DEVELOPMENT OF VEGETATION IN STAVERTON PARK, SUFFOLK

By G. F. PETERKEN

Monks Wood Experimental Station, Abbots Ripton, Huntingdon

The medieval park of Staverton, East Suffolk, now contains ancient woodlands dominated by oak and holly. In this paper, the present woodlands are described, and their development is reconstructed from documentary, cartographic, photographic and field sources.

CONTENTS

INTRODUCTION

THE ancient woodlands of Staverton Park and The Thicks have long been famous, yet they have never been fully described, nor has their development ever been studied in detail. They lie in the parishes of Wantisden and Eyke near the village of Butley in the Suffolk Sandlings some 5 miles east of Woodbridge on the road to Orford (Grid Reference 62/355509).

Today, the name "Staverton Park" is restricted to the open oak woodland distant from the road, but formerly it was applied to the entire area bounded on the south by the Woodbridge-Orford road and adjacent heathland, by the parish boundary on the east, the Butley river to the north and the coniferous plantations to the west (Fig. 1, Plate 1). These were the boundaries of medieval Staverton Park, an area of about 370 acres (150 ha.) which was once largely occupied by woodland, but from which some of the woodland has since been cleared. Today, three main blocks of woodland remain, which on modern maps are named Staverton Park (Tithe field numbers 130, 183, 184), The Thicks (132) and Little Staverton (136). Since this

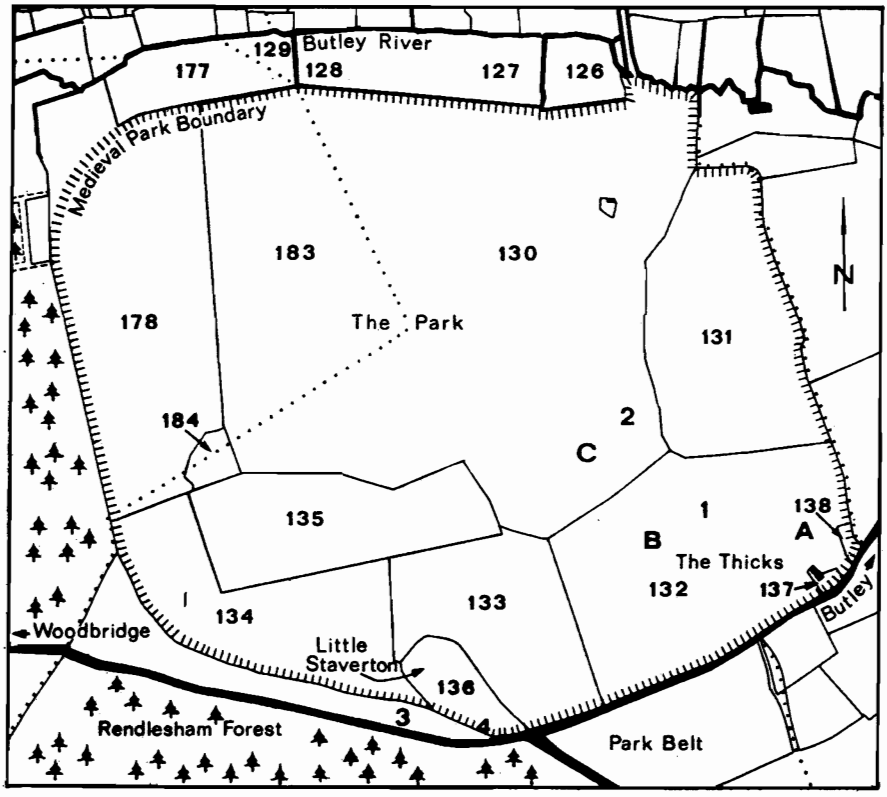


FIG. 1.
Staverton Park and its immediate surroundings, showing Tithe field numbers (126–184), the location of soil pits (1–4) and plots in which holly girth was measured (A–C). Staverton Park is 1.4 km. from east to west.

is likely to cause confusion, the whole area formerly within the medieval park will be "Staverton Park" throughout this paper, and the first-named block of woodland will be known as "The Park".

Climate

Meteorological observations have never been made in Staverton Park, but there is no reason to suppose that its climate differs significantly from that of the Sandlings as a whole. In common with the rest of the East Anglia this area has a relatively continental climate, but this is modified by proximity to the North Sea; it is, for example, rare for snow to lie long, and relative humidity is higher during summer (Climatological Atlas of the British Isles, H.M.S.O., 1952). Total annual rainfall is lower than almost anywhere else in Britain, being about 24 in. (610 mm.) on average, of which the majority falls in the six winter months October to March. The Sandlings lie in the region of highest annual average potential water deficit (soil moisture deficit) (Green, 1964), so it is hardly surprising that droughts are frequent. Indeed, the records (1909–1964) for Sudbourne Hall, 3 miles from Staverton Park, where the driest months are February to April, show that a soil moisture deficiency develops at the start of one year in three, and that such deficiencies are rarely made good during the summer (Whiting, 1967).

Geology and Soil

Staverton Park lies on glacial sand overlying Red Crag, a Pliocene deposit of sand and shells (Boswell, 1928). These give rise to light soils, with a sand fraction of approximately 90 per cent by dry weight, which in undisturbed conditions are usually acid and podsolized with an iron-humus pan at about 1 ft.–2 ft. (0·3–0·6 m.) depth, but in the Thicks no iron-humus pan could be found (Whiting, 1967).

Description

Existing Vegetation

Eleven main types of vegetation have been recognized whose distribution and extent are shown in Fig. 3 and Plate 1.

(a) *Oak Parkland.* This consists of three strata. The tree layer is dominated by ancient, pollard oaks (*Quercus robur*) with spreading crowns, but holly (*Ilex aquifolium*), birch (*Betula pubescens* and *B. pendula*), rowan (*Sorbus aucuparia*) and hawthorn (*Crataegus monogyna*) are also present in smaller numbers. Together these trees form an open canopy which is rarely closed and in some places becomes sparse. The intermediate stratum consists of bracken (*Pteridium aquilinum*), which forms a dense stand within which tree saplings and elder (*Sambucus nigra*) are scattered. Beneath the fern canopy is a herb and grass layer in which *Holcus mollis* is the most abundant species. The bracken is sparse or absent from many scattered patches: here the grass layer is dominated by *Dactylis glomerata.*

(b) *Arable oak parkland.* This is fundamentally similar to the oak parkland and indeed is a recent derivative of it. The main difference is that the bracken and grass layers have been eliminated and replaced by crop species and annual herbs. The tree layer is sparse.

(c) *Birch woodland.* Birch (mainly *Betula pubescens*) dominates the tree layer, with shorter individuals of oak, holly and rowan present in small numbers. Their combined canopy is closed in some places, open in others. Beneath this, closed layers of bracken and grass are present.

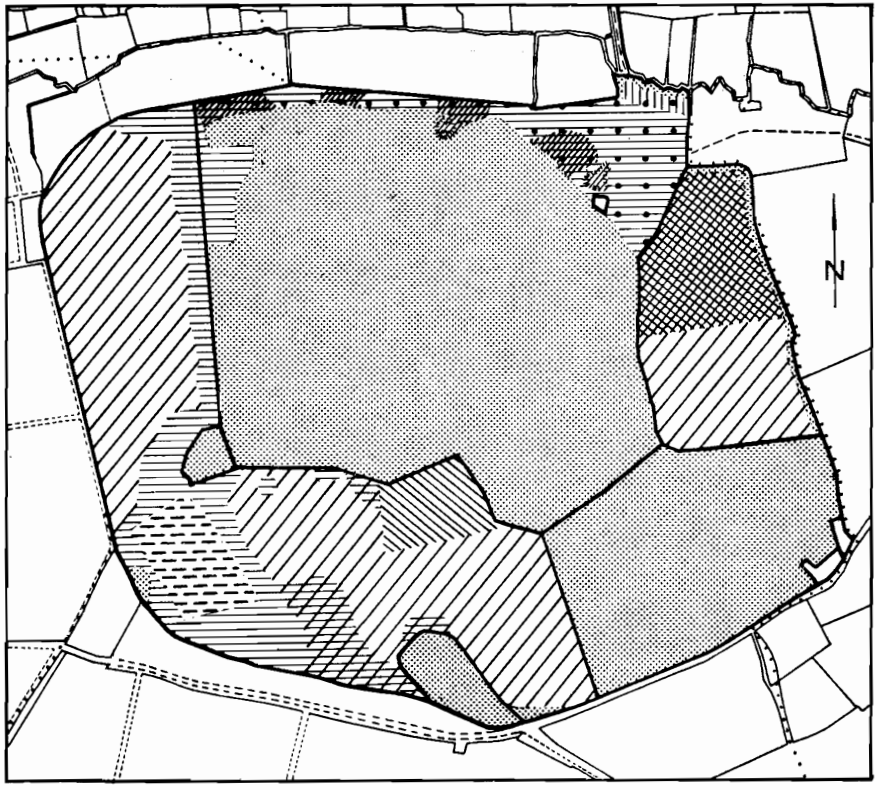
(d) *Oak woodland.* Oaks form a closed canopy in which mature holly, birch and rowan are also present in small numbers. Bracken forms a dense layer, either in pure stands or mixed with bramble (*Rubus fruticosus*).

(e) *Holly-oak woodland.* Holly and oak together form a canopy which is, in places, so dense that the ground flora is absent. Birch and rowan are present in moderate numbers in the canopy. Under the individuals of these species and in the clearings which occur irregularly throughout the community, low thickets of bramble, bracken, saplings of holly, birch or rowan, or mixtures of these species occur. Elder also grows in clearings and beneath the less-dense parts of the canopy.

(f) *Elm woodland.* Elm (*Ulmus carpinifolia*) forms a closed canopy, in and beneath which other species occur only in small numbers.

(g) *Bracken. Pteridium aquilinum* forms dense stands, beneath which is a herb layer consisting mainly of grasses. The distinction between this community and the bracken-rich forms of oak parkland is not clear on the ground.

(h) *Gorse-broom scrub.* A community dominated by mixtures of *Ulex europaeus* and *Sarothamnus scoparius* in various proportions.



Key

Sandy Breck
Gardens
Oak woodland
Bracken
Fen
Birch woodland
Woodland
Scrub
Oak Parkland
Calluna
Grass
Arable oak parkland
Arable
Holly-Oak woodland

FIG. 2.

Vegetation 1945. Non-woodland vegetation shown in detail. Woodland types (not differentiated) were the same as in 1968.

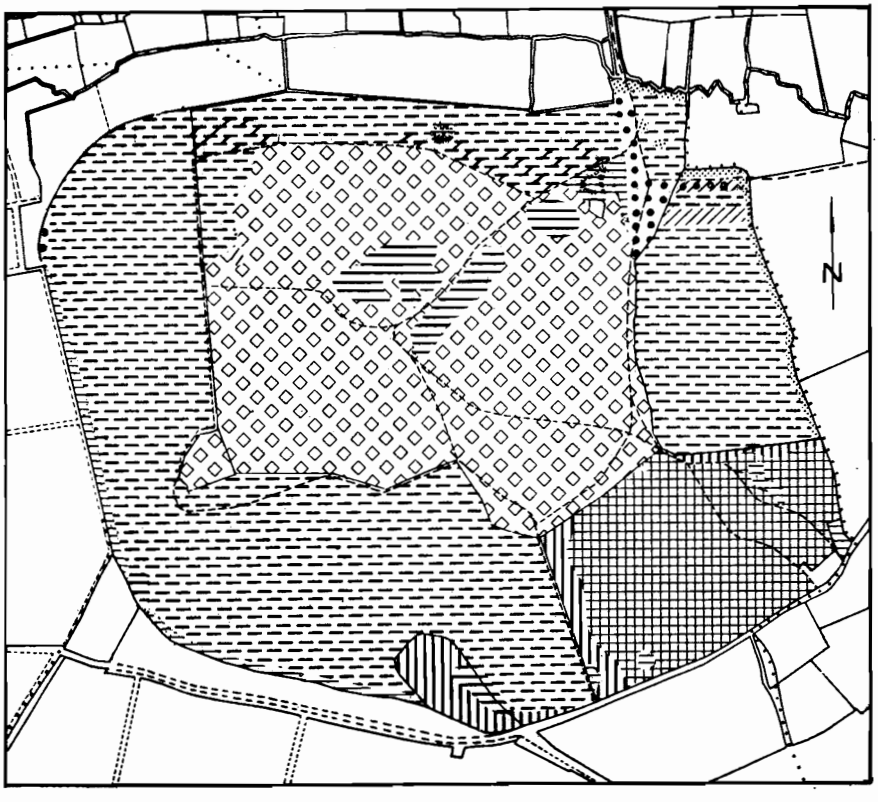


FIG. 3.
Vegetation, 1968.

(i) *Grassland.* A community composed mainly of grasses characteristic of dry heathland habitats. The distinction on the ground between this community and grass-rich oak parkland and bracken communities is not clear.

(j) *Gardens.* Characterized by the presence of exotic species and cultivated varieties.

(k) *Arable.* Vegetation dominated by annual crops and associated weed flora.

This list is not exhaustive. Beside the Butley river small stands of alder (*Alnus glutinosa*) woodland, willow (*Salix* spp.) scrub and reedswamp (*Phragmites communis*) still occur. Immediately outside the southern boundary of Staverton Park, *Calluna vulgaris*-dominated heath occurs; this community was once widespread within Staverton Park.

The Woodland Flora

The flowering plants, ferns, bryophytes and corticolous and lignicolous lichens which have been recorded from the main blocks of woodland are listed in the appendices. Species found only in the arable and riverside communities are not included.

The vascular flora is poor, but it includes *Corydalis claviculata*, a local species in East Anglia, characteristic of woodland on acid soil. The bryophyte flora is also poor, but it includes some species associated with old forests (*Pallavicinia lyellii*, *Plagiothecium undulatum*, *Dicranum montanum*) otherwise extremely rare in East Anglia (F. Rose). The rich corticolous lichen flora is discussed in Appendix 3.

Woodland Generation Structure and Growth Form

OAK

Mature and over-mature oaks occur throughout the woods (Fig. 4). Similar trees also grow on the slope above the river and on both the external and internal boundaries of Staverton Park. In both the Park and the Thicks their density is low and variable, with the result that they form a predominantly open canopy which is closed only in small patches. Their distribution and density have been studied by Horrill and Kerr (in preparation), who found that the existing density (with standard deviation) of living oaks in the Park is 49 ± 29 trees/ha. and in the Thicks 66 ± 27. If the numerous dead oaks in the Thicks are added, the oak density there becomes 77 ± 35 trees/ha. Statistically, the difference in density between the Park and the Thicks is no longer significant, although it becomes significant if the dead trees in the Thicks are included. The mean girth of living oaks is 317 cm. and 324 cm. respectively in the Thicks and Park, a difference which is not significant.

The great majority of these oaks have been pollarded at heights varying between 2 and 5 m. Each individual consists of a short bole, above which is a spreading crown of twisted branches. With no known exception, the trunks are rotted to a greater or lesser extent. The trunks are hollow or filled with debris derived from rotted heartwood and fallen leaves. Decay has advanced so far in some trees that the entire heartwood has rotted, leaving a hollow shell, part of which may be missing. The health and size of crown branches is extremely variable, although none is vigorous. The relative girths of crown branches and trunk varies also, suggesting that there is variation in the number of occasions when individuals have been cut.

Although nearly all mature trees have been pollarded, a few have coppice form and some appear to be maidens. The twelve trees with two or more trunks (Fig. 5) are scattered through the woods. In all but two cases the trunks appear to be of an age comparable with the old pollard oaks: the remaining two are conspicuously younger, and were last cut about 60 years ago. The significance of these trees is uncertain, but, in a wood which was long used for pasture (see below), they are probably either trees which have produced new trunks after having been felled for timber or those which have arisen naturally under moderate grazing. Maiden oaks occur predominantly in the Thicks and on boundaries, although a few are found in the Park. They are relatively small-girthed and clearly much younger than most pollards. They appear to represent natural regeneration, presumably after or shortly before the pollarding ceased. This is confirmed by the estimate of 150 years for one such tree (Table 1, count 9).

Sapling oaks occur in the Park in a belt between the Shepherd's cottage and the Thicks (Fig. 6). These were planted in 1949, and the trunks of many are still enclosed in rabbit-proof wire. The only natural regeneration is a turkey oak (*Quercus cerris*) on the southern margin of the Park, and two trees in the garden of the Shepherd's cottage, where they have received protection from rabbits (H. Farmar, personal communication). The turkey oak was at least 3 m. high in 1946 and is now growing vigorously.

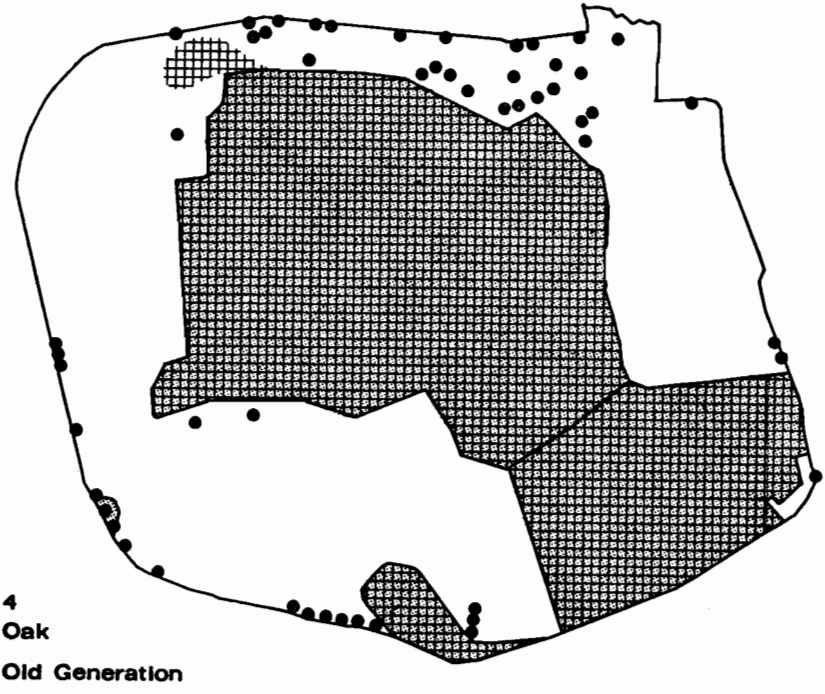
The age of the mature oaks has been a matter for much speculation and legend. It has been said that they were planted by the monks of Butley Abbey (Farmar, 1949) presumably between 1529 and 1538, but there is no evidence to support this. Horrill and Kerr concluded that the oak population is even-aged and that there is no age difference between the Park and the Thicks. This conclusion was based on statistical analysis of girth and distribution data and did not include evidence from growth ring counts or documentary sources. The essential points to establish appear to be their age and age structure, and the nature of their origin (planted or natural).

An estimate of the date of origin has been obtained for four oaks (counts 4, 6, 8, 9), of which the estimated ages were 191, 420, 330 and 150 years respectively. The 420-year-old tree was rather below average girth of mature pollards and the 191-year-old tree was one of the smallest. These estimates are admittedly rough, but they are sufficiently reliable to suggest that there is a wide range in the age of the pollard trees, and that some of these trees are well over 400 years old. The 150-year-old tree has escaped pollarding.

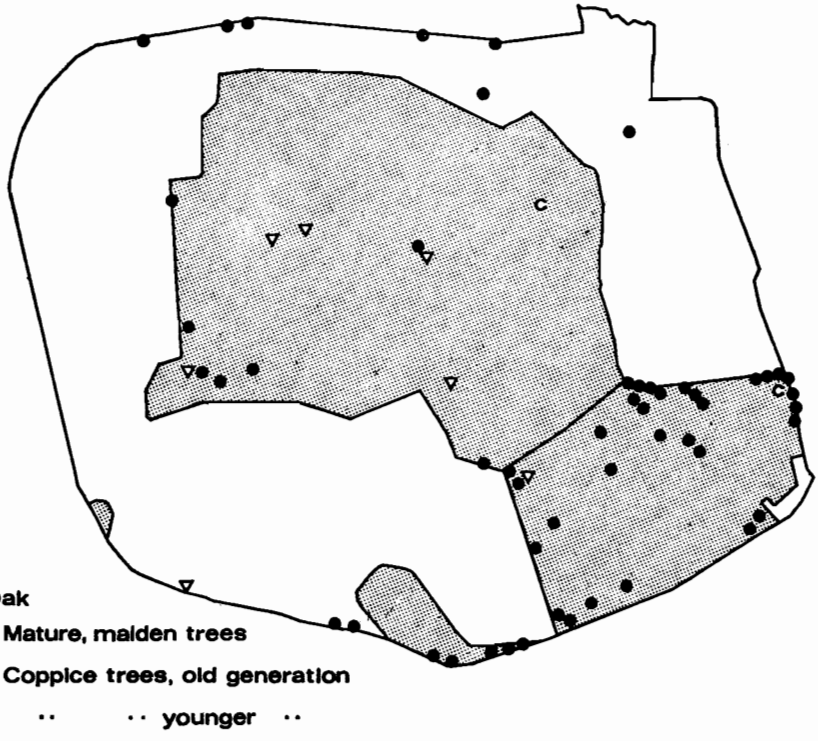
Estimates of the age of branches on pollard oaks were 128, 160, 140–150, 199 and 182, (counts 1, 2, 3, 5, 7), and together with the age of the unpollard tree above, suggest that most pollarding ceased about 150–160 years ago. If this is correct, the fact that no branch is more than 200 years old suggests that oaks were pollarded at roughly 50-year intervals. One oak (count 4) appeared to have been pollarded first at about 36 years of age. If it can be accepted that nearly all trees were last pollarded 150–200 years ago, it is significant that the size of existing crown branches is extremely variable, ranging from slim, short branches on most trees, to massive tall branches which rival the trunk in girth, on others. This probably indicates that the number of times each tree has been pollarded is variable and that the vigour of oaks during the last 150–200 years has likewise been extremely variable. Both conclusions further substantiate the argument that the old generation pollard oaks have a wide range of absolute age.

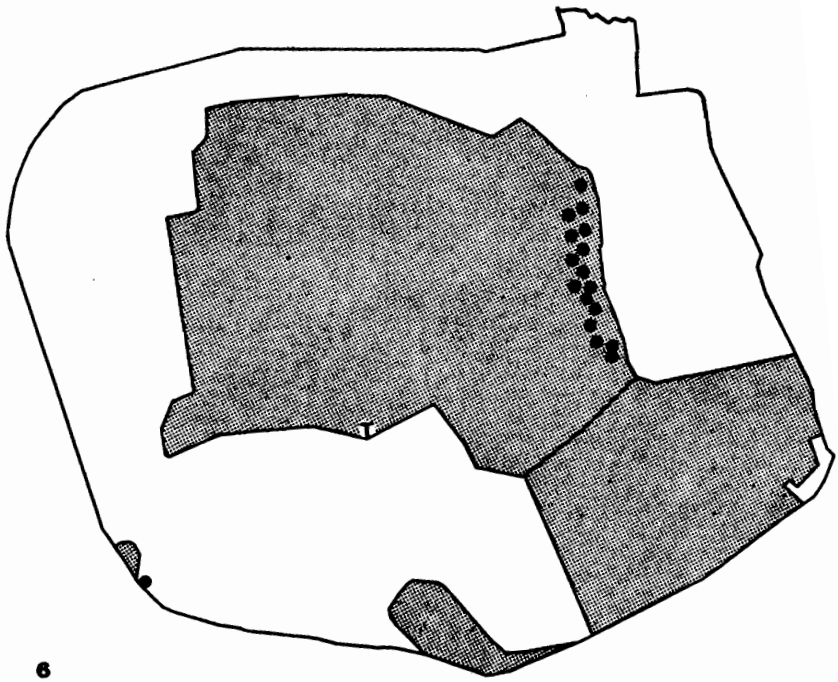
Table 1. *Growth ring counts of oak, holly and birch in 1967*

	Rings counted	Location	Comments
Oak			
1	93	Park	Old generation pollard. Count located on branch 7 m. above crotch. Growth even, but very slow latterly. Allowing 20 cm. extension per year immediately after last cutting, this branch was 128 years old.
2	145	Park	Old generation pollard. Count located on branch about 3 m. above crotch. Growth very slow and even throughout. At 20 cm. per year, age of origin is 160 years.
3	98	Park	Small, old generation pollard. Count 0.5 m. above crotch. The tree had fallen but not died; a new branch had developed from the old crotch after the fall (evidence from direction of growth) and was now estimated to be 40–50 years old. If cut branch died at time of fall, it originated 140–150 years ago.
4	191	Park	This was one of a small group of three depauperate, once-pollarded trees. It had apparently been dead 10–20 years. The centre was rotted; the rotted wood was estimated to have contained 10 rings for the following analysis: 0–36 moderate-fast growth; 36–50 slow, getting faster (? pollarded); 50–63 moderate-fast; 63–102 moderate growth, becoming slow; 102–191 very slow.
5	169	Thicks	Old generation tree, pollarded at about 3 m. Count located on branch 5 m. above crotch. Very slow growth. Allowing 20 cm. growth per year and up to 5 years since death, this branch originated 199 years ago.
6	285	Thicks	Old generation tree which may not have been pollarded. The tree had been dead perhaps 5–15 years, the bark had disappeared completely and the sapwood was well rotted. So, too, was the centre of the heartwood, but the remaining heartwood was sufficiently intact for rings to be counted in vertical section, 1 m. above ground. Increments were narrow and remarkably even. Assuming a constant increment until death, 40 rings should be added for the decayed sapwood. The decayed heartwood occupied about a quarter total radius and at constant increment contained about 110 increments. However, growth is normally faster in youth, so add only 80 increments. Total years since origin = 285+15+40+80 = 420 years.
7	172	Thicks	Old generation pollard. Count located on branch about 2 m. above crotch. 0–42 moderate growth rate, 42–172 very slow. Allowing 20 cm. growth per year, branch originated 182 years ago.
8	221	Little Staverton	Count located at ground level. Timber completely removed. Centre of heartwood rotted. Increments at 11 per cm. radius. Assuming constant increment, missing centre would have 95 rings. Coppice shoots developing from stump suggest that cutting occurred about 15 years ago. Origin therefore about 330 years ago, but probably later because early growth is normally faster than later growth.
9	115	Little Staverton	A marginal, suppressed tree counted about 7 m. from ground. Very slow growth. Allowing 20 cm. height growth per year, tree was about 150 years old.
Holly			
10	147	Thicks	Count at ground level on trunk 59 cm. in girth. Slow growth throughout. Tree located near bole of old-generation oak.
11	143	Thicks	Count at 0.5 m. Growth moderately fast initially, becoming slow. No early check.
Birch			
12	72	Park	Large-girthed, dead tree counted at about 4 m. height. Add, say, 15 years for early growth and time since death. Origin, therefore, about 87 years ago.

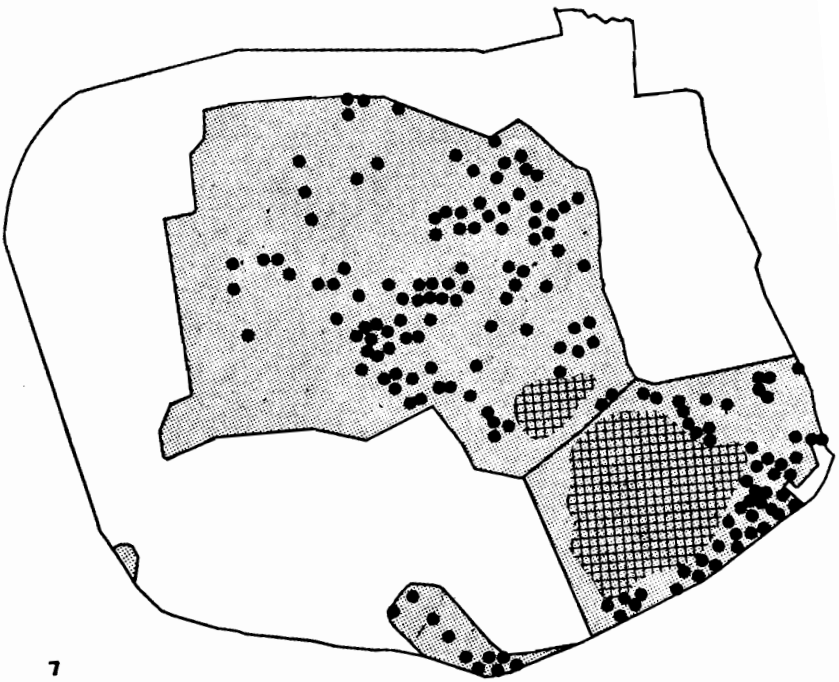


FIGS. 4–17.
Distribution of tree species and generations, 1968. Cross-hatched areas indicate high density. Dots indicate distribution and abundance in regions of low density. Woodland areas are stippled.

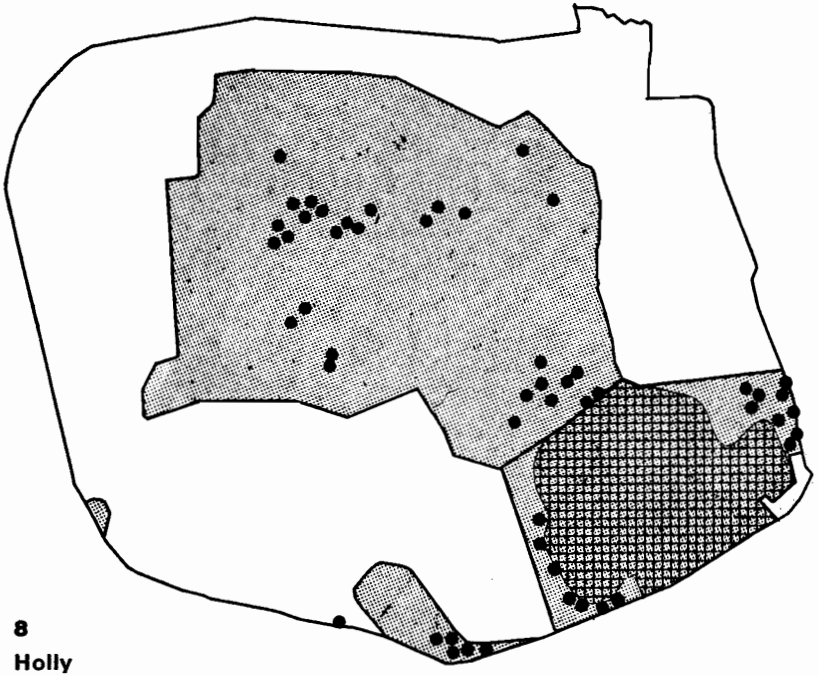




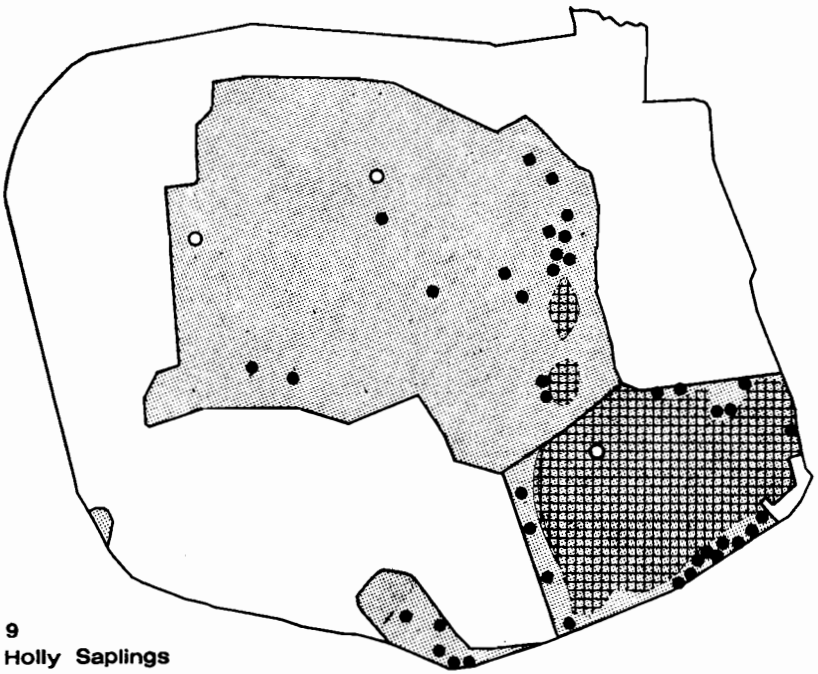
6
● Oak Saplings
T Turkey Oak Sapling



7
Holly
Old Generation



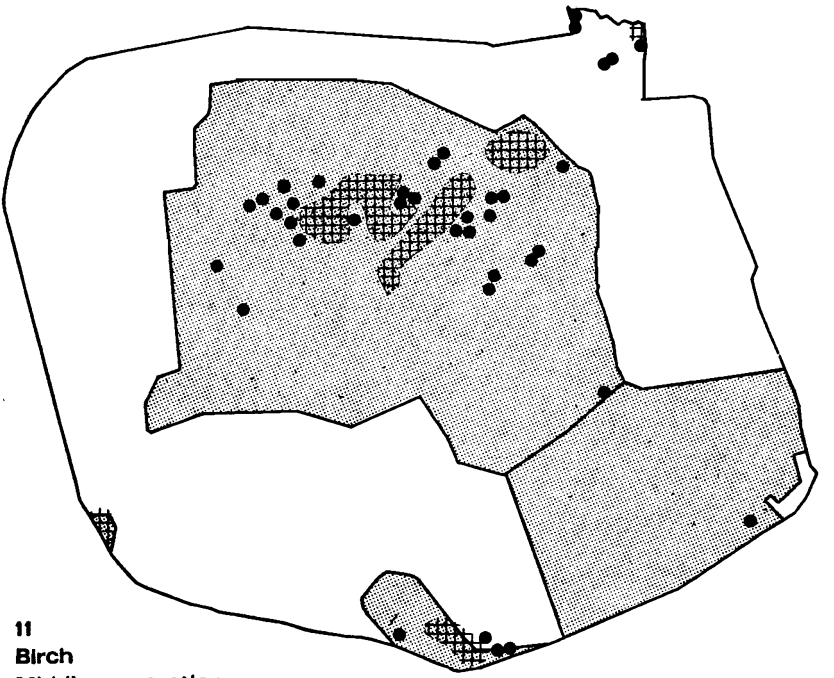
8
Holly
Middle Generation



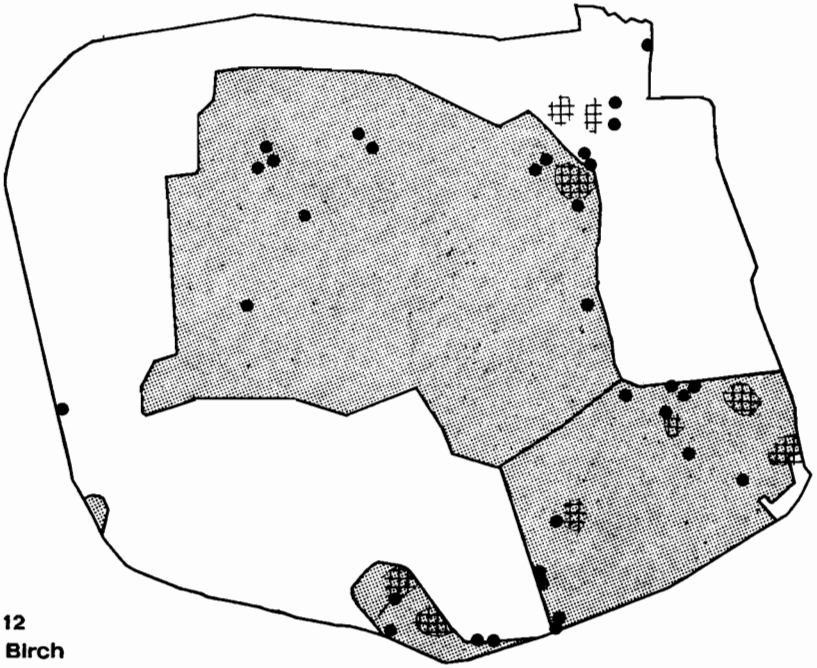
9
Holly Saplings

O Mature trees, less than 100 yrs.

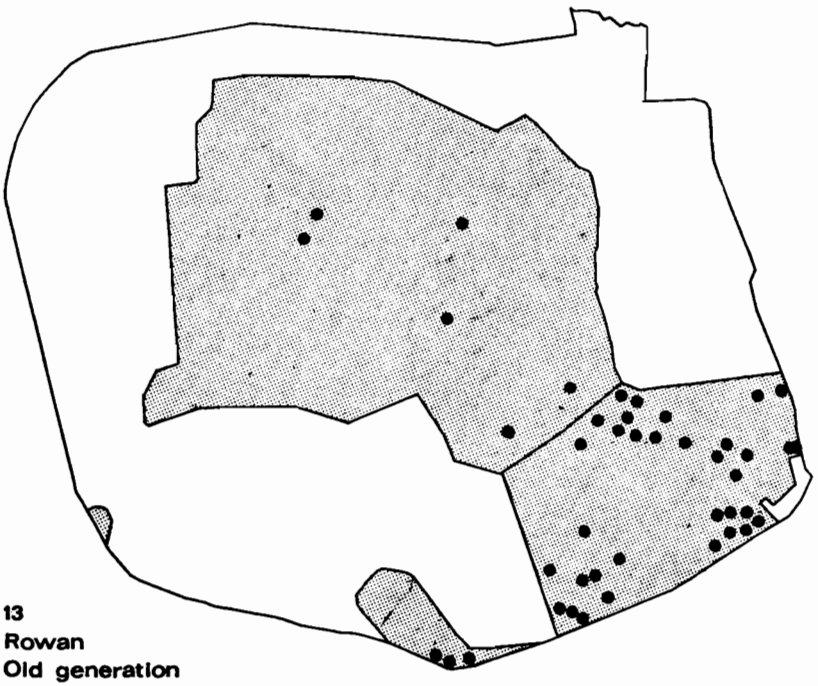
10
Birch
Old generation



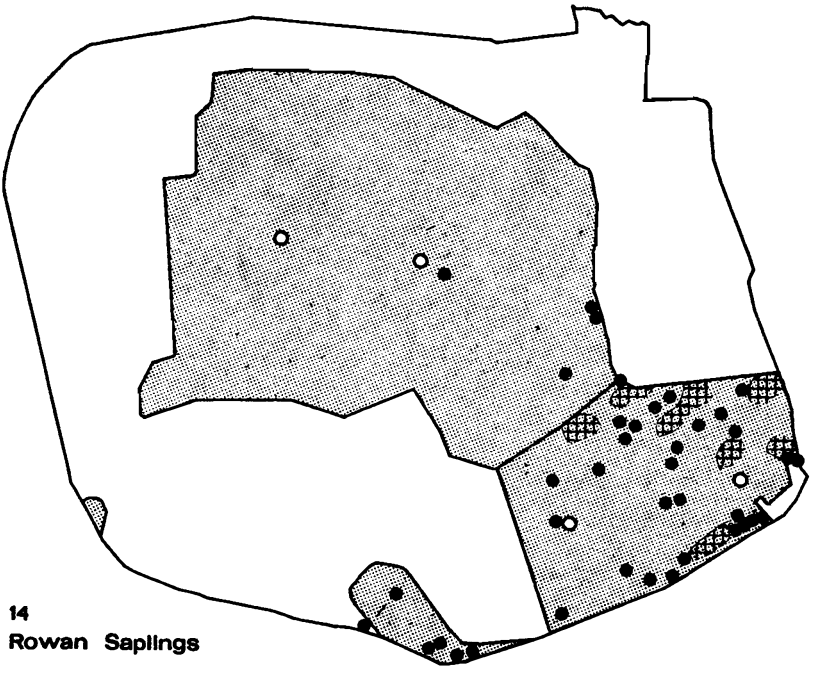
11
Birch
Middle generation



12
Birch
Saplings

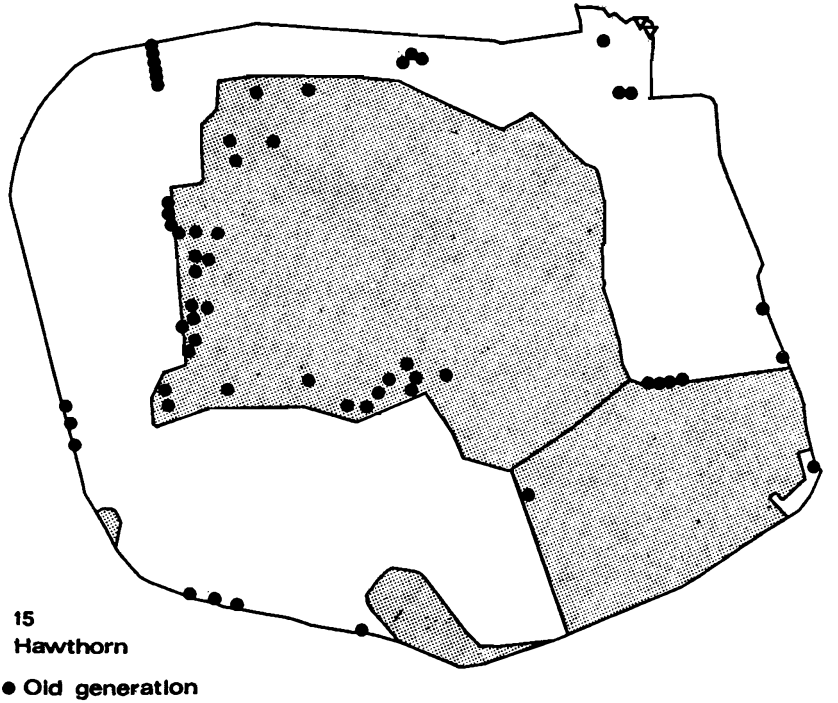


13
Rowan
Old generation



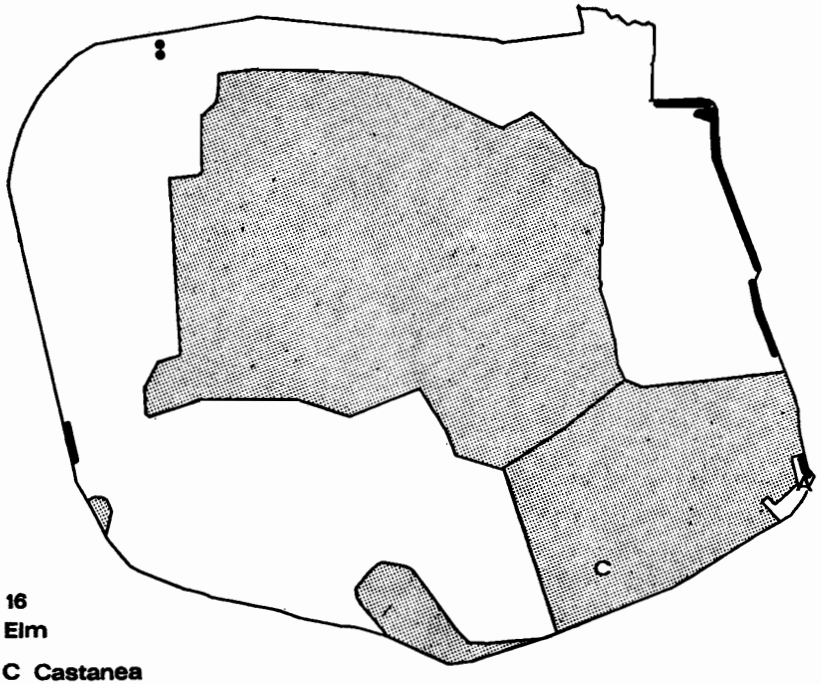
14
Rowan Saplings

O Mature trees younger than old generation

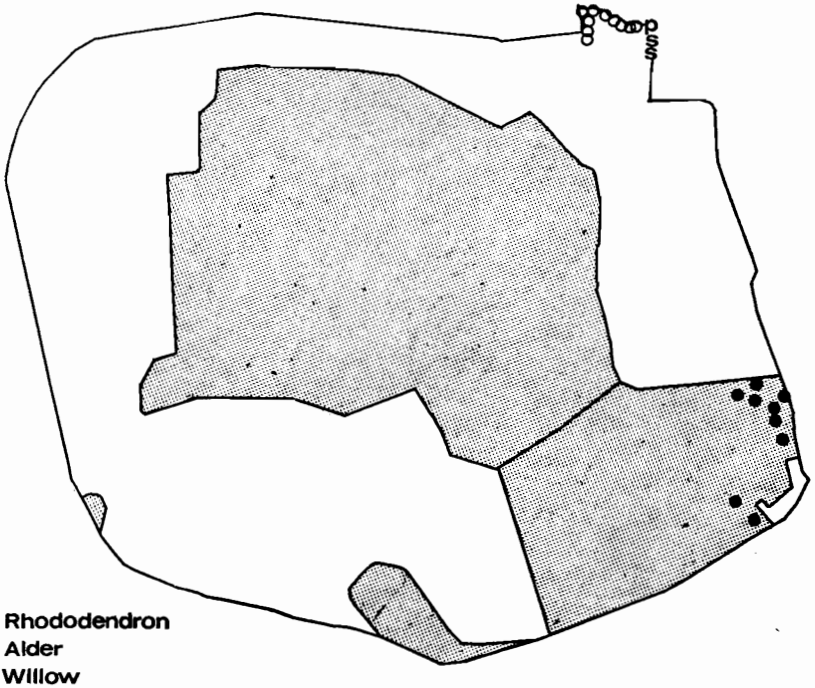


15
Hawthorn

● Old generation
▽ Younger trees



16
Elm
C Castanea
A Ash



17
● Rhododendron
o Alder
s Willow
p Poplar

Horrill and Kerr mentioned that the density of oaks lies within the range recommended by Evelyn (1670), (i.e. planting 25–40 ft. apart), but apart from this there is no evidence on the ground that the oaks were planted. Rather, the age distribution suggests that regeneration occurred naturally, if slowly, over a long period.

The evidence, such as it is, suggests that the oaks in Staverton Park have originated naturally over a long period and that existing trees are the product of natural regeneration between the sixteenth century or earlier and the early nineteenth century. In the last 100–150 years, however, there has been virtually no successful natural regeneration, although seedlings planted in 1949 and protected since, have developed vigorously.

HOLLY

Holly is the dominant species almost throughout the Thicks where there are some magnificent specimens. Indeed, one of them is believed to be the tallest in Britain (Horrill and Kerr, 1967). This tree which grows near the centre of the Thicks is 22·5 m. (73 ft. 9 in.) high, has a girth of 220 cm. (7 ft. 2 in.) and a crown diameter of up to 12 m. (39 ft.). It is only one of a number of comparable specimens which, despite having been cut at heights varying from about 3–10 m., overtop most of the oaks. They have large vigorous crowns and trunks which usually show no sign of decay or damage.

It has proved extremely difficult to divide the hollies into discrete generations to which any individual could be assigned without doubt, because there appears to be a continuous variation from the largest holly in the country to first-year seedlings. The only direct information on age comes from two tall, but relatively small-girthed trees which had ages of 147 and 143 years (counts 10 and 11), indicating an origin about 1820. Three plots, whose positions are shown on Fig. 1, were therefore selected in which the breast-height girth of 30 trees each was measured (Fig. 18). Plot A, representative of the eastern part of the Thicks, was a closed, apparently even-aged stand, from which counts 10 and 11 were obtained. The stand developed early in the nineteenth century and contained no large-girthed trees. Plot B, representative of the central Thicks, clearly comprised a wide range of size and age, which overlapped the range of Plot A at both ends. Gaps in the canopy were filled with holly saplings. Some of the smaller-girthed stems arose as basal shoots from old hollies whose original stem had disappeared. The hollies of Plot C, situated in the Park, had a size and age spread comparable with those in Plot B, but small trees were absent, suggesting that regeneration, once possible, has recently ceased. It is possible that most, if not all, individuals there originated before the nineteenth century. On these considerations, three generations have been based: an old generation of pre-nineteenth-century individuals, a middle generation of nineteenth-century mature individuals, and saplings.

Old generation hollies occur throughout the central and western part of the Thicks (Fig. 7). They are tall trees with deep crowns of vigorous foliage showing no sign of dieback. Some are maiden stems, but most have clearly been topped at one stage in their development, and a few have two main trunks, the result perhaps of early coppicing or grazing. The main danger to their continued health is mechanical failure: they have shallow roots and a top-heavy crown with the result that many individuals have fallen or are leaning, supported only by their neighbours. In some

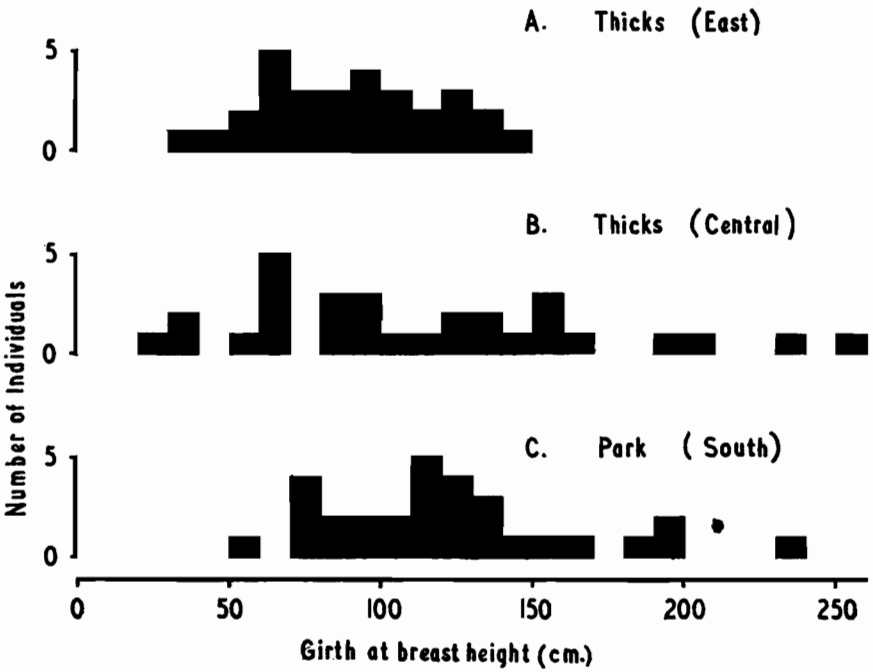


FIG. 18.
Girth distribution of holly of 30 individuals in each of 3 plots. For location of plots, see Fig. 1.

cases this has led to death, but mostly it has stimulated development of new shoots, usually from the base of the old trunk, while the old crown declines slowly.

The majority of hollies in the Park appear to be of the same age but generally differ markedly in form and health. Their main trunks are either dead or in an advanced stage of dieback and may be reduced to a short stump. They are clearly in decline, yet they were once massive trees for the largest have girths of 243 cm. and 254 cm., in excess of most in the Thicks. Only a few retain a stature comparable with their best. Their age, and that of comparable trees in the Thicks, is quite unknown, except that it exceeds 150 years. However, they are mostly rooted close to old generation oaks, a feature which suggests that they originated from seed dropped after the oaks had formed mature crowns.

Middle generation hollies are, in the Park, more or less confined to the birch region, where they are scarce (Fig. 8). In the Thicks, they are extremely abundant. Those in the Park are relatively short, small-girthed trees some of which, like the rowans with them, have been cut at a low level, producing a pollard form. In the Thicks, however, they are mostly uncut, tall individuals forming a deep canopy among, above and beneath the oaks. They are mostly maiden trees originating from seed, but a few are clearly the product of basal shooting from older trees, the old trunk of which is occasionally still to be seen. Many are rooted close to old oaks (c.f. New Forest, Peterken, 1965), and their direction of growth, which is towards the nearest canopy gap, is often at a considerable angle from the vertical, indicating that many post-date the development of the oak crowns. Nearly all individuals are

growing vigorously, but there are a few dead trees still standing and fallen trees, whose trunks have snapped or have been uprooted. The cause of the death of some standing trees is unknown, but it does not seem to be shading from taller individuals.

There is no clear distinction between the middle generation and the saplings which fill many clearings (Fig. 9), although it is obvious that once the holly canopy was nearly complete, about 1850, the rate of regeneration was much reduced. Hollies which have originated in the last 100 years are found in clearings, where they are bushy in form and in small groups beneath small gaps in the canopy. It appears that the clearings have persisted from the early nineteenth century and have only slowly been invaded by holly, whereas the gaps which developed since that time have immediately been occupied by numerous saplings.

BIRCH

There appear to be two adult generations of birch which are more or less clearly separable, especially in the central Park and the margin of Little Staverton, the only places where the two grow together in significant numbers. The older trees are tall and large in girth: the largest appear to be a 239 cm. *B. pubescens* and a 247 cm. *B. pendula*. They include maiden trees and those which have coppice and pollard forms, suggesting that they developed under light grazing. Their age is largely unknown, but one rough count suggested an age of 80–90 years (count 12), an origin in the later decades of the nineteenth century. Some are magnificent specimens showing no sign of deterioration, but others are dead and fallen. Some have fallen through mechanical instability: these are developing new stems from the fallen trunk. They are found through the central region of the Park, in the peripheral region of the Thicks (therefore post-dating the 150-year-old surge of holly), and on the margin of Little Staverton (Fig. 10). They rarely form a closed canopy, doing so in a small area near the Shepherd's cottage. They may be the remains of a generation developed throughout the nineteenth century of which the older individuals have died and decayed.

There appears to have been a lull in regeneration in the early decades of the twentieth century, for the younger generation birches are estimated to be 25–50 years old. They are confined to the central Park and margin of Little Staverton, but with the exception of one tree are absent from the Thicks (Fig. 11). In contrast to the older trees, they have developed in dense clumps and have formed a closed canopy. Many have 2 or 3 main trunks in a coppice form, indicating an origin in the face of light grazing. Their absence from the Thicks is presumably a result of the dense vegetation there, but one tree, 84 cm. in girth, was found growing on a well-decayed oak stump. They merge in age with the sapling generation (Fig. 12).

ROWAN

Rowans are found in the three main blocks of woodland, although they are only common in the Thicks. There is a clear distinction between an old and a young generation.

Old generation rowans are most common towards the margin of the area of dense holly in the Thicks (Fig. 13). They normally share canopy space and are large for the species, one individual in the Thicks having a girth of 227 cm. and

another in the Park attaining 196 cm. Most individuals have a single main trunk which shows no sign of having been cut, but two trees in the Park have a pollard form, the cutting having taken place (during recent decades) as low as 1 m. from the ground. Many show signs of deterioration. The trunk of one of the two pollard trees is much split and rotted. The trunk of a maiden tree in the Thicks has snapped at 3 m. but a few young shoots are developing from the stump. A few have fallen, but these have numerous shoots developing from the prostrate trunk and rootstock. Their age is not known, but their absence from the region of dense holly in the Thicks and their rarity in the Park suggest an origin post-dating the separation of Park and Thicks and the initiation of the holly thicket, a date in the first half of the nineteenth century.

There is a large gap in size and therefore age between the old generation and the young. The latter consists of saplings and a few older individuals which are now developing into small trees. Like the old generation, they are most abundant in peripheral parts of the Thicks but a few individuals also grow in the Park and Little Staverton (Fig. 14). In the Thicks they occur as groups restricted to gaps in the holly canopy, where they are growing vigorously. Each group appears to be internally even-aged, and the variation in size between groups is apparently small.

In addition there are rowans which have developed in the crotch of some pollard oaks. Four of these have been located, of which 3 are large specimens with numerous branches which are probably intermediate in age between the two generations.

HAWTHORN

This species occurs peripherally in the Park and on external and internal boundaries (Fig. 15). A small group of young trees grows by the stream on the NE border but apart from these all individuals are old, large-girthed but not particularly tall. Most have a deep, rather bushy crown and a short trunk. Those growing in boundaries may be remnants of a system of quickset hedges, but they show no sign of any form of management. Individuals growing within the woods are presumably the product of natural regeneration. Their age is not known directly, but photographic evidence suggests that they are nineteenth century: they appear to be the product of a short period of regeneration after which regeneration ceased completely.

ELM

A group of sapling elms grows in the old garden in the Thicks. Apart from these, all elms occur on boundaries (Fig. 16). The majority are concentrated in a belt along the eastern boundary, where the parish and park boundaries coincide. Here a few large, old-generation trees occur amongst a dense growth of younger stems, many of which have developed by suckering.

ELDER

This species is found throughout the woods. In the Thicks it is an infrequent invader into small gaps in the canopy and in the Park it is widely scattered as small individuals beneath the oaks. A few larger individuals also occur, e.g. in the sandpits and beside the path from Wantisden Hall.

OTHER SPECIES

Six other tree and shrub species occur within or on the boundary of Staverton Park (Figs. 16, 17). Two chestnut (*Castanea sativa*) individuals have been found on the Thicks, one an adult with a girth of 333 cm., the other a sapling. A single ash (*Fraxinus excelsior*) sapling is growing vigorously on the site of the old garden in the Thicks. *Rhododendron ponticum* was introduced into the eastern Thicks where a number of large bushes now occur. In the NE corner of the Park, along the bank of the Butley river, there are some coppiced alder including one large tree, two tall poplars (*Populus nigra*) and a group of willow.

Soils

Whiting (1967) and others have observed that, although the heathlands in the vicinity of Staverton Park have podsolic soils, the soil within Staverton Park has no pan, a fact which suggests that the land now occupied by woodland has never previously supported heathland. Four profiles have been examined, whose locations are shown in Fig. 1. Profile 3 (Fig. 19) exemplifies the heath podzols which, according to Whiting, usually have an iron-humus pan at a depth of 12–24 in. (30–61 cm.). The Park (profile 2) has a leached brown earth with a moderately deep moder humus: the stone fraction becomes prominent below about 1 ft. (30 cm.) depth. The Thicks (profile 1) has a similar profile with a greater depth of mull humus and deeper humus-staining. The boundary bank (profile 4), which was wasted considerably in the lifetime of trees growing on it, evidently consists of surface scrapings, rather than deeper soil which would have been richer in pebbles. The buried soil surface could not be detected. Neither was there any sign of a humus pan.

DEVELOPMENT

The nature of the record

The existing state of vegetation in a particular site may be regarded as a product of interaction between its natural development and its use and exploitation by man. The former can be deduced from a knowledge of the ecology and growth characteristics of the dominant species, but for the latter one is dependent mainly on documentary sources.

Documentary sources rarely contain descriptions of the vegetation itself, but may include information on the use and value of a site or a land-holding containing the site, from which the state of the vegetation may be inferred. In the case of Staverton Park, the earliest direct reference to the vegetation was in 1528, when the presence of oak trees was noted in passing. Thereafter, the vegetation was recorded occasionally and with varying amounts of detail in documents, books, maps and photographs.

Detailed though some documentary sources are, they do not reveal in detail the sequence of events whereby the woodland assumed its present form, nor do they indicate all the factors affecting its development. However, the trees themselves, by their form, age-structure and distribution are an abundant source of evidence, for the form of individual trees depends on the species' inherent growth characteristics and the manner in which these have been modified by human and environmental agencies; age structure reveals periods of active regeneration; and the distribution of each age class or growth form may indicate the distribution of certain factors. Inevitably this approach is restricted in time by the age of the oldest generation of trees: only rarely can features of a vanished generation be deduced.

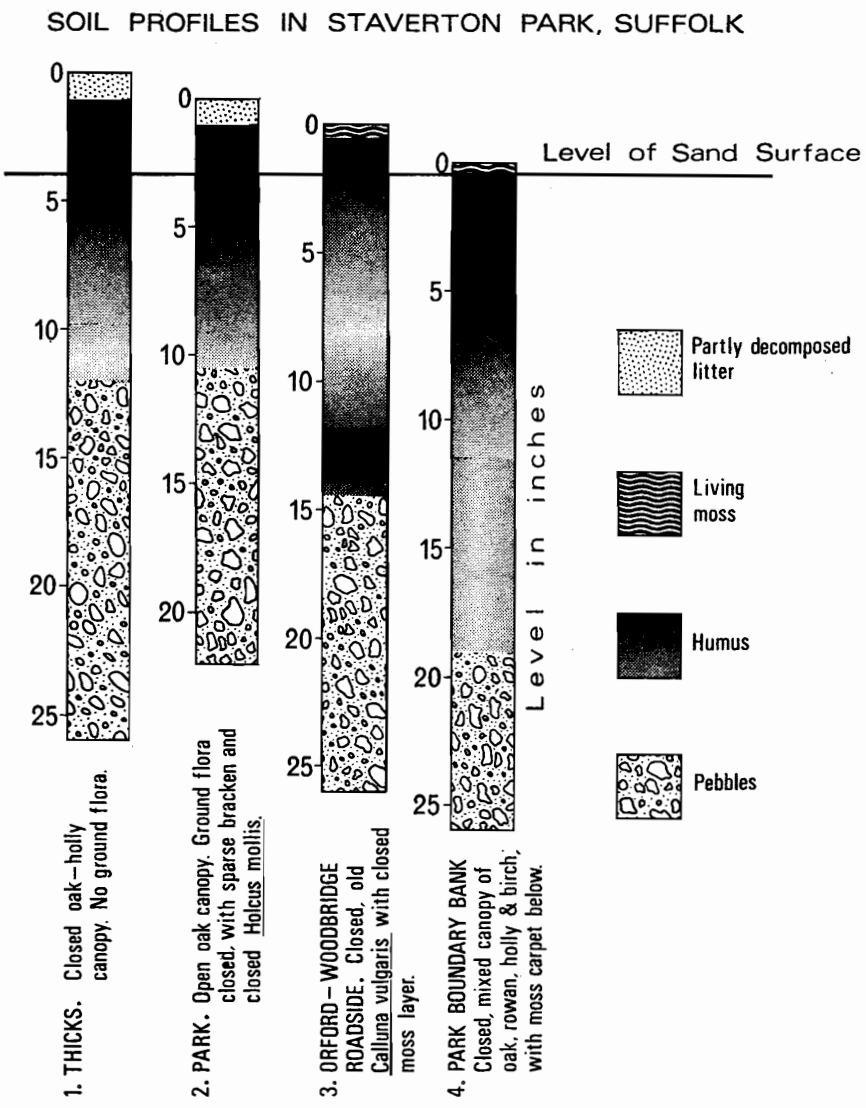


FIG. 19.
Soil profiles at four sites (for locations, see Fig. 1.).

Origin and the period to 1601

Staverton Park came into existence at an unknown date in or before the thirteenth century. The earliest reference to a park is in the Hundred Rolls, *circa* 1275 (Rotuli Hundredorum, 2, 1818). It had apparently not been emparked by 1086, for there is no mention in Domesday Book of a park in the manor of "Stauertuna", whereas elsewhere in Suffolk parks are recorded at Ixworth in Blackbourne and Dennington in Hoxne (Darby, 1952). The Pipe Rolls contain many twelfth and early thirteenth century entries for Staverton manor, but none of these gives details of the land within

the manor (The Great Roll of the Pipe, Pipe Roll Society). The only detailed reference in this period to land within the manor refers only to part of the manor and does not mention a park. However, the Pipe Rolls record a sharp increase in 1178 from £14 to £20 in the otherwise stable rent to the King for the manor, which may indicate emparking. The northern boundary was thrown up along the edge of the river marshes, but the rest of its length—roughly circular in outline—indicates economy of effort in open country. The causeway over the fen in the north-east corner presumably ante-dates the park. Once formed, the boundaries did not change. Norden in 1600–1601 (see below) gives its area as 312 acres, and in 1362 its value was assessed at 26 shillings, or 312 pence (P.R.O., C 135/162): both arable and heathland was then assessed at 1d. per acre and, although it is not explicit, a similar rate appears to have been attached to the park. Norden mentioned that it was the custom of the manor to measure land by a rod of 18 ft. rather than 16½ ft.: hence (exactly) the discrepancy between his value and the modern 370 acres. The early history and ownership of the manor, and with it presumably Staverton Park, has been described by Redstone (1900) and Copinger (1909). The origin and significance of the earthwork (Plate 3) has been discussed by Gray (1910).

It is barely profitable to speculate far on the state of the land before it was emparked. The Sandlings may have once been well wooded, but they were fairly densely settled by tribes from the continent and for a period about the early seventh century nearby Rendlesham was virtually the capital of southern England (Clarke, 1960). Human occupation was probably accompanied by extensive clearance of the native vegetation to the extent that by 1086, when the Domesday Book was compiled, "the wood entries [on the light soils in S.E. Suffolk] were few in number and small in amount" (Darby, 1952), and in general the villages of the Sandlings had only small amounts of meadow, a few sheep and perhaps some wood. Nevertheless, woodland for 30 swine was included in the possessions of the manor of Stauertuna (Victoria County History 1911), an entry which has often been taken to indicate that the Staverton woodlands existed 900 years ago (e.g. Redstone 1900, Brightman 1960). This may be so, but the Domesday record does not necessarily refer to the site of the present park. However, since medieval parks were usually wooded (Cox, 1907), it is possible that in selecting a site for the park, an area already well-wooded should have been chosen. Furthermore, there is no medieval reference to woodland in Staverton manor, which might be expected if the woodland recorded in 1086 persisted outside the park.

Medieval parks were doubly valuable as pasture and a source of wood. Throughout the Middle Ages such parks contained a certain amount of well-grown timber (Cox, 1907), and indeed they are mostly well-wooded to this day. These conditions evidently obtained in Staverton Park, for a manorial extent of 1362 (P.R.O., C135/162) states that "there is there one park whose agistment is worth 26s. per annum"; agistment is a term applied to the letting of grazing, particularly in woodland (O. Rackham). In 1528, the chronicler of Butley Priory recorded that "Regina et Dux cum suis generosis et generosibus vulpes apud parcum de Staverton venati sunt et ibidem Prandium suum sub Quercubus sumpsere cum Joco et Ludo satis Jucundis" (Dickens, 1951), and in 1540 the "farm of Stafferton Park" was listed in an Inventory of Particulars for a grant to the Duke of Norfolk (Tenth Report of the Deputy Keeper of the Public Records, 1849, App. ii, p. 242). In the grant itself the "pasture called Stafferton Park, parcel of premises contained in a 21 years lease" is

PLATE 1.
Vertical air photograph of Staverton Park and its immediate surroundings, September 1962. Ministry of Defence (Air Force Department) photograph, Crown Copyright Reserved.

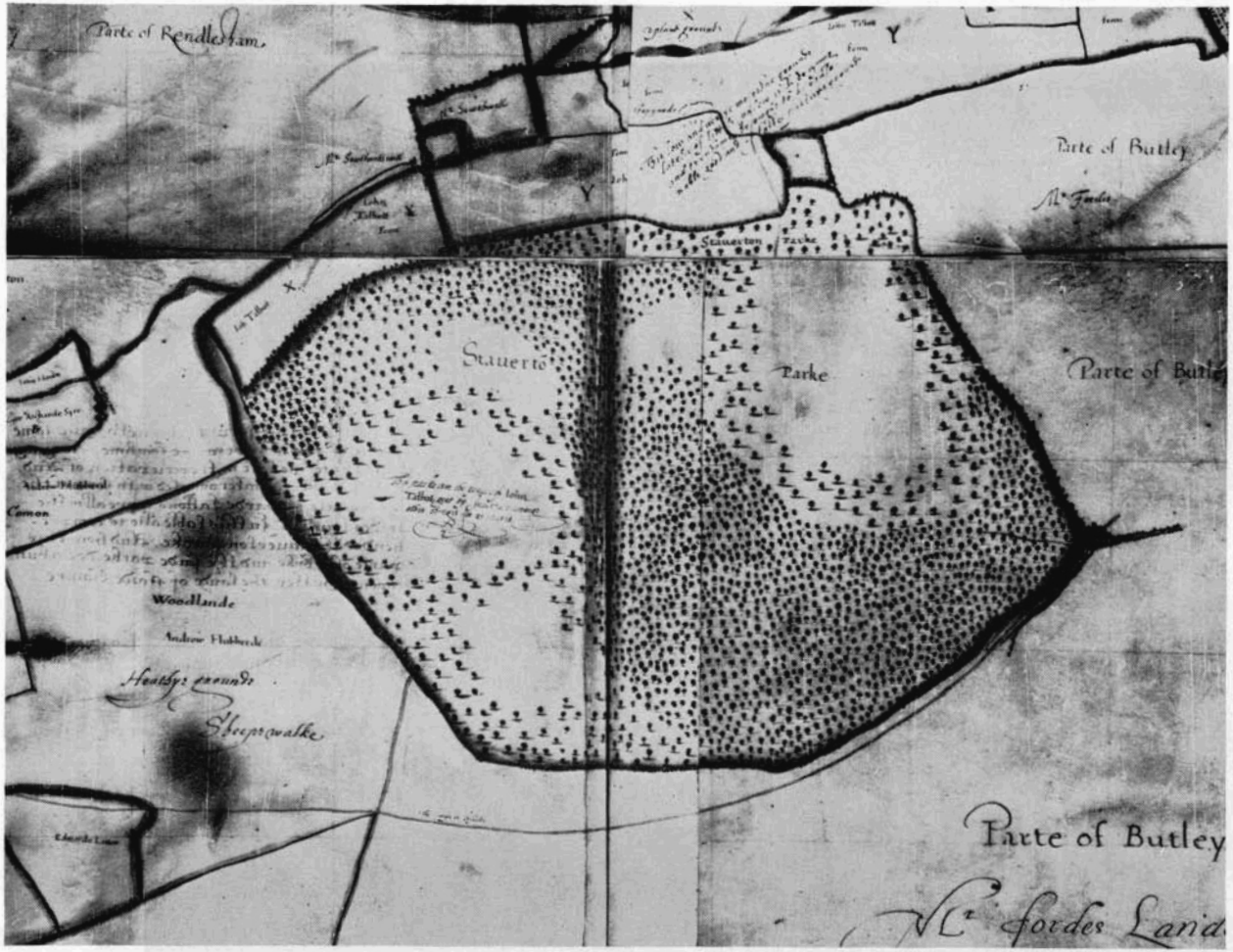


PLATE 2.
Part of John Norden's map of Sir Michael Stanhope's estate, showing Staverton Park, dated 1600–1601. The part shown is taken from four pages of a bound volume. Reproduced by permission of the Archivist of the Ipswich and East Suffolk Record Office.

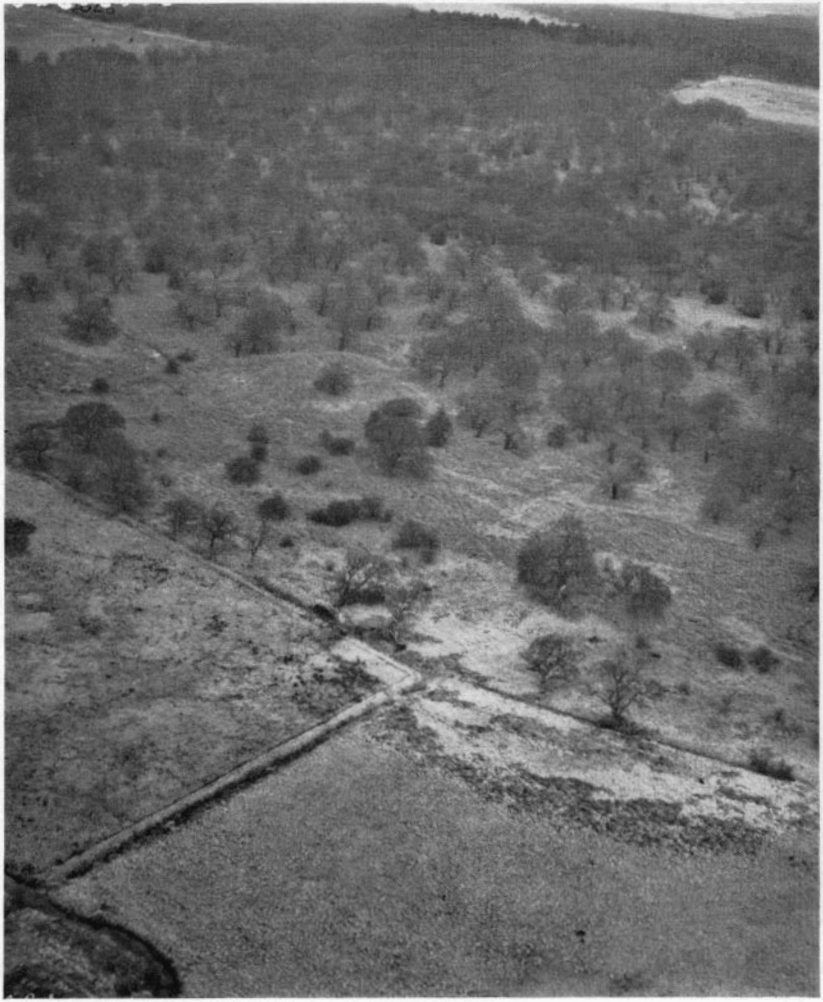


PLATE 3.
The Park from the north-west, 19 February 1946. The semi-circular earthwork can be seen just to the left of centre. Crown Copyright Reserved.

PLATE 4.
Staverton Park from the west, 19 February 1946. Field 135 in the foreground. Crown Copyright Reserved.

PLATE 5.
Staverton Park from the south-west, 27 November 1945. Fields 134 and 135 in the foreground, the Park the background. Crown Copyright Reserved.

mentioned (Calendar of State Papers). Staverton was possibly first used as a pasture for deer (Farrer, 1923), although no explicit reference to this effect has been found. Rather, the indications are that sheep were the most numerous stock in this area. In 1086 80 sheep were recorded, far more than any other species. Likewise in 1185, Staverton has 6 oxen, 1 horse, 4 cows, 4 pigs, and 60 sheep; and if 60 sheep were added, the village would be worth 10s. more per annum (Rotuli de Dominabus, Pipe Roll Society, 1913).

By the sixteenth century the medieval parks of Suffolk were evidently in decline. This process is described in Robert Reyce's seventeenth century *The Breviary of Suffolk* (Hervey, 1902): "In time parks were payd open, and so in every succeeding age as the desire of profitt increased more parkes were disparked than newly inclosed. In this latter age . . . many of our greatest parkes are layd open . . . The number of our parkes remaining are very few, and I thinke daily will grow fewer . . . ".

The condition of Staverton Park at the end of the sixteenth century is shown by J. Norden's (1600–1601) "An ample and trew description and survey of the Manors, lordships, townes and parishes of Stauerton, Eyke . . . in the Countie of Suffolk" (I. & E.S.R.O., V5/22/1), the recently acquired estate of Sir Michael Stanhope. In this, the first detailed record of Staverton Park, the boundary is clearly mapped (Plate 2) and can be identified today on the ground where it is marked by a shallow bank and external ditch. It is tempting to regard the variation in the density of the tree symbols as a reflection of the actual distribution of woodland, even though, as Carr (1962) points out, decoration was perhaps as important as content on maps of this period, and on Norden's map there are discrepancies of up to 100 per cent in the linear distances where a comparison can be made with existing features. Nevertheless, Norden's work was remarkably free from decorative material and his representation of the park boundary is relatively accurate. Although the name "Stauerto Parke" and information about the tenant is inserted into "treeless spaces", there is far more space than is necessary to insert these words, and on balance it seems reasonable to assume that Norden's map shows the actual distribution of trees.

Combining documentary evidence with that of the age of the ancient oaks, we may conclude that through the Middle Ages Staverton Park was a pasture, well wooded with oak and probably other tree species. These trees may have descended from a remnant of natural woodland which remained on or near Staverton in the eleventh century. In the presence of grazing animals natural regeneration may have been poor and recourse may have been made to planting: indeed there is a local legend that the oaks were planted in one year by the monks of Butley (Farmar 1949), presumably during the short period immediately before the Dissolution when they were the owners. Whether or not the woodland was perpetuated by natural regeneration, it is likely that in the relatively treeless Sandlings, the value of park timber would have been high enough to warrant careful management.

The period 1601–1820

The greater part of the heathlands of the Sandlings were leased as sheepwalk about 1600 (Burrell, 1960), although there was some cultivation of parts of the heath, often with rye. Heathland reclamation accelerated during the eighteenth century due to agricultural improvements, of which the introduction of new crops (especially turnips) into the rotation, the folding of sheep on arable and the use of clay and crag

to improve soil texture were the most important. Even so, considerable areas of heath remained by 1800.

Staverton Park clearly shared in this process. In 1600 John Talbot held it on a 21-year lease (Plate 2), presumably as sheep pasture. The clearings indicated by Norden were enlarged so that by 1820, when E. B. Metcalf completed a 2 in. drawing for the Ordnance Survey (O.S. 2 in. drawing, 1820, Sheet 315c), large areas (Tithe field numbers 131, 133, 134, 135, 178) were almost treeless, and woodland had been reduced to its present distribution and extent. Most eighteenth-century county maps (e.g. Kirby 1736, Bowen 1750) show no details of this process, and the map of Hodskinson (1783), which shows that the south-west corner was no longer within the Park, and later the map of C. and J. Greenwood (1834), which shows no difference between field 131 and the rest of the Park, even though 14 years before Metcalf had mapped a considerable difference, are at too small a scale to be reliable. Arable may not have been widely practiced within Staverton Park, for in the middle of the period Kirby (1732–1734) refers to "the pasture called Staverton-park". The voluminous "Abstract of the Title of Wm. Morris Esq., to . . . the Park called Staverton Park . . . " dated 1789 (W.S.R.O. 613/331) mentions no arable, but refers to "the Park of Staverton . . . with the Rights Royalties Woods Hereditaments and premises thereto belonging".

Grazing was evidently not at a continuously high level, for oak continued to regenerate in small numbers (e.g. Table 1, counts 4, 8). It was during this period, or possibly earlier, that holly became established in large quantities, mostly beneath established oaks, presumably from seed dropped by birds. Mature oaks were pollarded at roughly 50 year intervals: the wattle-sticks produced were used for house building, etc. (Redstone, 1900). In 1764, Kirby records that "An immense tract of ground commonly called Staveng Park is in this neighbourhood [near Rendlesham], it has thousands of polled oaks growing on it and a vast quantity of Holly". Over 50 years later (Cromwell, 1819) it was again described as "well wooded, and contains a great quantity of holly, a beautiful appearance in winter".

Changes in non-wooded land, 1820–1945

During the nineteenth century and early decades of the twentieth there were considerable changes in the extent to which the non-wooded land within Staverton Park was cultivated. The evidence for this is almost entirely cartographic, from the O.S. 2 in. drawing of 1820 and subsequently from the O.S. 1 in. first edition (1837), Tithe Award map, 1846 (I. & E.S.R.O. FDA 272/C1/16), O.S. 6 in. and 25 in. first edition (1881) and O.S. 6 in. and 25 in. second edition (1902). Valuable though they are, these maps must be interpreted with caution. On the Ordnance Survey maps, whilst woodland and heath are marked positively, large areas are blank: these areas may be arable, but this cannot be assumed with certainty. The nature of "heath" is variable to the extent that the 1837 maps show the Butley riverside marshes as such. The 1820 drawing is incomplete along the western side. The Tithe records do not state the vegetation/land use of fields 133 and 134, although it can be inferred from the nature of the record that they were pasture. The portion of the Park in Wantisden parish is "woodland", but the portion in Eyke is "sheepwalk", despite the fact that, as the existing trees and the 1837 and 1881 maps indicate, both portions were well wooded at the time. The 1837 map has what must be a substantial error:

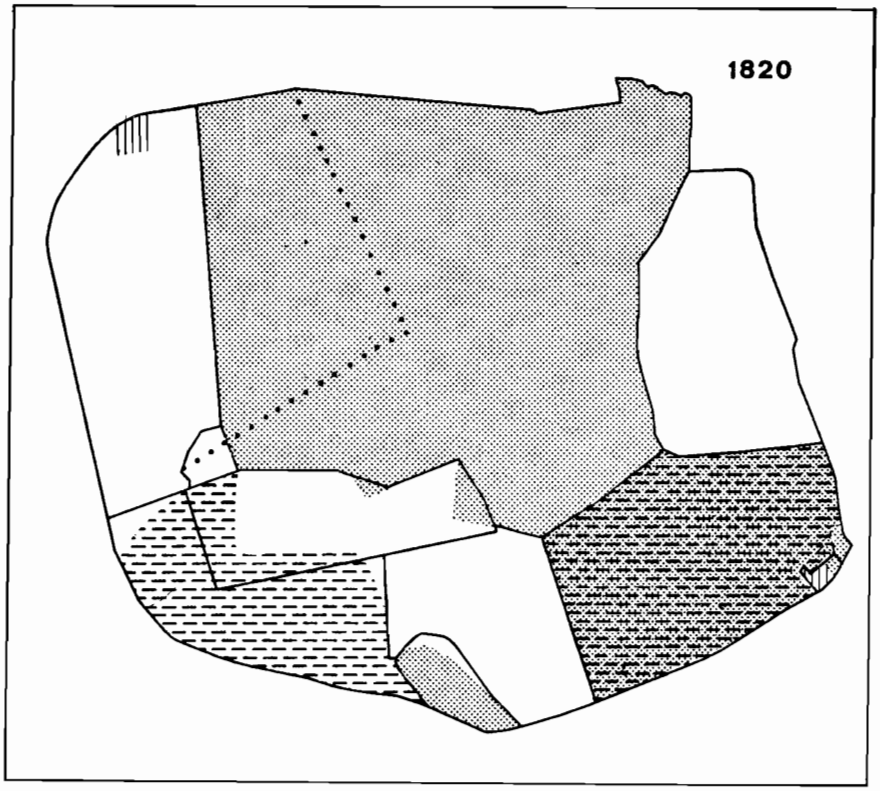
it shows Little Staverton as unwooded and the land between Little Staverton and the Thicks as woodland, whereas the 1820 and 1846 maps confirm that no changes in the extent of woodland took place. The vegetation present in 1945/1946 has been mapped from air photographs (e.g. Plates 3, 4 and 5).

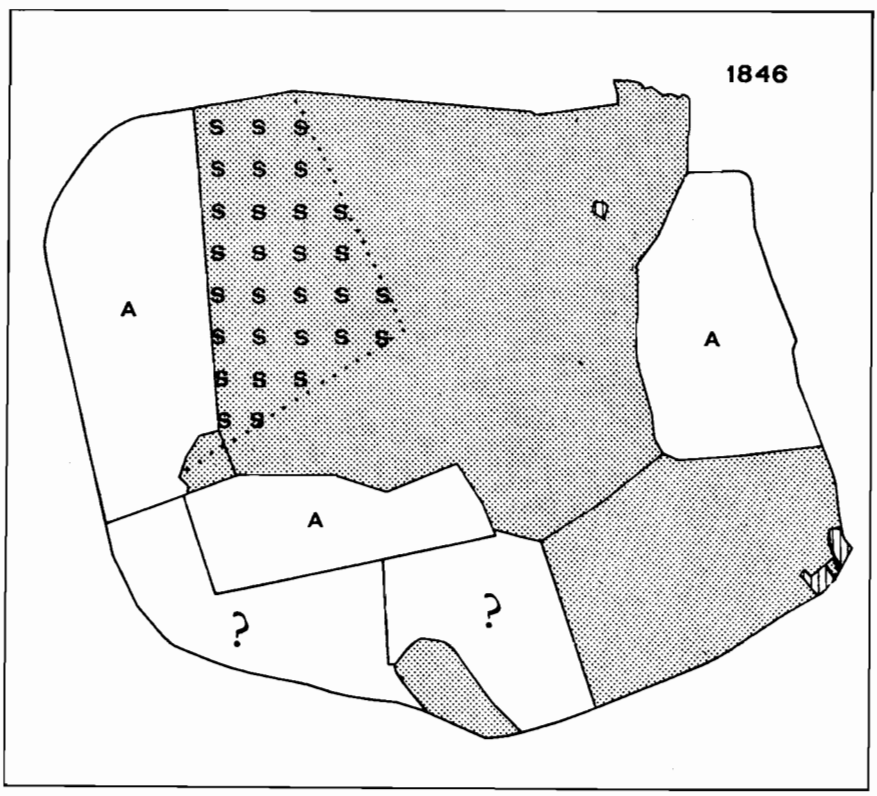
The maps (Fig. 20) show clearly the fluctuation in the relative extent of heathland and cultivation. Staverton Park clearly shared in the process of heath reclamation which was general over the Sandlings from 1800 to 1850 (Burrell, 1960). In 1820 only field 134 was heathland: in 1846 most of the non-wooded land was arable, and only 133 and 134 may have remained as heathland. Between 1846 and 1902 large areas were abandoned and reoccupied by heath vegetation. Many areas on the light soils reverted to heath in the mid-1870s as a result of increasing food imports and a series of bad harvests (Whiting, 1967), but by 1881, only field 134 and small parts of 133 and 131 were occupied by heath. By 1902, however, only 178 and half of 131 remained under cultivation.

Changes between 1902 and the Second World War are not well documented, but the tendency to let cultivated land revert to heath, which had developed after 1881, continued until there was no cultivated land at all within Staverton Park. Air photographic cover is available for 1945/1946 and also descriptive material of the period 1940–1944 (Farmar, 1949). The air photographs are particularly valuable. They show, for instance that the northern half of 131 which had reverted between 1881 and 1902 had become closed, *Calluna*-dominated heath by 1946, whereas the southern half, which was still cultivated in 1902, was open breck heath. The western part of 134 which was the only area which may have remained uncultivated since at least 1820, was dominated by bracken. Using this as a yardstick, it is possible to state that in 1946 the only other stand of heath more than 50 years old was the eastern half of 135 (Plate 4): as the entire 135 reverted between 1881 and 1902, this implies that the western half was brought into cultivation for a short period after 1902. The same must be true of 133 and part of 134, but to date there is no indication of when this took place (but possibly during World War I). Plot 178 was occupied by breck in 1946, but bracken was spreading down from woodland in 183 and had also occupied most of 134. Farmar (1949) gives some clues to the detailed nature of the non-woodland vegetation. Plot 131 (southern part?) was described (p. 14) as "a bare plain", with no vegetation except "sparsest grass and lichen". Carpets of bell heather (*Erica cinerea*) are mentioned (p. 20). In describing the tank tracks on the heath he says that the heather had been reduced to a desert of dust-coloured sand but two years later was covered by numerous seedlings of *Calluna vulgaris* and *Erica cinerea*. During World War II an 8-acre plot within field 134 (Plate 5) was reclaimed by the Ministry of War (Agriculture) for what proved to be unsuccessful potato growing (J. F. Kemball, personal communication).

Use and vegetation of the Park, 1820–1945

The origin, nature and effectiveness of internal boundaries is important in understanding the development of vegetation in Staverton Park, and is the key to the present differences between the Thicks and the Park. While the area was a wooded pasture, internal barriers were unnecessary and possibly did not exist, but by the nineteenth century, when the land was part arable and part pasture, these boundaries must have been at least sheep-proof. Nevertheless, there is no direct





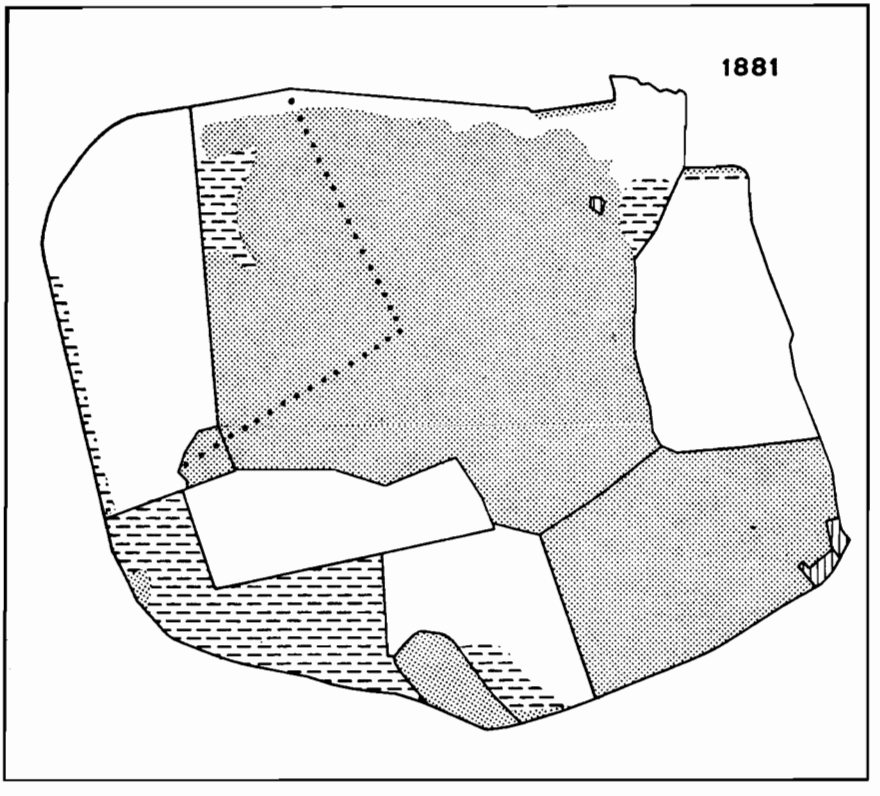
Key

Woodland

Arable

Heath

Gardens



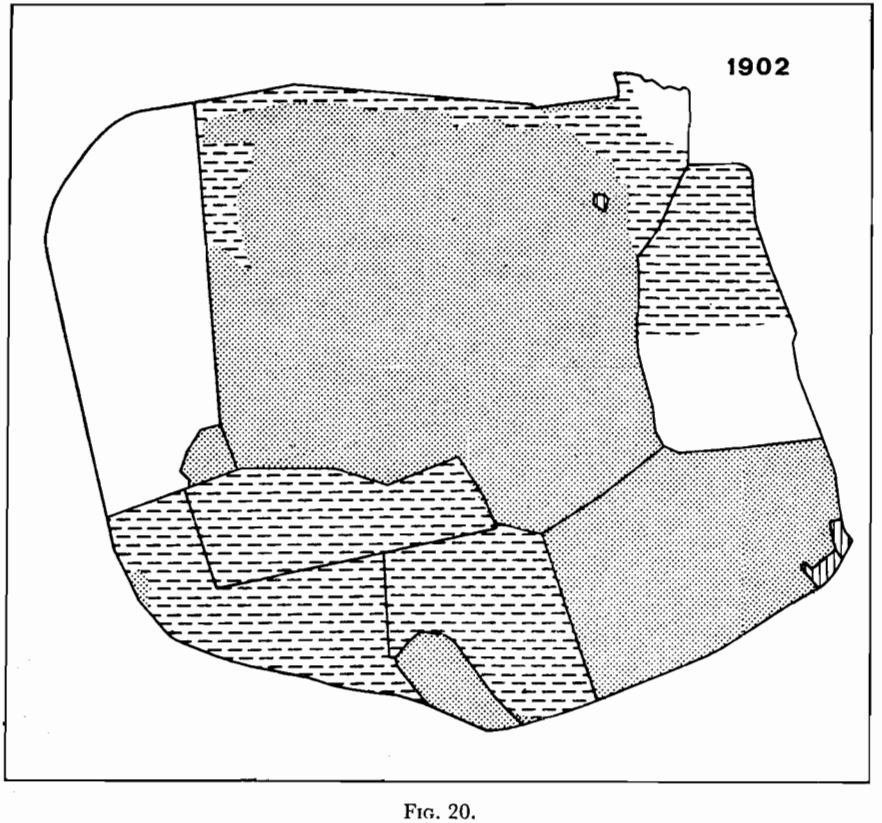


FIG. 20.
Nineteenth-century changes in vegetation/land use. On the 1846 map, A = arable, S = woodland described as sheepwalk, ? = no information, but probably pasture.

evidence of internal barriers before 1881, when the line of some pathways clearly shows that gates of gaps had to be used, e.g. between fields 130 and 133. Despite this, the low banks along many of the internal boundaries have the same wasted appearance of the external bank, which is at least 700 years old. It is possible that the internal boundaries had hedges. Hawthorns are still commonly found along them, and the fact that in one place only are they now abundant enough to form a barrier to stock is not contrary evidence for "overgrown thorn-fences" were widely cut down in Suffolk in the first half of the nineteenth century (Raynbird and Raynbird, 1849).

Maps record a boundary between the Park and the Thicks from 1820 onwards, but the exact date of this boundary is unknown. Possibly it was made stock-proof as a consequence of an Enclosure Act of 1807 (Farmar 1949, p. 42). The Suffolk Enclosure Award series is incomplete (Tate, 1952) and in fact no other reference to this Act has been found. The possibility of error remains, although it is fair to say that possible confusion with one of the many other Stavertons elsewhere in England has been eliminated.

Vegetation development in the Park differed from that in the Thicks after the early nineteenth century. Up to that time both areas had been used as pasture, but were well wooded. The commonest trees were oak and holly (Cromwell, 1819). Thereafter, while the Thicks was evidently ungrazed, the Park was still used as sheep pasture. After about 1900, however, sheep were no longer pastured (G. Boast, personal communication), and the Park was used primarily as a game preserve (Gray, 1910).

Since 1820 there have been only small changes in the extent of woodland: the Thicks and Little Staverton have not changed, but there has been a slight reduction in the area of the Park woodland by the loss of small areas bordering field 135, conversion of the north-western part of 183 through heath with scattered trees in 1881 to the present arable, and the reduction in the tree cover and conversion to arable of the strip beside the riverside marsh and the north-east corner beyond the Shepherd's Cottage.

Comparison of contemporary descriptions from 1819 to the present day shows that no substantial changes have occurred during the last 150 years in the vegetation of the Park. "Grand old oaks . . . abound, many of them surrounded by holly trees of great age, grouped about in the most curious fashion. Beautiful green glades run through the wood, carpeted with sward and heather, and bordered by a profusion of bracken" (Anon., 1900). Gray (1910) confirms the evidence of his photographs in stating that the earthwork is "covered for the most part with bracken, but there is some greensward in the interior space". It is evident that, while a luxuriant growth of bracken and grasses dominated the ground flora, parts at least had a good deal of heather. As late as World War II there was "some heather and whortleberry" in the central, birch-dominated region (H. Farmar, personal communication) and even today a few plants of *Calluna vulgaris* can be found.

Under the nineteenth-century conditions of light grazing and a luxuriant ground flora it is not surprising that tree regeneration was sparse for the most part. As is commonly the case in under-grazed sheepwalks in western Britain, hawthorn sprang up throughout the park to form a sparse shrub layer (Fig. 15). Birch, holly and rowan regenerated in small numbers, most abundantly on the heath area where competition with the ground flora was presumably less severe (Figs. 8, 10, 13).

Although pollarding ceased and their crowns together with the supply of acorns increased, regeneration of oak was rare and peripheral (Fig. 5); this was a probable consequence of the large gamebird population, for otherwise conditions for oak regeneration were ideal. Establishment of saplings on the crotches of old oaks took place without difficulty; Redstone (1900) records an 80-year birch and later (Redstone, 1908) he records holly, birch and elm of many years growth in this situation. Beech (*Fagus sylvatica*) is also recorded (Anon., 1900), perhaps as a transcription error for birch.

In the absence of grazing between about 1900 and 1945 it is surprising that regeneration was not more abundant but, apart from a further upsurge of birch in the central region (Fig. 11) and possibly a few holly and rowan, this did not take place. One turkey oak (*Quercus cerris*) sapling became established (Fig. 6). Possibly the bracken was so widespread and abundant by this time that it choked most saplings: the low-level air photograph of 1946 (Plate 3) confirms that the Park ground flora was then a dense stand of bracken.

At the end of this period "the heathland including the Park and the Thicks was absolutely overrun with rabbits, so much so that 9,000 were killed in the year from October 1946" (J. Kemball, personal communication). They were especially abundant on the northern slopes of the Park (Plate 3). Rabbits had been present in the area for a long time: in 1362 the manor's profit from rabbits was £1, and they were evidently not restricted to a warren (P.R.O., C 135/162). If during the eighteenth century their numbers increased on the Sandlings as they did elsewhere, this, rather than possible increased grazing by stock, may have eliminated oak regeneration after 1800.

Vegetation development in the Thicks, 1820–1945

Before the early nineteenth century, the only difference between the Park and the Thicks in the vegetation was the greater density of oak and holly in the Thicks (e.g. Figs. 4, 7), but even here it is doubtful whether a completely closed canopy existed (Fig. 20a). Thereafter stock were evidently excluded, for there was prolific regeneration of many species. The main surge of holly regeneration took place before 1850, mainly from seed, but also from the base of older hollies. A dense holly canopy was established so rapidly that birch and rowan, normally quick to occupy new ground, were excluded from the central region where holly is most dense: this suggests that, unlike the other species, large numbers of holly were present, but in check, while the Thicks was still grazed. The physiognomic change in the woodland was so great that the area, hitherto not differentiated from the Park, attracted the name "Thicks", a name first used on the 1881 O.S. map which refers to groves or woods with close undergrowth (Moor, 1823). Outside the central region, where holly was less dense, but nevertheless abundant, birch, rowan and oak regenerated in moderate numbers.

After the first wave of regeneration, which, together with crown expansion of the old oaks (pollarding had ceased), resulted in closure of the canopy and establishment of a shrub layer over most of the Thicks, the rate of regeneration fell sharply. Regeneration of rowan, oak and birch ceased altogether for a period which cannot be dated exactly, but which was probably about 1880–1920, and holly regeneration was extremely local. Nevertheless, there were still some clearings which had resisted

invasion, and along the western margin an understorey failed to develop, but such sites were invariably occupied by dense bracken.

One result of the vigorous holly development was increased shading of the old oaks and an acceleration of their mortality rate. Many hollies grew so large that their shallow root system no longer supported them. Some leaned on neighbouring trees, but others fell to the ground. Thus, whilst the old clearings have diminished, new clearings have formed at a steady and possibly increasing rate, thus presenting new opportunities for regeneration, which have been taken by holly, rowan and birch. Some clearings so formed have been invaded by *Rubus fruticosus*, but this does not exclude tree saplings completely. Curiously, the species composition of regeneration varies greatly from one clearing to another: holly is dominant in some, whereas others have pure birch or rowan thickets. Oak is no longer regenerating, but *Sambucus nigra* is common in clearings.

On the eastern side *Rhododendron ponticum* has invaded the shrub layer locally, where it takes the place of holly. It was near the north-east corner, that a large bomber crashed on the wood during the 1939–1945 war, burning a large clearing in the wood, which is now occupied by bracken and some birch saplings. In World War II an east-west strip was cleared through the Thicks for a flare path for a neighbouring aerodrome. It had once been possible to walk down this unhindered, but in 1968 it had become so overgrown with holly that its course could not be traced by Mrs. G. Boast, who has lived by the Thicks since before the war.

Post-war management

Since 1946, in common with large areas of heath on the Sandlings (Whiting, 1967), the heaths within Staverton Park have once more been brought into cultivation to the extent that heathland vegetation has been eliminated. Mr. J. F. Kimball has farmed Wantisden Hall Farm, which includes Staverton Park, since shortly after the end of the war, and the following paragraphs are based on his information.

The Thicks has still been used as a game covert, and it has not changed significantly in post-war years.

In 1946 the Park was congested with bracken: scrub (mainly hawthorn and elder) had developed sparsely, and fallen trees and branches littered the ground. The fallen timber was removed. Many scrub bushes were uprooted and burned in the sandpit on the northern edge of the Park. Rabbits were killed in large numbers until myxomatosis reduced their population to a low level. Bracken was cut and trampled. Part of the land was ploughed, fertilized and sown with cocksfoot (*Dactylis glomerata*). In about 1955 sheep and cattle were introduced, but by 1962 they had proved unsuccessful and were withdrawn. The northern marginal strip and other small, peripheral areas on the western and southern boundaries were converted to arable. The non-arable parts of the Park are now used for game and locally as a temporary dump for root crops, especially carrots. Nevertheless, bracken is still cut regularly, whenever there is spare labour.

By the end of the war the fields surrounding the Park and the Thicks were occupied by heath vegetation, with the exception of an 8-acre plot in the south-west corner. The heaths were largely treeless, with heather, gorse, broom and bracken dominant. This vegetation was cleared, the land was fertilized heavily and, since about 1947, cereal and root crops have been raised. In the northern part of field 131 ("Shepherds

Field") a strip has been allowed to revert in order to provide a windbreak and additional cover for game and this is now dominated by tall gorse and broom. During winter pheasant shoots take place.

Existing natural regeneration

Saplings of oak, holly, both birch species, rowan, ash and alder occur within Staverton Park (Figs. 6, 9, 12, 14), yet only in the Thicks is natural regeneration at all abundant. Here there is evidently no check to regeneration other than that imposed by the vegetation itself. Beneath the holly canopy regeneration is entirely absent for, although seedlings may be found here, they never survive. In the large clearings, too, most seedlings fail to survive within the dense bracken, but occasionally individuals of holly, rowan and birch succeed. In the smaller clearings, partially shaded by neighbouring trees, the growth of the ground flora is less vigorous. Here dense groups of holly, birch and rowan saplings may be found, although the species composition of individual groups varies greatly from one clearing to the next and may comprise a pure group of one of these species. Although fallow deer are present, their numbers are small and any influence they have on regeneration is temporary.

Saplings in the Park are relatively small in number and short in stature. This is partly the result of recent and present management, including re-seeding, grazing and bracken brashing, but it is probable that the density of the combined bracken and herb layers itself prevents the establishment of seedings in greater numbers. The holly saplings are grazed by the deer.

There is no natural regeneration of oak. This is not because the Park is no longer suitable for their growth, for saplings planted there in 1949 and protected in wire cages are growing vigorously. Nor is there a lack of viable seed: eight acorns taken from the heavy crop of 1967 all germinated next spring in cultivation and have produced sturdy seedlings. The block to regeneration, which certainly occurs between acorn fall and establishment of the saplings, probably has two main causes. Staverton Park is inhabited by immense flocks of wood pigeons, a species which can clear acorns from large areas of woodland. Those acorns which survive certainly germinate, for a few seedlings have been observed, but they subsequently die, perhaps starved of light by the established vegetation.

Further invasion of chestnut is not taking place, although one sapling has been found. In 1967 the adult tree produced a great deal of fruit, but all nuts examined had aborted. Along the eastern boundary the elm thicket is suckering vigorously. In the Thicks, many of the hollies are producing adventitious roots from low, pendulous branches. The single turkey oak is still immature.

Discussion

Status of the woodland

Are the Staverton woodlands survivals of primaeval forest cover? This question must be rephrased in the form: has Staverton Park ever been completely cleared of trees for a significant period? It is almost impossible to prove a negative—that total clearance never occurred—decisively, for the absence of direct documentary evidence of tree cover before 1528 is insufficient to prove the point, just as the lack of evidence of clearance is no proof of continuous tree cover: the record is incomplete at that

distance of time. Rather, we must assess the balance of probabilities from direct evidence, of which there are three main lines.

First, we know from the domesday survey that woodland existed in Staverton Manor, and that at that time the Sandlings were poorly wooded (Darby, 1952). From other sources we know that Staverton was emparked in early medieval times, a time when parks were formed in large numbers throughout the country. In the Sussex Weald (Brandon, 1963, p. 44), emparking was prevalent in the twelfth and thirteenth centuries. The parks so formed contained a large reservoir of timber whose original purpose was to afford shelter to the deer. Brandon suggests that most parks were enclosed direct from common lands and waste: the fact that neighbouring inhabitants had common rights over some parks, and documentary evidence in some cases that woodland and heath were emparked is taken as evidence supporting this. At Staverton it seems reasonable to suggest that a similar train of events took place. In selecting a site it seems likely that extant woodland would have been chosen. Furthermore, prior to emparking the land was probably part of the common waste, for according to Farmar (1949, p. 42), the people of the manor had a right of topping and lopping for fuel. If Staverton Park was wooded when it was formed, and was mature woodland in 1528, it is highly unlikely that clearance occurred in historical times.

Secondly, when the woodland vegetation on a well-drained, acid, sandy site is cleared and replaced by some form of dwarf-shrub or grass heath, it is likely that a podsol will develop (Dimbleby, 1962). This is certainly the case for the Sandlings (Whiting, 1967) and, indeed, a podsol can be seen beneath *Calluna* heath within a few yards of the Staverton Park boundary. Soil regeneration may occur once a suitable tree cover has been established, but the B horizon still persists. Thus, if the Park or the Thicks had ever been occupied by heath for a long period, it is probable the podsolization would have occurred and that this would still be detectable. Since the soil is not podsolized, even though the surface horizons are partly bleached, this is further evidence suggesting that clearance has not occurred.

Thirdly, the lichen flora, which is extremely rich, includes a number of species which are rare in eastern Britain and whose centre of distribution is in the west. The presence of such "Atlantic" species in eastern sites is usually correlated with continuity of woodland cover (see Appendix 3).

If the Staverton Park area has indeed never been completely cleared of woodland, to what extent can the present woodlands be regarded as natural? Obviously they are not entirely natural, for many of their features are partially man-made, notably their location and extent, the growth form of many of the oaks and hollies and the generation structure. On the other hand, there are a number of important natural features. Only native species are present, with the exception of the recent small *Rhododendron* invasion. Apart from the post-war, small-scale oak plantings, all the individual trees are evidently of natural origin. There has been very little selective elimination of tree species—the post-war removal of some bushes from the Park is the only known instance—except indirectly through the effects of sheep and cattle grazing. In the Thicks at least dead and fallen timber lies where it falls, and a balance is developing between death and decay on the one hand and regeneration and growth on the other. There is probably a close genetic link between existing trees, especially oaks, and those of the original woodland. Thus, although the woods are semi-natural in common with much British woodland, the Thicks probably

approaches closer to the natural condition than most other woods in lowland Britain.

Future development of the woodland

It is worth predicting the future course of development, now that something is known of the manner in which the existing woodland developed. This is, of course, closely bound up with management and the possibility of a major change.

Whilst existing management continues, changes will be very slow. In the Park, the old generations of oak, holly and birch will gradually decline. A few saplings—mainly holly and birch—will develop into adult trees, but will not replace completely the losses, with the result that the canopy will open further and bracken and grasses will continue to dominate. However, the value of the Park for game depends on the tree cover, which would eventually have to be restored. The Thicks, though functioning as a game preserve, has been largely unmanaged since the early nineteenth century. During this time there has been a fall in the importance of oak and a sharp increase in holly, whilst rowan, birch and elder have probably changed little. This trend is likely to continue to the eventual exclusion of oak and to dominance by holly.

If tree regeneration were actively facilitated in the Park, it is likely that it would develop into dense, holly-dominated woodland resembling the Thicks: indeed as late as the early nineteenth century the vegetation in the Thicks was closely similar to that of the Park today. Large clearings would remain, dominated by bracken. The birch stands would probably be succeeded by another species, but there is no indication yet of which this would be.

Succession of heathland plant communities

The air photographs of 1945 (e.g. Plates 4, 5) reveal the nature of the heathland vegetation at that time. Combined with the maps of former land-use vegetation (Fig. 20) they give some idea of the heathland succession, despite the difficulties in map-interpretation mentioned above. Even though such vegetation is no longer found in Staverton Park, it is still important in the Sandlings as a whole, despite widespread reclamation in recent decades for agriculture, forestry and airfields: in 1965 there were still 51 tracts of heath greater than 10 acres, of which two were greater than 1,000 acres (White, 1965).

The vegetation to develop on bare ground is an open *Callunetum:* such colonization is described briefly by Farmar (1949, p. 178). Increase in the density of *Calluna* and the few associated species is slow, but eventually the cover becomes complete (Plate 4). Bracken, which is eliminated under arable, invades *Callunetum* from surviving stands in woodland and on boundary banks, but eventually a balanced *Callunetum-Pteridietum* is established (c.f. Watt, 1955). Birch is capable of invading both *Pteridietum* and *Callunetum* to form closed birch groves. The status of grassland is not certain, but it appears to develop after long-continued absence of cultivation, under grazing and along paths. Gorse and broom can invade closed grassland, closed *Callunetum* and bare ground to form a dense scrub. These relationships agree well with what has been observed on Westleton Heath and elsewhere on the Sandlings (White, 1965), where birch is normally associated with bracken, gorse/broom is associated with both grassland and *Calluna*, and grassland is associated with paths and recent use of the land as pasture.

Conservation

Finally, it is worth considering the value of Staverton Park and its surroundings as a reservoir and refuge of native species, its current significance in the natural history of the Sandlings and its potential for research and study.

Staverton was once set in a large area of dry heath, riverine marshland and deciduous woodland. Each habitat had its characteristic assemblage of species and in addition there were some species which benefited from the juxtaposition of these habitats. The region was floristically diverse. Bird populations were very rich: thirty years ago stone curlew, wood lark, tree pipit, and many others, bred on the heaths, nightjars on the wood edge, and wrynecks in the woods (E. Hosking, personal communication). Reclamation of the heaths and marshes has resulted in a loss of floristic and faunistic diversity. The birds mentioned above have been lost, except for one or two pairs of stone curlew (H. Farmar, personal communication). Nevertheless, the woodland flora remains. Many heathland species occur within Staverton Park or just outside it. Many marshland species persist in small numbers marginally and along ditches. The lichen flora is of outstanding interest. The fauna, though not investigated in detail still seems to be rich: it includes woodcock, tawny owl and sparrow-hawk, and with a wide variety of woodland habitats—open and closed canopy, young trees, rotting timber, deep litter—it is likely to contain a rich invertebrate fauna.

The Staverton woods, as an ancient, semi-natural stand of native trees, are unique in the Sandlings now that Sudbourne Great Wood and Office Piece, which used to be similar (F. W. Simpson, personal communication), have been replanted. A remnant of Iken Wood (62/395565) is superficially similar, but its trees are much younger, hazel stools are prominent and its history is probably different. Ancient oaks can still be seen scattered about fields, heaths and hedgerows. The Staverton woods are the only site where an approach to the potential natural vegetation of the Sandlings can be seen. They also show the extreme growth capabilities of many native trees.

The woods could yield data for research in many facets of ecology. Most British woods, having been managed for timber, comprise young or mature trees, and very few are over-mature. Staverton Park is one of the few places in which the natural decline of a native woodland and its subsequent development can be studied. The hollies in the centre of the Thicks comprise a complete size range, supposedly the condition of primaeval woodland. As a result of this study it is one of the few old woodlands in whose development the relative contributions of man and nature are reasonably well known. As a site which has long borne relatively undisturbed native woodland, its value in soil studies and as a reference against which to judge the effect on soil of various forms of land use is considerable. For all these reasons it is to be hoped that the Staverton woods will be preserved as effectively in the future as they have been in the past.

ACKNOWLEDGEMENTS

I am extremely grateful to Mr. J. F. Kemball for permission to work on his land and for much useful information.

My colleagues Dr. M. D. Hooper, Dr. J. Sheail and Mr. R. C. Steele have given me invaluable help and guidance. Dr. O. Rackham translated and helped in the interpretation of some of the medieval material. Knowledge of the heath vegetation

up to 1946 is based largely on information supplied by Mr. H. Farmar, who made many other useful suggestions. Mr. F. J. Bingley, Dr. A. D. Horrill, Mr. A. J. Kerr, Dr. F. H. Perring, Dr. F. Rose, Mr. N. Scarfe, Mr. F. W. Simpson, Mr. P. Wanstall, the staffs of the Ipswich Record Office and Reference Library, and the Staff of the Nature Conservancy's Maps Section have all helped in various ways. To all these I would like to extend my thanks.

References

Anon. (1900). Annual excursion, 1898. Staverton, Butley, Orford and Campsey Ashe. *Proc. Suffolk Inst. Archaeol. nat. Hist.*, **10**, 49–52.

Boswell, P. G. H. (1928). *The geology of the country around Woodbridge, Felixstowe and Oxford.* Memoir of the Geological Survey of England and Wales. H.M.S.O. London.

Brandon, P. F. (1963). *The common lands and wastes of Sussex.* Ph.D. thesis, University of London.

Brightman, F. H. (1960). Field Meeting at Flatford. *Lichenologist*, **1**, 203–206.

Burrell, E. D. R. (1960). *An historical geography of the Sandlings of Suffolk, 1600 to 1850.* M.Sc. thesis, University of London.

Carr, A. P. (1962). Cartographic record and historical accuracy. *Geography*, **47**, 135–144.

Clarke, R. R. (1960). *East Anglia.* Thames and Hudson, London.

Copinger, W. A. (1909). *The manors of Suffolk*, **4**, 259–262. T. Fisher Unwin, London.

Cox, J. C. (1907). *Forestry.* Victoria County History of Suffolk, **2**, 403–409.

Cromwell, T. K. (1819). *Excursions in the County of Suffolk*, **2**, Longman, Hurst, Rees, Orme and Broom, London.

Darby, H. C. (1952). *The Domesday geography of Eastern England.* C.U.P., Cambridge.

Dickens, A. G. (1951). *The Register or Chronicle of Butley Priory, Suffolk 1510–1535.* Wykeham Press, Winchester.

Dimbleby, G. W. (1962). *The development of British heathlands and their soils.* Clarendon Press, Oxford. For. Mem., 23.

Evelyn, J. (1670). *Sylva*, London.

Farmar, H. (1949). *The cottage in the forest.* Hutchinson, London.

Farrer, E. (1923). *Deer Parks of East Anglia—Suffolk.* East Anglian Daily Times. Ipswich Reference Library, S/9.

Gray, H. St.G. (1910). The earthwork near Butley. *Proc. Suffolk Inst. Archaeol. nat. Hist.*, **14**, 69–90.

Green, F. H. W. (1964). A map of annual potential water deficit in the British Isles. *J. appl. Ecol.*, **1**, 151–158.

Hervey, Lord Francis (1902). *Suffolk in the XVIIth Century. The Breviary of Suffolk by Robert Reyce*, 1618. London.

Horrill, A. D., and Kerr, A. J. (1967). The Staverton holly. *Q. Jl. For.*, **61**, 342–343.

Horrill, A. D., and Kerr, A. J. (in preparation). The size, spatial pattern and density of oak trees in two adjacent stands. Nature Conservancy, unpublished MS.

Kirby, J. (1732–1734). *The Suffolk Traveller.* 1st edition. J. Bagnall, Ipswich.

Kirby, J. (1764). *The Suffolk Traveller.* 2nd edition. T. Longman, London.

Moor, E. (1823). *Suffolk words and phrases.* R. Hunter, London.

Peterken, G. F. (1965). *The status and growth of holly* (Ilex aquifolium *L.*) *in the New Forest.* Ph.D. thesis, University of London.

Raynbird, W., and Raynbird, H. (1849). *On the agriculture of Suffolk.* Longman & Co., London.

Redstone, V. B. (1900). The Sandling. II. Staverton and Butley gateway. *Proc. Suffolk Inst. Archaeol. nat. Hist.*, **10**, 71–82.

Redstone, V. B. (1908). *Memorials of Old Suffolk.* Bembrose and Sons Ltd., London.

Tate, W. E. (1952). A handlist of Suffolk Enclosure Acts and Awards. *Proc. Suffolk Inst. Archaeol. nat. Hist.*, **25**, 225–263.

Watt, A. S. (1955). Bracken versus heather, a study in plant sociology. *J. Ecol.*, **43**, 490–506.

WHITE, D. A. (1965). *Management plan for Westleton Heath National Nature Reserve.* Nature Conservancy. Unpublished MS.

WHITING, N. E. (1967). *Changes in the agricultural geography of the Suffolk Sandlings since* 1930. M.A. thesis, University of London.

The following abbreviations of sources of manuscript material have been used in the text:

P.R.O. Public Record Office.
I. & E.S.R.O. Ipswich and East Suffolk Record Office.
W.S.R.O. West Suffolk Record Office.

APPENDICES

APPENDIX 1. Preliminary list of vascular plants for the woodland areas.

Achillea millefolium
Agrostis canina
A. stolonifera
A tenuis
Arrhenatherum elatius
Artemisia vulgaris
Betula pendula
B. pubescens
Bromus mollis
Bryonia dioica
Calluna vulgaris
Carduus acanthoides
Cerastium semidecandrum
Chamaenerion angustifolium
Cirsium arvense
C. vulgare
Conopodium majus
Corydalis claviculata
Crataegus monogyna
Dactylis glomerata
Deschampsia caespitosa
Digitalis purpurea
Dryopteris austriaca
Endymion non-scriptus
Epilobium hirsutum
Erica cinerea
Festuca rubra
Fraxinus excelsior
Galium verum
G. saxatile
Geranium molle
Glechoma hederacea
Hedera helix
Hieracium pilosella
Holcus lanatus
H. mollis
Ilex aquifolium
Loliium perenne
Lonicera periclymenum
Malva moschata
Matricaria matricarioides
Moehringia trinervia
Myosotis arvensis
Phleum pratense
Plantago lanceolata
P. major
Poa annua
P. pratensis
Polygonum hydropiper
Potentilla erecta
P. sterilis
Primula vulgaris
Pteridium aquilinum
Quercus cerris
Q. robur
Rhododendron ponticum
Rubus fruticosus agg.
Rumex acetosella
Ruscus aculeatus
Sambucus nigra
Sarothamnus scoparius
Senecio squalidus
S. sylvaticus
Silene alba
S. dioica
Sonchus asper
Sorbus aucuparia
Stellaria graminea
S. holostea
Taraxacum officinale
Teucrium scorodonia
Trifolium arvense
T. dubium
T. repens
Tussilago farfara
Ulex europaeus
Ulmus carpinifolia
Urtica dioica
Veronica chamaedrys
Viola arvensis
V. riviniana
V. tricolor

Nomenclature according to Clapham, A. R., Tutin, T. G., and Warburg, E. F. (1962). *Flora of the British Isles.* Second Edition. C.U.P., Cambridge.

APPENDIX 2. Bryophytes (P. J. Wanstall).

In addition to records made in 1968, the list includes the records of F. Rose (1952), P. J. Grubb (1957), H. L. K. Whitehouse (1958), and F. J. Bingley, in the card index held at Flatford Mill Field Centre. Nomenclature and order follows Warburg (1963) and Paton (1965).

Mosses

Atrichum undulatum
Polytrichum juniperinum
P. aurantiacum
P. formosum
P. commune
Dicranella heteromalla
Diacranoweisia cirrata
Dicranum montanum
D. flagellare
D. scoparium
Campylopus pyriformis
C. flexuosus
Leucobryum glaucum
Grimmia pulvinata
Funaria hygrometrica
Tetraphis pellucida
Orthodontium lineare
Pohlia nutans
Bryum caespiticium
B. capillare
Mnium hornum
M. longirostrum
Aulacomnium androgynum
Orthotrichum affine
O. diaphanum
Thuidium tamariscinum
Amblystegium serpens
Isothecium myosuroides
Camptothecium sericeum
Brachythecium rutabulum
Eurhynchium praelongum
E. confertum
Pseudosclerodium purum
Pleurozium schreberi
Plagiothecium sylvaticum
P. undulatum
Hypnum cupressiforme
H. cupressiforme v. resupinatum
H. cupressiforme v. ericetorum
Rhytidiadelphus squarrosus

Hepatics

Metzgeria furcata
Pallavicinia lyellii
Lepidozia reptans
Lophocolea bidentata
Lophocolea heterophylla
Cephalozia bicuspidata
Radula complanata
Frullania dilatata

REFERENCES

PATON, J. A. (1965). *Census catalogue of British Hepatics*. 4th edition. British Bryological Society.
WARBURG, E. F. (1963). *Census catalogue of British Mosses*. 3rd edition. British Bryological Society.

APPENDIX 3. Corticolous and lignicolous lichens (F. Rose).

Sixty-four species are reliably recorded, which, for East Anglia, is a very large number for a woodland area of this size.

Mr. P. James of the British Museum (Natural History) and I searched the greater part of this woodland, both the Thicks and the Park, on 28 February 1968. We saw 61 species on this date, to which I have added three seen by previous workers which we accept as reliable records (*Physcia adscendens*, *Phaeographis ramificans* and *Cladonia bacillaris*). Two other species recorded by the British Lichen Society in 1959 (*Rinodina exigua* and *Parmelia subaurifera*) are possible, but were also not refound. *Parmelia laevigata*, recorded in 1959 (Brightman, 1960) is most unlikely to be correct. I have excluded these last three species from the list.

Higher totals for similar sized areas of old forest or parkland are known in Kent and Sussex (Mersham Park, Kent—94; Ashburnham Park, Sussex—115; Eridge Park, Sussex—167), and also in the New Forest, which, of course, is a far larger area. These, however, are areas with a more humid climate, more sheltered and varied topography, a greater variety of tree species and with little or no air pollution. Air pollution, though apparently slight at Staverton, is probably a significant factor in excluding certain old forest species (e.g. *Lobaria* spp., *Nephromia laevigatum*, *Usnea* spp.) or in causing others to be less well developed there.

The most interesting species present at Staverton include:

(1) *Haematomma elatinum*, which is locally plentiful and was regarded until recently as confined to south-west Ireland, north-west Wales and the Scottish Highlands; it is now known to be widespread in south-east England and even common in the New Forest, but always in what appear, or are known to be ancient, little-disturbed stands of old forest or in sheltered, well-wooded parkland. *Lecanora cinnabarina* has a similar pattern (boreal-atlantic) and is equally remarkable.

(2) *Thelotrema lepadinum*, a widespread British species, but one which normally only seems to be found in old forest relics, e.g. New Forest, Wealden Forests, Blean Forest, Burnham Beeches.

(3) *Phaeographis ramificans*, a very rare lichen characteristic of holly, hitherto unknown in East Anglia.

(4) *Stenocybe septata*, common on holly (in old woodlands only) in west, south and south-east Britain, but otherwise unknown in East Anglia.

(5) *Phlyctis agelaea*, a species common in England till the mid-nineteenth century in old woodlands, but not certainly seen in *England* this century until it was refound (albeit in small quantity) at Staverton.

(6) *Opegrapha lyncea*, a rare species of old oak forests in England.

Other Staverton species which are less rare, but equally characteristic of ancient trees or ancient woodland relics now are *Rinodina roboris*, *Catillaria lightfootii*, *Lecanactis premnea*, *Enterographa crassa*, *Schismatomma decolorans*, and *Calicium abietinum*, on oak, and the *Arthopyrenias* (*A. fallax*, *A. punctiformis*, and *A. antecellans*) on holly.

This assemblage of species suggests very clearly to me that Staverton Park and Thicks is almost certainly a relic of the ancient forest cover of this part of England and that there has been here a fair degree of permanence of forest condition and tree cover, and lack of any major clear felling and replanting.

Many of these species, to judge from their present known distributions and what is known from historical records, are ill-adapted to change, and are normally unable to colonize new and isolated habitats today in Britain, even in areas of low air pollution. They are largely confined to old trees and appear to be relict in nature, though where larger areas of old forest still exist (e.g. New Forest) they seem able still to colonize younger, but mature, trees and so maintain themselves. Their ultimate fate at Staverton may depend therefore on encouragement of regeneration or on planting of younger oaks to "take over" in due course.

The assemblage is much what one would expect to find in the primaeval forests of East Anglia; some species that are missing but which occur in the New Forest and the Weald, may have been eliminated by air pollution from Ipswich (or, more probably, from London or the Midlands), but since some highly SO_2-sensitive species such as *Parmelia caperata* remain, dryness is more likely to be responsible for the absence of some, though not all, of them. *Lobaria pulmonaria*, for example, occurred in East Suffolk at Parham, Easton and Barham prior to the mid-nineteenth century.

Habitat: Q = Quercus; I = Ilex; B = Betula.
Nomenclature according to James (1965, 1966).
* D. Hawkesworth, 1965—vidi sp. conf. P. W. James.

Usnea subfloridana (Q)
Ramalina farinacea (Q)
Evernia pruinastri (Q)
Parmelia caperata (Q)
P. subrudecta (Q)
P. revoluta (Q)
P. saxatilis (Q)
P. sulcata (Q)
P. glabratula (Q)
P. physodes (Q)
Lecanora chlarotera (Q)
L. expallens (QI)
L. conizaeoides (QIB)
L. dispersa (Q)
L. cinnabarina (QI)
Lecidea quernea (Q)
L. scalaris (Q)
L. granulosa (Q)
Pertusaria amara (Q)
P. pertusa (Q)
P. hymenea (Q)
P. hemisphaerica (Q)
Ochrolechia androgyna (Q)
O. turneri (Q)
O. yasudae (Q)
Haematomma coccineum (Q)
H. elatinum (QI)
Rinodina roboris (Q)
Buellia canescens (Q)
B. punctata (Q)

B. alboatra (Q)
Lepraria incana (QI)
L. candelaris (Q)
Thelotrema lepadinum (QI)
Physcia adscendens (Q)
Lecanactis premnea (Q)
Lecanactis abietina (Q)
Phlyctis argena (QI)
P. agelaea (Q)
Catillaria griffithii (Q)
C. lightfootii (Q)
Cladonia fimbriata (Q)
C. chlorophaea (Q)
C. macilenta (Q)
C. digitata (Q)
C. coniocraea (Q)
C. parasitica (Q)
C. bacillaris (Q)
Graphis scripta (I)
G. elegans (QI)
Phaeographis ramificans (I)*
Opegrapha lyncea (Q)
O. vulgata (QI)
O. atra (Q)
Enterographa crassa (QI)
Schismatomma decolorans (QI)
Arthonia radiata (I)
A. spadicea (Q)
Calicium viride (Q)
C. abietinum (Q)
Chaenotheca ferruginea (Q)
Stenocybe septata (I)
Arthopyrenia fallax (I)
A. punctiformis (I)
A. antecellans (QI)

REFERENCES

BRIGHTMAN, F. H. (1960). Field Meeting (of British Lichen Society) at Flatford (Suffolk). *Lichenologist*, **1**, 203–206.

JAMES, P. W. (1965). A new check list of British Lichens. *Lichenologist*, **3**, 95–153.

JAMES, P. W. (1966). A new check list of British Lichens: additions and corrections—1. *Lichenologist*, **3**, 242–247.