red Sandstone cliff of the Lower Devonian (also capped with Boulder Clay) north of Laugharne.

Well inland at Poor Man's Wood, near Llandovery, there are three trees in an oakwood that now belongs to the Dyfed Wildlife Trust on clay derived from rocks of the Upper Ordovician.

## 39. RADNORSHIRE AND BRECKNOCKSHIRE, POWYS

The Wild Service grows on cliffs of the Wenlock Series of the Silurian bordering the Wye to the south of Builth Wells and further upstream on similar cliffs by the River Ithon in v.c. 43, Rads. (now part of Powys). It is also found on this formation in Brecs. (v.c. 42) and further to the north. Further search will almost certainly reveal more locations in suitable lower lying parts of Wales, both inland and on the coast. In many cases plants have been kept small due to grazing by sheep, but several of these sites have now been fenced and the trees should now be able to grow to their full size.

## 40. SOUTH PEMBROKESHIRE

The Wild Service was first recorded formally from Pembs. (v.c. 45) only in 1971. Since then it has proved to be fairly widespread and even boasts a unique local name – maple cherry.

The majority of trees grow in oakwoods on the low cliffs or banks bordering the extensive estuarine system that runs out to sea at Milford Haven. The rock here is mostly Old Red Sandstone of the Lower Devonian and these groups of trees are analogous to those associated with some of the south Cornish estuary systems.

Further coastal records occur on the Coal Measure sandstones on the western side of Carmarthen

Bay and there are a few inland records from this geologically very varied peninsula north to the Newgale area (Anon. 1976).

Davis (1976) has observed that in this area the trees only fruit well after warm summers, confirming that it is a thermophilous species at the limit of its range in Britain. The same has been observed elsewhere in the west and the north in this country and elsewhere in Europe (Büsgen 1929; Conwentz 1895; Termena 1972). In the south of England the tree usually fruits well, but will frequently miss one, and sometimes more seasons, another phenomenon well-known in trees that prefer a warmer and sunnier climate than our own.

#### 41. TEIFI AND NEVERN, DYFED

There are small Wild Service areas in woods adjacent to the lower reaches of the rivers Teifi and Nevern north of the Mynydd Preseli in northern Pembs. (v.c. 45) and southern Cards. (v.c. 46), now both in Dyfed.

The soils here are derived from Upper Ordovician rocks of the same type as those at Poor Man's Wood, Llandovery (see 38 above).

#### 42. ABERAERON, DYFED

There is a scatter of records from the low-lying area inland from the coast at Aberaeron in Cards. (v.c. 46), mostly on steep, wooded river banks.

The soils here are derived from the Llandovery Series of the Silurian and cover much of western central Wales which is mainly free of boulder Clay and other drift. One record is from a hedge at Llangybi over 15 km from the coast and in a tributary valley of the River Teifi. The location is, however, still on the Silurian and falls within the grouping.

#### 43. DOVEY VALLEY (CWM DYFI)

There is one record of a plant at the top of a steep, rocky, wooded slope in a valley off the main Dovey Valley between Machynlleth and the estuary. The whole of this area, as with 41 above, is on the Llandovery Series of the Silurian. The site is just in v.c. 47, Monts. (now part of Powys), and quite different from those in the east of the vice-county (see 56 below)

#### 44. BARMOUTH

The most northerly of the west central Wales populations are the few trees that grow in steep, rocky woods on Cambrian formations close to the Mawddach estuary.

#### 45. NORTH EAST SUFFOLK/SOUTH NORFOLK

There are a few records from the area to the south west of Southwold of trees growing on soils derived from the underlying Boulder Clay. One correspondent sent me leaves from the Southwold area and said he knew at least five sites for the species in the neighbourhood.

R. Mabey (pers. comm., 1976), has noted that members of the Yoxford Women's Institute knew that the tree grew wild in their district. This indicates that there may be more sites for botanists to discover in the area.

There is one outlier of this group of records well inland near Mendlesham, another near Hempsall south of Norwich (Withering (1818) said the trees grew at Bath Hills near Bungay not far from here) and a garden relict north east of Bury St Edmunds. The Wild Service has been quite widely planted in the past for ornamental and utilitarian purposes. The source of such plants is often local and older garden trees may indicate a wild population nearby.

Most of the woodland cover in East Anglia was removed long ago but a map in Rackham (1986) shows that this north east Suffolk/south Norfolk Wild Service area is broadly congruent with an area where villages still had their own woods at the time of the Domesday Survey in the 11th century. This area stretched north to the Foxley district in Norfolk (see 46 below).

#### 46. CENTRAL NORTH NORFOLK

There are several Wild Services in Foxley Wood on the Boulder Clay sheet near Themelthorpe (E. Norfolk, v.c. 27) and a recent record from a wood at Mileham (W. Norfolk, v.c. 28), both to the north east of Dereham. Older records from the neighbourhood indicate that these are survivors from an earlier, more widespread woodland population.

## 47. SOUTH MIDLAND LOWER GREENSAND

There are five Wild Service locations along the Lower Greensand ridge that runs from south western Cambridgeshire to Leighton Buzzard in Bedfordshire. Although the correlation with the solid geology seems too close to be accidental, most trees are in fact on Boulder Clay and elsewhere the tree does not occur on soils derived from the Lower Greensand. Examination of the 1:50000 Ordnance Survey map shows that this ridge is more heavily wooded than the surrounding plain, perhaps because the countryside was less easily cultivated due to its hilliness. The survival of the Wild Service is almost certainly due to this rather than to the underlying solid geology.

## 48. BERNWOOD (BUCKINGHAM/OXFORDSHIRE BORDER)

There is a concentration of records of trees over the narrow, 16 km stretch of countryside from the Quainton, Bucks. area to just south of Oxford and associated with the ancient Forest of Bernwood.

None of this area is covered in glacial drift and most of the sites are in woods on Oxford Clay, with a few associated with the Greensand/Portland Beds complexes of the Kimmeridge Clay.

## 49. WYCHWOOD, OXFORDSHIRE

Before deafforestation, which followed enclosure in 1857, Wild Service berries from the Forest of Wychwood used to be sold in Burford market and probably elsewhere locally.

The tree continues to be found at low concentrations in some of the few remaining woodlands, nearly all of which are on soils deriving from the rather complex Oolite and Upper and Middle Lias, that typify the Cotswold belt. The tree seems not to be found on the adjacent Lower Lias and is scarce on this formation everywhere in the south and west and virtually absent from it in the north and east. On a site near Kineton in Warwickshire on the Lower Lias some 32 km north of Wychwood, the tree appears to be on the overlying Boulder Clay.

Scattered records occur westwards towards Cheltenham and the Vale of Evesham and there were once, no doubt, trees in the woodlands throughout the whole of this area.

## 50. CIRENCESTER/STROUD

There is a somewhat isolated group of records of trees in Cirencester Park some of which are planted, and records from the Tetbury and Painswick areas in the Cotswolds. These locations are not dissimilar to those cited in area 48 above and again one can surmise that the tree was once more widespread locally. The fact that there is a unique Cotswold name for the species – 'lizzory' or 'lezzory', clearly derived from 'alazier', one of the Old French words for the species (Boulger 1908) – lends support to this hypothesis.

## 51. VALE OF SEVERN

There are records of the tree, mainly from the Keuper Marl but also on the Lower Lias near Pershore, from Gloucester to Stourport. Sometimes the tree grows on cliffs by the river, but more often in woods and sometimes hedgerows nearby.

## 52. MALVERN

The Malvern and Suckley Hills and their southward extension to the outskirts of the Forest of Dean are one of the strongholds of the Wild Service in Britain and are clearly associated with the complex Silurian strata of the Ludlow, Wenlock and Llandovery Series that go to make up these hills. On the spur of this formation that runs north west towards Hereford the Wild Service reaches one of its highest densities in Britain with up to 125 trees per hectare in Haugh Wood near Mordiford. Stoke Edith Wood, also in this area, is the type location and the source of the only British records of the *British Red Data Book* moth, *Stigmella torminalis* (Wood), whose larvae, like those of several other moths, mine the leaves of the tree (Emmet 1976; Shirt 1987).

## 53. WYRE FOREST

The Wild Service is not uncommon in the Wyre Forest and neighbouring parts of Worcestershire, Shropshire and Staffordshire growing mainly on soils derived from the Westphalian Series of the Upper Carboniferous. In the forest itself it is widespread, but occurs particularly along the central Dowles Brook. While there are probably more soil nutrients here, it is possible that the tree was

encouraged by the millers who had premises along the Dowles since its wood was among the best for making cogs for mill machinery (Du Breuil 1854; Hanbury 1770; Hickin 1971).

#### 54. UPPER SEVERN VALLEY

The tree is found north of the Wyre Forest along the Severn Valley showing a marked preference for the Westphalian Series and largely avoiding the Lower Old Red Sandstone to the west as it does everywhere in western central England and eastern Wales. It is not found on the river terrace deposits, a distinctive feature of its distribution everywhere. Records become far scarcer north of the limit of glaciation, though there are a few from Boulder Clay-free areas east and north of Bridgnorth.

#### 55. WENLOCK EDGE AND THE WELSH MARCHES

As with the Malverns (52 above), the Wild Service has been recorded from much of the Wenlock Edge and associated Silurian areas, with a concentration to the north around Ironbridge. There are scattered records to the south west as far as the northern tip of Herefordshire and the Welsh border at Knighton. There is one site near Pontesbury to the south west of Shrewsbury and two in the Welsh hinterland, one on the Severn at Abermule and the other on the Afon Banwy (a tertiary tributary of the Severn) south of Meifod. Both these are in Monts. (v.c. 47).

Unlike the more southerly areas of this type, the rocks of the Wenlock and other series of the Silurian are overlain by Boulder Clay and glacial sand and gravel and all the *S. torminalis* records from this area are on, or very close to, drift deposits. Sinkler *et al.* (1985) say that in the Shropshire region the tree is "a characteristic member of the ancient broad-leaved woodland community together with holly, yew and small-leaved lime on sandstones and other freely drained acid rocks as well as on limestone".

#### 56. WEST SHROPSHIRE LIMESTONE

There is one old and one more recent record from the Carboniferous Limestone west of Oswestry. This area is well known for its apomictic *Sorbus* species that are so often confined to open limestone areas and in this case the Wild Service is responding in the same way. The nature of the terrain reduces competition for light from more vigorous tree species and allows the *Sorbus* spp. to reach maturity whereas on richer soils in the same neighbourhood they would be shaded out.

#### 57. UPPER DEE VALLEY

There is a small group of records from the Upper Dee Valley on the Shropshire/Clwyd border between the point where the river debouches from the Vale of Llangollen downstream to Bangor-is-y-Coed.

Unlike the lower part of the valley, this area is still heavily wooded. The geology is varied with much overlying clay and gravel drift.

#### 58. NORTH WEST MIDLAND PLAIN

There is a very thin scatter of records, many of them old, across the low-lying agricultural plain of north-east Shropshire, west Staffordshire and Cheshire. Much of the soil is heavy and derived from the thick sheet of Boulder Clay left by the last glaciation, while elsewhere there are glacial sands and gravels. The underlying Permian and Keuper Marl appear here and there.

There seem to have been concentrations of the tree to the north and west of Shrewsbury, to the south of the Potteries and in the Delamere Forest area, although these are based on very few old records. Elsewhere there are, or were, isolated trees.

It is possible that the species was once widespread in this area, although perhaps always rare. If one looks, for example, at the records from the sticky soils of the Culm Measures in central and north Devon, one sees a similar, though slightly denser, pattern of scattered records.

#### 59. VALE OF CLWYD

There is a surprising concentration of records in the Vale of Clwyd, mainly in the area around Denbigh some way inland, but with an outlying station south of Prestatyn. Some of these records are associated with Carboniferous Limestone, but the area is extensively covered with Boulder Clay and the trees are growing in woods and hedges rather than on cliffs.

## 60. GWYNEDD COAST

One tree has long been known from the Craig y Gigfran on Garth Point, an area of Cambrian and Ordovician rock on the coast of the Menai Strait in Bangor.

I also have an unconfirmed record of a tree alongside the Conwy Estuary on the Benarth Estate to the south east of Conwy itself. My informant thought it might have been planted, but the geology and the general situation are of the type favoured by the species and the area warrants further investigation.

## 61. ANGLESEY

There is a long history of the species (possibly planted) at Trefarthen, near Brynsiencyn close to the Menai Strait in the south-west of the island (Davies 1813) although it has not been seen recently as far as I know. Non-native trees, including *Sorbus* spp., have been extensively planted in some parts of Anglesey (Sell 1989), but there is no overriding reason why the Wild Service should not be native here.

The underlying rocks in this part of Anglesey are metamorphic Horneblende Schists, but almost the whole island is overlain by a mantle of Boulder Clay.

## 62. LIVERPOOL

There is a record of a Wild Service on the rocks at Knot's Hole, Liverpool "in a situation quite exposed to the salt water, and where it must occasionally be washed by the spray of the sea" (Withering 1818). There have been no recent reports. In many ways this location is analogous to those where the species grows on various parts of the coast of Wales, or further north around Morecambe Bay. The rocks at Knot's Hole are New Red Sandstone.

## 63. FOREST OF ARDEN

There is a strong concentration of records in the area south of Birmingham that is roughly congruent with the ancient Forest of Arden. The trees are found in woods and hedges, almost entirely on Keuper Marl.

## 64. NORTH EAST MIDLAND PLAIN AND FOREST OF CHARNWOOD

North of the Arden area the tree becomes very much scarcer. Its chances of survival have been reduced by urban development and agriculture and, as is the case in other areas, it does not grow as successfully on the extensive Boulder Clay and drift as on other soils. As in the south Midlands and places further north, it is absent from the very extensive Lower Lias.

There is a small concentration of trees on the Westphalian Series of the Carboniferous east of Sutton Coldfield and another in the northern part of Charnwood Forest. Elsewhere the records, mainly from Keuper Marl, are very thinly scattered and mostly date back some considerable time.

## 65. STAFFORDSHIRE AND SOUTH DERBYSHIRE

There are scattered records from the Needwood Forest and Bagot's Park area of Staffordshire with an isolated hedgerow tree from a neighbouring part of Derbyshire. Most are on Boulder Clay, although the underlying stratum is Keuper Marl throughout.

## 66. NORTHAMPTONSHIRE AND ROCKINGHAM FOREST

The tree has long been known in northern Northamptonshire and north western Cambridgeshire in the old Rockingham Forest area. The early 19th century poet John Clare, who came from this neighbourhood, was familiar with the tree and called it by its local name of Surrey as well as Service Tree in his writing (Clare 1832). J. R. Gilson (pers. comm., 1977) has reported that parish bounds in the Rockingham Forest area used to be beaten with branches of the tree, and the branches also used to be carried at the head of village processions (Grindon 1883). All this indicates that the tree has long been familiar in the countryside here.

It now grows almost exclusively in woods, and occasionally hedges, on soils derived from the Oolitic limestone formations that are so characteristic of this area and generally avoids places where there is a Boulder Clay covering. This is in contrast to the examples immediately to the north where the reverse is true and Boulder Clay seems to be preferred.

## 67. RUTLAND AND KESTEVEN

There are still widespread records from this once heavily wooded area, although many trees were destroyed during the replacement of deciduous woods by conifer plantations after the Second World War.

The tree is particularly concentrated on the Boulder Clay spur followed by the Great North Road from a few km north of Stamford to Grantham and records extend westwards on a similar substrate to Dunsby in Lincolnshire. To the south east there are scattered records across the Vale of Catmose area and from beyond Oakham.

Both in Rockingham Forest and this area, pheasant shooting has been popular, particularly on the large estates, since the last century. Many Wild Service trees grow in the coverts where the birds are raised or roost and the birds are known to be very fond of its fruit (Conwentz 1895). This may, to some extent, have helped the tree survive as gamekeepers undoubtedly know what their birds like. In some cases the species could have been deliberately introduced, particularly into the smaller woods that are wholly artificial and that were established with game and foxes in mind.

## 68. HUNTINGDONSHIRE

There is a group of records from central Huntingdonshire and one to the south near St Neots. These are on Boulder Clay and the underlying Oxford Clay. In the case of the latter, it is remarkable how the cluster of records to the south-east of Sawtry (which includes Monks Wood) almost exactly matches a small area where the Oxford Clay is not covered by glacial drift.

## 69. BARDNEY FOREST, LINCOLNSHIRE

Although much of the countryside to the east of Lincoln is now conifer plantation, there are still some remnants of the ancient wildwood that persisted here until the middle of the 19th century and the area is noted for its rich wildlife.

Records of the Wild Service are numerous and are concentrated in an area only some 14 × 20 km in size. They grow almost entirely on the Boulder Clay, although a few records seem to be from the alluvial soils in the Witham Valley.

The topography and geology of much of central England is not dissimilar to that in this area and this strong population of the Wild Service may give some indication of the density it once reached in many other places.

## 70. NORTH LINCOLNSHIRE

There is one record of a tree in a hedge on the chalk in north Lincolnshire far from any other Wild Service trees. It is almost certainly introduced.

## 71. EAST NOTTINGHAMSHIRE

The Wild Service is well-distributed, mainly in woods, throughout the Keuper Marl of eastern Nottinghamshire with a couple of records, clearly belonging to this group, on the other side of the River Trent at Gainsborough. This preference for the Keuper Marl in an area largely free of drift is striking and, apart from one record on the New Red Sandstone near Thoresby, the species remains on its preferred soil throughout the Sherwood Forest area.

The Keuper Marl continues north through Yorkshire to Teesmouth and the sudden cessation of *S. torminalis* records is clearly related to the fact that from north Nottinghamshire the formation vanishes under a great sheet of drift.

## 72. PEAK DISTRICT

There is one record from Wild Cat Tor on the Carboniferous Limestone at Matlock (Willmot 1975). Other *Sorbus* spp. grow well on the limestone eyebrows and other habitats created by the geology of this area and in this instance the Wild Service is responding to the environment like some of the related *Sorbus* spp., especially the apomicts.

## 73. MAGNESIAN LIMESTONE

The Wild Service appears in woods on Magnesian Limestone from its southern extremity and follows it up the Nottinghamshire/Derbyshire border northwards to the Chadwick-le-Street area in South Yorkshire. There are now some 20 known locations along this limestone belt and its



associated mudstones despite the fact that the formation is never more than about 9 km wide (Willmot 1975). It is also largely free of drift and the species is clearly responding, as many other plants do on this formation, to the soil conditions deriving from the solid geology.

Beyond Chadwick-le-Street it reappears, after a gap of over 60 km, on a Magnesian Limestone cliff near Fountains Abbey in Mid-W Yorks. (v.c. 64). It seems perfectly natural on this site, which is the most northerly so far discovered on this side of the country, but one should always be wary of the status of plants with some economic value growing near ancient monasteries.

#### 74. DERBYSHIRE COAL MEASURES

In 1974 four bushes of Wild Service were found in a hedge bordering a green lane at Staveley, Derbyshire on Coal Measure shales only 8 or 9 km from plants on the Magnesian Limestone (Willmot 1975). The species occurs on this formation in one place in Pembrokeshire, but otherwise nowhere else, although it is very widespread.

#### 75. MORECAMBE BAY AND THE SOUTHERN LAKES

The Wild Service occurs on Carboniferous Limestone rocks and in lowland woods with glacial drift derived soils in a number of places around Morecambe Bay (Piggott 1973/74). In the Arnside area many of these woods are known to be ancient and were part of the Chase of Harneshed and the deer park created there in the 16th century. The wildlife and social history of the other localities where the Wild Service is found also indicate that their vegetation is of natural origin.

Often in these steep rocky areas the Wild Service responds like other members of its genus, particularly the apomictic species (on Jack Scout it grows with *Sorbus aucuparia* L., *S. rupicola* (Syme) Hedlund and *S. lancastriensis* E. F. Warb.) but, in Grubbins Wood and elsewhere, it grows in similar situations to those in the more heavily wooded areas of the south.

There are good reasons to believe that old records from Plumpton near Ulverston, Brigsteer and Levens Park are authentic and new sites in this area may remain to be found. As recently as 1987 a long-established Wild Service was found on a low cliff on the shore of Lake Windermere, a place one would have thought had been quite well-worked botanically. This is the most northerly site in Britain where the species can be accepted as native. There are a few old records from further north on the Cumbrian limestones, but these trees are almost certainly planted.

From time to time one hears of 'service trees' in north-east England and southern Scotland. Sometimes these are simply misidentifications, but the Swedish Whitebeam, *Sorbus intermedia* (Ehrh.) Pers., is very widely known as the Service Tree in this part of the country and this is often the species meant. The Wild Service has been planted at several places in Ireland (Forrest 1985).

#### CONCLUSION

The Wild Service tree is, as other authors have established (Peterken 1974), a useful species for indicating primary woodland and ancient hedgerows, as well as some other types of relatively undisturbed habitat, and it is more likely to be found in an area that is still, or was once, part of an ancient forest, but its presence on any particular site does require interpretation. Apart from biological and ecological factors and the history of land and forest management in the British Isles, the tree has economic, aesthetic and other qualities that have favoured its survival in some districts to a greater extent than would be the case with many other species.

While the present survey has been as comprehensive as possible, it is clear that the Wild Service remains under-recorded. Although it grows to a large size – I know one tree over 18 m tall and with a spread of 21 m, while trees of between 22 and 24 m have been reported from several parts of Britain and of 25 m from the Crimea and the Caucasus (Elwes & Henry 1906; Howard 1947; Conwentz 1895) – it is easily overlooked, and there are many areas that have not been thoroughly searched. Despite this, the limits of its range in the British Isles are now reasonably well defined: it is essentially a lowland tree of England and Wales and has not been reported in the wild from Scotland, Ireland, the Isle of Man or the Channel Islands.

Its range is unlikely ever to have extended to Scotland. In the Atlas Mountains, where the Wild Service and the Whitebeam, *Sorbus aria* (L.) Crantz, grow (Jahandiez & Maire 1931–34; Quezel & Santa 1962), the Whitebeam extends to higher altitudes and this is an analogue of the situation in Britain where the Whitebeam is found further north in a cooler climate than the Wild Service. The

Whitebeam and *Sorbus devoniensis* E. Warb. are both found in Ireland (Clapham *et al.* 1962) and the latter species has recently been reported from the Isle of Man (Proctor *et al.* 1989; Sell 1989). If both these species could cross the Irish Sea, there would seem no reason why other *Sorbus* spp. could not do the same, so it is worth continuing to look out for the Wild Service in these places.

#### HABITAT PREFERENCES

The Wild Service in Britain and elsewhere grows in several distinct and apparently dissimilar habitats, although an understanding of the requirements of the species goes some way to providing an explanation of its distribution. These habitats can be divided into four broad categories:-

1. Nutrient-rich soils, clays in particular (Brown 1894). The species is more abundant and grows better on some clays than others. It does well on Weald and Wadhurst Clay in the south-east, and on London Clay and Oxford Clay (in the latter instance especially where there are, or were, ancient forests). It is widespread on the Culm Measures in the West Country and the Keuper Marl from Somerset to Nottinghamshire. It is less common on Boulder Clay, but grows well where it occurs, and is virtually absent from Gault. One possible explanation is that it grows better on clays with a lower calcareous mineral content, although woodland management over the centuries is a more likely factor.

Woodland soils overlying clays often do not share the characteristics of the underlying stratum: they are usually lighter and more acid and may be modified by downwash or other local conditions. While the Wild Service can send its roots below the surface soil layer, the natural distribution (as is the case with any forest tree) is governed by the conditions in which it has to develop as a young plant and the superficial soil qualities are therefore an important factor.

2. Areas of hilly or undulating gravel terrace and similar formations deposited in the glaciations of the Tertiary or Quaternary periods. There is some evidence that its presence on these formations is associated with bands where the water content is higher due to the slope and the layering of the material (Kozłowski 1962). Such gravels are often accompanied by seams of clay which may improve the nutrient content locally.

Those who cultivated the tree in the past noticed that they did not fruit as well on freely-draining gravelly soils as on clay (Cook 1676).

3. Coastal and inland cliffs, rocky hillsides, landslips and similar open or disturbed habitats.

4. Large river valleys, especially those containing cliffs and rocky slopes.

The Wild Service is capable of becoming a large forest tree reaching the canopy layer, and its absence from lighter lowland soils may be due to the fact that it competes poorly with oak and other trees (Longman & Coutts 1974). If it is overshadowed by trees that grow more rapidly, the Wild Service can survive, but will not flower and fruit. Away from nutrient-rich soils it depends on open habitats where there is less competition and where it can flower and fruit more successfully. In these places chances of seed survival are also higher due to their becoming lodged in crevices and similar positions where predators cannot easily reach them. The young plants are also less likely to be damaged by browsing or grazing due to their inaccessibility.

The present pattern of distribution indicates that the Wild Service was probably widespread, if seldom abundant, on the stiffer soils in the forests that covered much of the lowlands of England and Wales in the past. In many places it has been severely reduced, or eliminated, by human activity and this has been compounded by its low rate of reproduction from seed compared with many other native trees. There are two main reasons for the latter: climatic and ecological. Gabrielian (1961) contends that the species evolved in dry, open woodlands and there is ample evidence to show that climatic conditions affect the tree's ability to flower and produce viable fruit. Warm summers promote fruit formation (Davies 1976; Büsgen 1929) and increase the number of seeds per fruit. In the warmer, drier parts of Britain many trees often fruit only every other year and in marginal habitats, particularly towards the edge of the range, even less frequently. Termena (1972) has

shown that both temperature and humidity affect pollen viability and fruit production of the species in the Bukovina area on the borders of the Ukraine and Romania. In northern Poland good crops of fruit were only produced every 25 years (Conwentz 1895).

Although the fruit is avidly devoured by birds, Wild Service seems only rarely to be bird-sown (the seed, with its thin testa, is probably digested in the bird's gut) (Prime 1960). In large, lowland forests wild boar and other animals, including domestic pigs and cattle, may well have been important agents for the dispersal and burial of Wild Service seed: wild boar are known to like the fruit and the effects of their trampling on woodland ecology have been well-documented (Conwentz 1895; Darling & Morton Boyd 1969; Goodwin 1975; Tansley 1968). Elsewhere seed was, and still is, extensively predated by birds, small animals and invertebrates so that almost none remains (Corbet 1974; Janzen 1970; Tansley 1968; Termena 1972).

The wild boar as well as burying much seed by rooting and trampling, destroyed many small rodents (Tansley 1968) as did the much higher numbers of predatory animals and birds that were formerly widespread. Populations of voles and mice have increased substantially as predators have declined and animals like rabbits, grey squirrels and pheasants (all of which eat seeds or seedlings of Wild Service) have been introduced and have spread.

Like many trees and shrubs within the family Rosaceae, Wild Service seeds need a period of some three months of near freezing temperatures before germination will take place (Gordon 1982). In places where winters are longer and colder than in much of Britain, germination will normally take place in the first spring following seed formation whereas in Britain two or more years are often needed and the seed is at risk for far longer. This is true of many tree seeds, but the first spring germination that would have taken place more regularly during periods when the climate was colder could have helped the Wild Service to reproduce from seed in slightly larger numbers in those days.

While a cooler, less continental, climate and increased seed and seedling predation coupled with other factors may have reduced populations of the Wild Service and prevented recolonisation, its survival in ancient hedges and woodlands has been helped by its ability to reproduce from suckers. Wild Services live a long time: Mitchell (pers. comm., 1975) has estimated the age of large old trees to be around 200 years and many of these may themselves have arisen from suckers produced from an earlier generation of trees. Some mature populations – that in Epping Forest, for example – have been shown to originate largely from suckers (Lloyd 1977) and O. Buckle (pers. comm., 1975) was of the view that virtually all the Wild Services that he knew of in West Sussex (for which he was B.S.B.I. vice-county recorder) had originated from suckers. No one knows how far back these sequences may have extended since the original seeds germinated, but it is clear that the species can survive for long periods before conditions recur in which seeds germinate freely. Suckers are often mistaken for seedlings and care must be taken in reaching a judgement on the origin of a given tree (the root from which a sucker arose can often be discovered just beneath the soil surface).

As a result of the survey the Wild Service has, in the last 19 years, been shown to be more abundant than was thought and it is clear that it had been overlooked in many places. Its range is known to extend slightly further north than Morecambe Bay and further into Yorkshire than was realised. It is also widespread, though rare, in the lower lying parts of Wales. There are, however, many areas in the British Isles where it might be expected to occur from which it has not been reported.

More evidence has come to light to show that the tree was formerly more abundant than today, though probably never common in most areas. There is no doubt that the species is found almost exclusively in ancient woodlands and hedges or on rocky outcrops, unless planted, and its value as an indicator of primary woodland is confirmed.

The survey has also revealed that the tree has had a considerable social and economic role much of which has not hitherto been recorded or gathered together and which has undoubtedly affected the current pattern of distribution since the tree has been conserved and planted in some areas and neglected or destroyed in others. This is the subject of a separate paper (Roper 1987).

Although the formal survey of the Wild Service is now complete, I am always interested to have any new records or information about the natural or social history of the tree. There is much work still to be done on its associations with insects, fungi, bryophytes and lichens and the uses to which the fruit and the wood were put.

## ACKNOWLEDGMENTS

I am grateful to all the B.S.B.I. members and the many others who have helped with the survey over a long period of years and have patiently awaited the results. In particular I am indebted to Mary Briggs and Franklyn Perring without whose initial support and continuing encouragement I would not have become involved, and to Breda and Ernie Burt who showed me my first Wild Service.

## REFERENCES

- ANON. (1976). *Sorbus torminalis* in Powys, Cardigan and Carmarthen. *B.S.B.I. Welsh Bulletin* 25: 2-4.
- AUBREY, J. (1685). *Natural history of Wiltshire*, ed. Britton, J. (1847). London.
- BAMFORD, F., ed. (1936). *A Royalist's notebook. The commonplace book of Sir John Oglander Kt. of Nunwell*. London.
- BOULGER, G. S. (1908). *Familiar trees*. London.
- BROMFIELD, W. A. (1856). *Flora Vectensis*. London.
- BROWN, J. (1894), in NISBET, J., ed. *The forester*, 6th ed., enlarged. Edinburgh & London.
- BÜSGEN, M. (1929). *The structure and life of forest trees*, 3rd ed. revised by MÜNCH, E. London.
- CLAPHAM, A. R., TUTIN, T. G. & WARBURG, E. F. (1962). *Flora of the British Isles*, 2nd ed. Cambridge.
- CLARE, J. (1832). *The midsummer cushion*, ed. TIBBLE, A. Edition published by the Mid-Northumberland Arts Group, 1978. Manchester.
- CONVENTZ, H. (1895). Beobachtungen über seltene Waldbaum im West Preussen. *Abhandlung zur Landeskunde der Provinz Westpreussen*. Heft 9. Danzig.
- COOK, M. (1676). *The manner of raising, ordering and improving forrest-trees*. London.
- CORBET, G. H. (1974). The importance of oak to mammals, in MORRIS, M. G. & PERRING, F. H., eds. *The British oak*, pp. 312-323. London.
- DARLING, F. F. & MORTON BOYD, J. (1969). *The highlands and islands*, 2nd ed. London.
- DAVIES, H. (1813). *Welsh botanology and catalogue of the native plants of the Isle of Angelsea*. London.
- DAVIS, T. A. W. (1976). The Wild Service in Pembrokeshire and South Cardiganshire. *B.S.B.I. Welsh Bulletin* 25: 4-6.
- DU BREUIL, M. A. (1854). *Cours élémentaire theorique et pratique d'arboriculture*. Paris.
- ELWES, H. J. & HENRY, A. (1906). *The trees of Great Britain and Ireland*. Edinburgh.
- EMMET, A. M. (1976). Nepticulidae, in *The moths and butterflies of Great Britain and Ireland*, vol. 1. London.
- FORREST, M. (1985). *Trees and shrubs cultivated in Ireland*. Dublin.
- GABRIELIAN, E. T. (1961). The genus *Sorbus* L. in Turkey. *Notes from the Royal Botanic Garden, Edinburgh* 23: 483-496.
- GERARDE, J. (1597). *The Herball, or general historie of plantes*. London.
- GILMOUR, J. S. L., ed. (1972). *Thomas Johnson. Botanical journeys in Kent & Hampstead 1628 and 1632*. Pittsburgh.
- GODWIN, H. (1975). *History of the British flora*, 2nd ed. Cambridge.
- GORDON, A. G. (1982). Germination and seed dormancy. *The Plantsman* 4: 76-90.
- GRINDON, L. H. (1883). *Fruits and fruit trees*. Manchester.
- HAMILTON DAVEY, F. (1909). *Flora of Cornwall*. Penryn, Cornwall.
- HANBURY, W. (1770). *A complete body of planting and gardening*. London.
- HANBURY, F. J. & MARSHALL, E. S. (1899). *Flora of Kent*. London.
- HARPER, G. (1981). Wild Service in Hertfordshire and Middlesex. *Trans. Hertfordshire Natural History Soc.* 28(4): 17-26.
- HICKIN, N. (1971). *The natural history of an English forest*. London.
- HOWARD, A. L. (1947). *Trees in Britain and their timbers*. London.
- JAHANDIEZ, E. & MAIRE, R. (1931-34). *Catalogue des plantes du Maroc*. Algiers.
- JANZEN, D. H. (1970). Herbivores and tropical forest diversity. *Am. Nat.* 104: 501-528.
- KOZŁOWSKI, T. T., ed. (1962). *Tree growth*. New York.
- LLOYD, E. G. (1977). The Wild Service Tree *Sorbus torminalis* in Epping Forest. *Lond. Nat.* 56: 22-28.
- LONGMAN, K. A. & COUTS, M. P. (1974). Physiology of the oak tree, in MORRIS, M. G. & PERRING, F. H., eds. *The British oak*, pp. 194-221. London.
- MANSELL-PLYDELL, J. C. (1895). *The flora of Dorsetshire*, 2nd ed. Dorchester.
- MARCHANT, W. J. (1937). *Choice trees, shrubs, wall plants & climbers (Catalogue for Marchant's Nursery for 1937)*. Dorset.
- MAYNARD, D. C. (1925). *The old inns of Kent*. London.
- MILLER, P. (1768). *The gardener's dictionary*, 8th ed., revised. London.

- PETERKEN, G. F. (1974). A method for assessing woodland flora for conservation using indicator species. *Biological Conservation* 6: 239–245.
- PIGOTT, C. D. (1973/74). The Wild Service Tree in Lancashire and Westmorland. *Nature in Lancashire* 4: 40–43.
- PRAIT, A. (1854–57). *The flowering plants and ferns of Great Britain*. London.
- PRIME, C. T. (1960). *Lords and ladies*. London.
- PROCTOR, M. C. F., PROCTOR, M. E. & GROENHOF, A. C. (1989). Evidence from peroxidase polymorphism on the taxonomy and reproduction of some *Sorbus* populations in south-west England. *New Phytol.* 112: 569–575.
- QUEZEL, P. & SANTA, S. (1962). *Nouvelle flore de l'Algérie et des régions desertiques méridionales*, Vol.1. Paris.
- RACKHAM, O. (1986). *The history of the countryside*. London.
- ROPER, P. (1975). The tree of mystery. *Kent life* 14: 21–23.
- ROPER, P. (1987). *The Wild Service Tree in the British Isles*. Unpublished MS.
- SALISBURY, E. J. & JANE, F. W. (1940). Charcoals from Maiden Castle and their significance in relation to the vegetation and climatic conditions in prehistoric times. *J. Ecol.* 28: 310–325.
- SELL, P. D. (1989). The *Sorbus latifolia* (Lam.) Pers. aggregate in the British Isles. *Watsonia* 17: 385–399.
- SHIRT, D. B. (1987). *British red data books: 2. Insects*. Peterborough.
- SINKER, C. A., PACKHAM, J. R., TRUEMAN, I. C., OSWALD, P. H., PERRING, F. H. & PRIESTWOOD, W. V. (1985). *Ecological Flora of the Shropshire region*. Shrewsbury.
- TANSLEY, A. G. (1968). *Britain's green mantle*, 2nd ed. London.
- TERMENA, B. K. (1972). Effect of meteorological conditions on the blooming and fruit bearing of *Sorbus torminalis* in Bukovina. *Ukr. Bot. Zh.* 29: 609–613.
- THURSTON, E. & VIGURS, C. (1922). *A supplement to the Flora of Cornwall*. Truro, Cornwall.
- WILLMOT, A. (1975). The rediscovery of the Wild Service tree in Derbyshire. *Derbyshire Naturalists' Trust Newsletter* 50: 6–8.
- WITHERING, W. (1818). *An arrangement of British plants*, 6th ed. London.

(Accepted January 1993)