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LAND USE SURVEY HANDBOOK

ALICE COLEMAN, M.A., F.R.G.S.
K. R. A. MAGGS, B.Sc.

*An Explanation of the Second
Land Utilisation Survey of Britain
on the Scale of 1 : 25,000*



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Land Use Survey Handbook

*An Explanation of the Second Land Use Survey of
Britain on the Scale of 1:25,000*

BY ALICE COLEMAN, M.A., F.R.G.S.

Illustrated by K. R. A. Maggs, B.Sc.

PUBLICATIONS OF THE SECOND LAND USE SURVEY

Obtainable from the Director of the Survey, King's College, Strand, London,
W.C.2.

1. "The First Twenty Four Land Use Maps". Interpretations of the published sheets. 32 pp. Price 3/- (15 N.P.).
2. Land Use Maps in eleven colours on the scale of 1:25,000. Price 15/- plus postage. See list on page 32.
3. Land Use Survey Index Sheet at the scale of 20 miles to one inch showing sheet names, main towns, etc. Price 3/- (15 N.P.).
4. In preparation. A set of six maps and a handbook to illustrate the geography of England and Wales for overseas schools. Price \$15.

I. INTRODUCING THE 1:25,000 LAND USE SURVEY OF BRITAIN

IN the field of land use survey Britain holds an honourable record. As far back as the mid-eighteenth century areas as big as a county were mapped field by field, while in its modern guise the idea was brought to fruition by Professor L. Dudley Stamp in the decade before World War II. Professor Stamp envisaged and achieved a complete coverage of land utilisation maps for the whole of Great Britain, a task which involved about 20,000 six-inch field maps.

This remarkable pioneer effort gave Britain a complete record of the utilisation of her land, which was quickly accepted and appreciated as a valuable new tool, both for academic study and for illustrating practical problems. A similar tool was soon demanded by the administrators and geographers of other nations, and Professor Stamp has acted as a consultant to a wide range of national governments, many of whose territories presented quite different problems in mapping from our own. Later he prepared a general scheme for world land use survey, which was studied by the International Geographical Union and recommended as a basic colour notation for the guidance of those preparing land use maps. Conventional colours were laid down for nine major categories of data, together with certain subdivisions, but the scheme also recognised wide local variations and allowed for corresponding flexibility in modes of representation.

Some of the less developed countries with urgent and practical needs have forged ahead both in the degree of detail published and in the scale of presentation. The Gambia has recently published a series of sheets showing sixteen categories of information on a scale of 1:25,000, while Singapore's project portrays 43 categories on no less a scale than ten inches to the mile.

In contrast to these achievements, Britain lagged behind. The printing plates of the prewar survey were destroyed by enemy action, the maps became unobtainable and reprinting could not be considered as many had become out of date. The second world war, the boom conditions that followed it, and big strides in technical progress, all

combined to weave a pattern of British agriculture very different from that of the nineteen thirties when slump conditions prevailed. The British land utilisation map was justly described as a "historical document", and by 1960 there was a widespread demand for something to replace it as a modern geographical tool.

It was thought that if the existing enthusiasm could be co-ordinated in a single national scheme a complete land use revision could be produced within a few years. There was now a much larger reservoir of trained geographers than thirty years previously when the original survey was begun, and there was also a greater appreciation of the nature and value of land use maps. Thus the time seemed favourable for the launching of a new scheme, and the active role in doing so fell to the Isle of Thanet Geographical Association. After two years spent in preparing the foundations, and with generous encouragement and financial help from Professor Stamp, the Thanet Branch announced a Second Land Use Survey, to be directed by the author, its president.

In January, 1960, the Director sought public co-operation in implementing the project, and it is a measure of the need felt, that within a week one-third of England and Wales had been undertaken. By 1968 the whole of England and nearly half of Wales had been completed in manuscript and the survey had been extended across the border to Scotland.

In the first edition of this handbook, the voluntary surveyors were asked to include a survey of heath and moorland vegetation communities. In the majority of cases, this proved too difficult a task, and the Nature Conservancy subsequently awarded grants to enable paid surveyors to add these data separately.

II. THE NATURE OF THE LAND USE SURVEY

A fresh start, especially when it is a revision of an earlier achievement, is always a time for considering the incorporation of improvements.

To this end discussions were held, and a provisional scheme was submitted to a pilot test of 500 square miles. The pilot area, East Kent, proved particularly suitable for the purpose, as it exhibited very varied utilisation ranging from fruit-growing to coal-mining. Every category of British land use, and indeed virtually every British crop, was represented within this area. During and after testing, a number of modifications were made, and after further small-scale testing in other parts of the country, the following recommendations were made :

1. A Scale of 1 : 25,000

At the time of the pre-war survey, land use data were new and stimulating to mature geographical minds on account of significant

spatial correlations revealed for the first time. Yet the seven-category basis of mapping was essentially simple and today is no longer stimulating even to undergraduates as they have already digested its scope during their schooldays. Moreover, geography as a subject had continued to advance, and by 1960 was calling out for land use data that would not only be new but also more finely detailed to permit the tracing of more accurate and sensitive correlations.

No significant increase in detail was possible on the one-inch scale, and 1 : 25,000 maps were essential. On this scale 70 categories of information could be represented without loss of clarity. The field survey was best carried out on the six-inch scale as previously, but with greater differentiation of crops and other types of use. This additional detail proved to add interest to the task of the surveyors.

2. 78 square miles per sheet area

It was decided that each land use sheet should be equivalent to two 1 : 25,000 Ordnance Survey maps printed together side by side. It measures approximately 35 by 22 inches which is a convenient size to handle, and represents an area of $6\frac{1}{4}$ by $12\frac{1}{2}$ miles, or 78 square miles.

Since this decision was reached, the Ordnance Survey has also decided to combine its 1 : 25,000 maps in pairs. Henceforth land use maps and Ordnance Survey maps will share the same names and sheet lines, with the exception of a few coastal sheets.

England and Wales will be covered by 843 maps, one hundred of which were published by 1968. A list of sheets currently available appears on page 32. Scottish maps will be produced as and when publication funds are raised by a Scottish sub-committee which assumed fund-raising responsibility from 1967.

3. Volunteer Surveyors

The survey has depended heavily on the generous co-operation of volunteer workers. There is in Britain an ample reserve of land-use conscious geographers and others, over 3,000 of whom have participated in the field survey.

Each volunteer was asked to be responsible for surveying one or more six-inch maps. This is not to say that he necessarily mapped it by himself. On the contrary, joint mapping by a team of two or three workers has often proved a more sociable and stimulating task than lone survey, as also has the co-operative effort of undergraduates. But one person has been responsible for each sheet in terms of communication with the survey headquarters, thus streamlining the organisation.

Public credit is accorded to the surveyors for their work by printing their names on the sheets they have mapped.

4. Synoptic Picture

Much of the value of a land use survey depends on the simultaneity of mapping, to give a synoptic picture of the whole country. Volunteers were requested to complete their sheets with as little delay as possible.

Since many items of agrarian land use are changed from year to year, the true picture of agriculture is given by the relative proportions of the different crops found in association. These are directly related to the rotational systems present. Surveyors were urged, therefore, to map the country in solid blocks, without leaving unmapped spaces. If individual fields are left to be filled in the following year, the advantage of areal ratios related to the rotation system is lost, and very misleading impressions are imparted.

5. Land use categories to be mapped

It was requested that six-inch field mapping should be rather more detailed than the 70 categories which eventually appear on the 1:25,000 map. The extra detail consisted largely of the individual crops, and since these must normally be recognised in any case in order to assign them to the correct 1:25,000 group, little extra work was involved.

Seventy and more categories of information is not such an overwhelmingly complex scheme as it may at first appear, and with two or three days practice in the field is readily grasped. To assist the process of assimilation, the third section of this handbook explains in some detail the logical basis for the choice of the categories to be mapped. If the surveyor has a thorough understanding of the reasons behind his survey instructions, he finds them much easier to apply.

A second aid to survey is the provision, as appendices of this handbook, of keys to the field identification of crops, and of natural vegetation communities.

The original purpose of this handbook was as a field guide. Today it is also increasingly used as a guide to the interpretation of the published maps, which explains the need for a fifth edition. This role, however, can be fulfilled without revising the field instructions that follow.

III. LAND USE CATEGORIES IN THE NEW SURVEY

The danger of showing a large number of categories on one map is that it may become impossible to see the wood for the trees. This danger is eliminated here by a decision to produce a map which can be read at two different levels of intensity. The first level consists of eleven major and two minor groups, each represented by a distinctive colour easily discerned at a first inspection. At the

second level are the subdivisions of each group, which are represented by variations of tone within the main colour, or by other subdued cartographic devices. The subdivisions are clearly distinguishable from each other as soon as the map is subject to a moderate scrutiny, but they do not interfere with the unity of the 13 main groups.

The main groups, and the colours which represent them, adhere as closely as possible to the scheme recommended by the Old World Division of the World Land Use Survey. There is only one deviation from it, in the case of settlement, but there are four additional categories: transport, open spaces, derelict land and unvegetated land.

The main groups, together with the exact colour required, which is given as a "Derwent" crayon number, are listed below. Field mapping is done by means of pencil symbols (see page 18), and the maps are coloured later.

<i>Land Use Group</i>	<i>Colour</i>	<i>"Derwent" Crayon No.</i>
1. Settlement (residential and commercial)	Grey	19-68
2. Industry	Red	19-14
3. Transport	Orange	19-10
4. Derelict Land	Black Stipple	Indian Ink
5. Open Spaces	Lime Green	19-48
6. Grass	Light Green	19-46
7. Arable	Light Brown	19-61
8. Market gardening	Purple	19-23
9. Orchards	Purple Stripes	19-23, 19-46, 19-61
10. Woodland	Dark Green	19-45
11. Heath and Rough Land	Yellow	19-6
12. Water and Marsh	Light Blue	19-32
13. Unvegetated Land	White	—

In explaining the groups and subdivisions selected for the 1:25,000 map, mention must first be made of non-rural land use. In built-up districts a great many forms of land use are crowded into a small space as compared with rural localities, and relatively little space to represent them is available on the map. It has been decided therefore to associate together as a grey-coloured background all those forms of residential and commercial use which are common to all or most settlements, and to separate in other colours those features which are individual to particular settlements either in type or extent, i.e. industry, transport and open spaces. The texture of settlements is further distinguished by the subdivision of certain other groups, for example, allotment gardens or nurseries.

1. Settlement (Residential and Commercial) Grey:

This group is composed of those urban facilities which may normally be expected in any settlement, varying more according to the settlement's size than to any other factor. It includes housing, shops, hospitals, churches, business and administrative offices, places of entertainment and so on.

Apart from grey's suggestiveness of the urban scene, it has a practical advantage for use on the $2\frac{1}{2}$ in. scale. Settlement already mapped by the Ordnance Survey on this scale is in grey, so that to use any other colour would be to sacrifice the basic identity of a major colour category. A light grey has been adopted so that the solid shapes of houses already printed on the map are not obscured.

Field mapping by settlement is simply by pencil line shading, which is converted into a light grey for printing. This colour combines automatically with the Ordnance Survey underprinting, to produce four subdivisions:

- (a) Dark grey where the underprinting is continuous and no light grey appears signifies a fully built-up area;
- (b) Dark grey blocks surrounded by lighter spaces denote houses with gardens;
- (c) Uninterrupted light grey distinguishes recently built-up areas that post-date the Ordnance Survey base map;
- (d) Black underprinting signifies public buildings.

These four subdivisions are an excellent illustration of the principle of minor variations of tone which do not break the overall identity of the basic colour.

- (e) Grey diagonal lines represent caravan sites. They are mapped in the field by the letters "Car". Some caravan sites, like rotation crops, are temporary, but nevertheless if all are mapped where they are at the time of the survey, the synoptic total and distribution for the whole country will be approximately valid.

2. Industry: Red

The red colour used for industry contrasts well with settlement grey and permits the clear representation of small works scattered through the towns, as well as of large industrial concentrations. There are four subdivisions.

- (a) A red wash represents manufacturing industry;
- (b) Red cross hatching represents extractive industry. Very often the nature of the extraction is clearly marked on the map, e.g. colliery, gravel pit, but if not it should be added;
- (c) Red dots denote active tips; c.f. black dots for abandoned tips and other derelict land;

- (d) Horizontal red lines show public utilities, including gas, electricity, water and sewage works, and refuse disposal sites, but excluding war department property.

The first of these subdivisions must be discussed in more detail. The size and distribution of manufacturing industry is automatically shown by the map but some other device is needed to indicate its type. It has been decided to use the index number of the 14 main manufacturing categories listed in the Industrial Tables volume of the 1951 Census. In field mapping the industry should be outlined in pencil and marked with the letter I and its appropriate index number. On the published map the index number will be printed in black on or beside the red industrial patch. The numbers are as follows:

3. Treatment of non-metalliferous mining products other than coal (glass, ceramics, cement, etc.)
4. Chemical and allied trades
5. Metal manufacture
6. Engineering, shipbuilding and electrical goods
7. Vehicles
8. Metal goods, not elsewhere specified
9. Precision instruments, jewellery
10. Textiles
11. Leather, leather goods and fur
12. Clothing
13. Food, drink and tobacco
14. Manufacture of wood and cork
15. Paper and printing
16. Other manufacturing industries (specify type).

If the surveyor is interested in industrial survey, he may make notes on the factory on the back of the map, under the following headings: Name, address, date of establishment, products, raw materials and their sources, power, water supply, labour, transport, markets, capital and site. If even a few industries are treated in this way, the information recorded will be of value to those who afterwards consult the maps to write the county reports.

Names of works already printed on the map should be checked for changes.

Storage premises, such as builders' yards, are not classified as manufacturing industry but as settlement, and are coloured grey.

3. Transport: Orange

It could be argued that roads are a normal part of settlement and should be included in the grey category, but there are several reasons for not doing so. First it seems logical to class them with other forms of transport such as ports and airfields which are not

normal parts of most settlements. Secondly, if coloured distinctively, the roads give a good indication of the texture and layout of the settlement, and of the location of shopping and business centres, which are not specifically shown. Thirdly, the most important roads are already marked orange on the 1:25,000 map.

In addition to roads, port areas and airfields, the transport category includes railways, bus termini and car-parks, but excludes garages and filling stations, which are classed as commercial settlement. No attempt is made to differentiate railway embankments used for hay: all are included as orange. Non-metalled roads are left white. Disused railways are marked as derelict land, heath or scrub as appropriate while disused airfields are coloured orange unless some other form of use has supervened.

A field mapping symbol, T, is used for 6 inch mapping.

4. Derelict Land: Black Stipple

This category is rather strictly defined as produced by the dereliction and abandonment of land formerly devoted to settlement, industry or transport. Often it is land with a tendency to persistent uselessness unless the public conscience is stirred to do something about it.

In field mapping a pencilled stipple is used, and care must be taken not to confuse this category with rough land. Run down farm land, even in small residual plots between buildings, is not classed as derelict, but as heath or scrub. Bombed sites, disused collieries or railway sidings, etc., come within the derelict category, unless they have been so long abandoned that nature has tidied them up with woodland scrub.

If the former use of land now derelict is still shown on the map, e.g. colliery, the word "disused" should be inserted.

5. Open Spaces: Lime Green

This is cared-for, but non-productive open space, excluding agricultural land on the one hand, and untended heath and rough land on the other. It includes private parkland, which is defined as those landscaped parts of private estates which are not either gardens, farmland or woodland. It includes public parks and ornamental gardens, recreational areas such as golf courses and school playing fields, tended open cliff top, village greens, cemeteries, and so on.

6. Grassland: Light Green

This category proved one of the most difficult on which to reach a decision. In the provisional scheme allowance was made for:

(a) hay as opposed to pasture;

(b) rotation grass as opposed to permanent grass;

(c) the first, second and third quality groups of the grassland survey, respectively rye grass, rye and agrotis, and other grass mixtures.

Each of these distinctions had to be abandoned. It soon became evident that when a hay crop had been cut, land was often turned over to grazing, and the division into which it was placed would depend more on the time of mapping than on its own intrinsic nature. This is obviously unsatisfactory.

It is easy to identify rotation grass in a new ley, but with the passing of a few years it becomes progressively indistinguishable from permanent pasture. Without asking each farmer, and so doubling the survey time, the two are not certainly separable. Where it is definitely known that a field of grass is a first or second year ley, this fact should be noted by means of the letter L.

The third subdivision, based on grass quality was also rejected after trial, for two reasons. First, cases were met where the correspondence between species and quality seemed doubtful, as when a supposedly first quality rye grass field rife with thistles was juxtaposed to a well-tended field of mixed species. Secondly, the mapping of the grass species in each field was the greatest single delaying factor of the survey, and it was felt that the result obtained was not commensurate with the time sacrificed.

All forms of enclosed agricultural grass are therefore printed in light green. Grass containing the small wild, white clover is similarly classed. The field mapping symbol is G, and L is added to indicate young leys where identifiable.

In the prewar survey, rotation grasses were separated for inclusion in the arable category. The new recommendation differs from the old more in principle than in effect, for the identification of rotation grassland was the biggest source of error in the pre-war maps. Moreover, as will be elaborated in the next section, some rotation grass is still mapped as arable land, if sown together with the ley legumes: red clover, lucerne, vetch, sanfoil and trefoil.

There are several modifications of the G or light green category, the respective symbols to be overprinted in black on all or part of a field as required.

(a) The scrub symbol is used for grassland infested with hawthorns, brambles or other bushes. When the infestation is dense enough to preclude grazing, this category ceases to be scrub pasture and becomes scrub woodland, or heathland scrub.

(b) The juncus rush symbol is used for grassland so infested. The degree of infestation increases with the dampness of the field, and the length of time since the last ploughing.

Thus juncus-ridden fields tend to be commoner in areas of high rainfall and long leys. They grade into truly water-logged conditions more fitly described as marsh.

- (c) Where heath and moorland species, such as bracken, have invaded pastures, the appropriate symbols should be added (see Appendix II).
- (d) Where non-pasture species have invaded and occupied more than 50% of a field, the symbol should be inserted over yellow for rough land instead of over pasture green.

Surveyors are requested to note on the six-inch map any animals seen in a field. This information will not appear on the printed map, but will be useful for the writers of the county memoirs. Animals should also be noted if they are found on arable crops or in orchards. Abbreviations to be used are H. horses; S. sheep; C. calves or cattle not otherwise identified as either BC, beef cattle or DC, dairy cattle; Pi., pigs; Go., goats; Ch., Du., Tur., and Ge. for the various kinds of poultry; and Be. for bees.

Some animals, notably pigs, may destroy the grass and churn up the field into mud. Such a field is to be conventionally shown as grass. Poultry hatcheries, etc., which are closely built up, and where the birds are reared indoors, may be mapped as settlement with the animal symbol superimposed.

7. Arable Land: Light Brown

The Arable group is classed in six subdivisions, five of which are further divided into individual crops recorded by the first letter or first two letters of their names.

(a) **LEY LEGUMES.** These are most closely related to the preceding major group since they contain grass. For this reason it is logical to represent them by a colour mixture of light brown and green. They are normally cut for hay and silage, though they may also be grazed. They are left in the same field for several years, and on this basis are distinguished from those other legumes, fodder peas or broad beans, which are annuals, and are included in the green fodder division. The symbols for field mapping are:

Cl—Red Clover (N.B. the small wild white clover is classed as G); Lu—Lucerne; Ve—Vetch; Sa—Sanfoin; Tr—Trefoil.

(B) **CEREALS.** As these are basic to arable farming in this country, they are represented by a simple flat wash of light brown.

The field mapping symbols are:

W—Wheat; B—Barley; O—Oats; R—Rye; D—Dredge (a mixture of oats and barley).

If a cereal acts as a nurse crop, the undercrop should also be noted. Thus, barley undersown with clover would be recorded as B-u-Cl.

Cereals grown in association with pulse crops are known as mashlum, and are included in the green fodder sub-division.

(c) **ROOT CROPS.** These are represented by close vertical stripes in light brown. The field mapping symbols are:

Tu—Turnips; Sw—Swedes; KR—Kohl Rabi; FC—Fodder carrots; Mn—Mangolds; Sb—Sugarbeet, if used for fodder.

(d) **GREEN FODDER.** These crops are represented by horizontal lines in light brown. The field mapping symbols are:

Ka—Kale (not to be confused with curly kale which is a market garden crop); Ra—Rape; Lp—Lupins; BB—Broad beans; FP—Fodder peas, distinguished from market garden peas by their coloured flowers; Ma—Mashlum, a mixture of cereals and pulse such as barley and broad beans or oats and peas; Mu—Mustard; Mz—Maize; Li—Linseed. This crop is distinguished from flax by the red colour of its flowers; Ca—Fodder cabbage, to be distinguished from market garden cabbages.

(e) **INDUSTRIAL CROPS.** This class does not include every crop which finds its way into a factory. It excludes cereals, and it also excludes crops such as canning peas which are preserved rather than processed and reach the consumer in much the same form and for the same purpose as if they had been delivered fresh. The crops included are those which undergo definite alteration by industrial processing. They are shown by a light brown cross hatching, and the field mapping symbols are:

Sb—Sugar beet; Fl—Flax; Bi—Buckwheat and other bird-seed; Chi—Chicory; BMu—Black mustard.

Any other names are to be written in full.

(f) **FALLOW.** This is mapped by the symbol F, and printed in a light brown stipple.

All efforts should be made to reduce this category to a minimum. Areas fallow in August are likely either to have carried a crop such as peas earlier, or to carry one such as kale later, and the identity of such a crop should be ascertained by either checking the field for relics of an earlier crop (see appendix), a return visit later, or asking the farmer.

Fallow in the early spring is a simple matter as generally it signifies a summer crop which can be ascertained. Fallow in high summer, however, presents a problem as it may mean that the land is carrying two crops in one year. For example mustard may be sown late in the year after a cereal. The danger here is that an area mapped in June may appear as a great concentration of cereals, while a precisely similar area mapped in November appears largely devoted to green fodder.

To overcome this difficulty it should be ascertained whether there is any local pairing of two crops on the same land in the same twelve months. If both members of the pair fall into the same

subdivision, no problem arises. For example, in the Isle of Thanet it is customary to follow early potatoes by brassica, both of which are market garden crops. In more stubborn cases where the two linked crops are in different categories, there is no option but to map them as they are found. Though somewhat misleading, this accounts for only a tiny portion of the total information recorded, and is a small price to pay for all the advantages which more detailed mapping offers. The information obtained on paired crops should be recorded on the back of the field map.

8. Market Gardening: Purple

This group consists basically of crops for direct human consumption.

ORDINARY MARKET GARDENING should be coloured with a flat wash of purple. Field mapping symbols are:

M—Mixed crops, including vegetables, soft fruit and flowers; P—Potatoes; B—Brassica crops (cabbage, broccoli, etc.). Other vegetable crops which occupy a whole field should be named in full, e.g. peas, beans.

(b) NURSERIES are akin to mixed market gardening, but are smaller, enclosed, and associated with glass houses. The field mapping symbol is N and the printed colour is a purple diagonal crosshatch.

(c) ALLOTMENT GARDENS are shown by vertical crosshatching in purple. The field mapping symbol is A.

(d) FLOWERS usually occupy small strips of a mixed market garden or nursery, but when they occur alone on a field scale they are represented by purple dots. In place of a field mapping symbol the actual name of the flower should be entered on the map.

(e) SOFT FRUIT, like flowers, have a separate symbol, SF, only when occurring alone in an area big enough to map separately. On the printed map purple diagonal lines are used. These run in the same direction as the stripes used for orchard.

(i) HOPS. Although perhaps strictly an industrial crop, hops are so commonly found in fruit and market gardening areas that it has been decided to give them a purple conventional sign, consisting of broken vertical lines. The name is written in full in field mapping.

9. Orchards: Purple Stripes

Orchards vary considerably in their management and capitalization. Many highly capitalized orchards are normally grassed. Some are grazed directly, and others mown for hay, but in the highest grade orchards neither of these things happen: the grass clippings are allowed to decay in situ to add humus to the soil.

A second class of orchards may be fallowed to prevent weed competition or sown with crops such as mangolds which grow out of phase with the orchard season.

A third group consists mainly of small orchards owned by small farmers who must avoid having all their eggs in one basket. Undercultures of soft fruit and market garden crops spread the basis of income but detract from the abundance of the tree fruit. A larger grower would prefer to separate the different crops so that each could receive proper treatment without affecting the other.

Because of these considerations, the purple diagonal stripes of the orchard category are interlaced with green stripes for grass, brown for fallow or arable land, and purple dots for market gardening and soft fruit.

Orchards are mapped by means of a special system of three parts separated by strokes. Part one is the main tree:

A/—Apple; Pe/—Pear; Pl/—Plum; C/—Cherry; Nu/—Nut; M/—Mixed.

The second part records the underculture:

G/—Grass; F/—Fallow or arable; M/—Market gardening or soft fruit.

The third part is the symbol for any animals present. Thus an orchard record may run C/G/S, or M/M/-, etc.

10. Woodland: Dark Green

The basic colour for woodland is dark green, and subdivisions are shown by means of conventional signs over-printed in black.

(a) to (c) are the normal deciduous, coniferous and mixed woodland signs. These are used both for printing and for field mapping.

(d) Coppice is shown by a special symbol of three upward radiating strokes.

(e) Coppice with standards is represented by a mixture of coppice and deciduous symbols. Withies and osierbeds are included here and named.

(f) Scrub woodland is represented by overprinting the scrub symbol.

Note: In the process of field mapping the map is constantly turned to suit the direction of travel, and thus many symbols are entered upside down. If the conifer sign is drawn sparingly with only one branch on the side, it may when upside down be confused with the coppice symbol. It should therefore be more generously branched.

Recently-felled woodland should be entered according to its pre-felling type, unless it has been grubbed up, when it ranks as fallow.

Scattered trees in parkland may appear almost as dense as woodland in some places, but nevertheless they belong to the open space and not to the woodland category.

11. Heathland, Moorland and Rough Land: Yellow

(a) This category is mostly unenclosed land which receives little or no deliberate human tending, and is characterized by semi-natural vegetation kept in an arrested stage of development by extensive grazing, by burning or by natural conditions which discourage the emergence of climax woodland.

The land use survey is an opportunity to repair some vital gaps in the existing knowledge of the vegetation distribution in Britain. We still do not know just where heather or bracken or cotton grass predominates, for instance, and the mapping of their borders would be greatly appreciated. The field mapping symbol for this type of land is H followed by symbols for specific types of vegetation.

S — sphagnum, eV — Cotton grass (it should be noted whether either of these is undergoing erosion). C — Heather and ling, V — Bilberry. Pt — Bracken. U — Gorse, broom, etc. F — Festuca/Agrostis, M — Molinia, N — Nardus. A — Alpine heath, lichen, Rhacomitrium moss. MD — Unfixed dunes with marram. FD — Dunes fixed with grass. —o— — Heath in the early stages of reversion to forest. ||| — Rushes except *Juncus squarrosus* †

Run down pasture beyond use for grazing, and urban patches of grass awaiting the builder are also coloured yellow.

(b) The heath and moorland symbols should also be inserted in pasture fields which have been invaded (for example) by bracken. If the invading vegetation occupies more than 50% of the field, it should be classified as yellow land.

Further details concerning vegetation mapping are included in appendix II.

12. Water and Marsh: Blue

(a) Open water is coloured blue. Its specific use may already be printed on the map. Otherwise the surveyor may enter any significant use such as reservoir or watercress bed.

(b) Marsh, or thoroughly waterlogged land with specifically marsh plants such as reeds, is represented by blue marsh symbols on a white ground. Inter-tidal salt marsh is distinguished from fresh water or fen by two extra lines drawn under the marsh symbol.

13. Unvegetated Land: White

Naturally bare land such as limestone pavements, seabeaches or rocky cliffs, is left white. The field mapping symbol is X. This includes some land with a sparse open plant community and here the surveyor may superimpose the symbols used for heathland over white instead of yellow. For example, XD represents unfixed dunes, which may be partially colonized, especially by marram grass. XC represents a rocky fell partially covered by heather, and so on.

Some artificially stripped land is also included, but only when it cannot be classified as anything else. Like derelict land and fallow, the artificially unvegetated category should be kept as small as possible. For example, where overburden is stripped prior to quarrying, the quarrying operation has already begun, and the bare land is classed as extractive industry. But where a field has been churned up prior to building, it would be inaccurate to class it as settlement at the time of survey. In some cases the ultimate use may not even be known, as for example when old pits are in process of being plugged with demolition waste. All these artificially unvegetated tracts are essentially transitional in use, and by mapping them separately they afford an index of relative rates of development in different urban areas. White is an appropriate colour, as it permits map users to colour in the subsequent usage if required.

The network of unmetalled roads is also left white.

These three classes of land left white, naturally bare land, artificially stripped land, and unmetalled roads are sufficiently different in shape, distribution and context to be identified separately without the aid of distinguishing symbols.

IV. TECHNIQUE OF FIELD MAPPING

The first requirement for field survey is scrupulous honesty; the surveyor must resist all temptation to guess at the utilisation of inaccessible places.

The work may be difficult at first, when the categories are still unfamiliar, and individual plots may demand an appreciable time to work throughout the check list. But it is better to progress slowly and accurately than to achieve a rapid, inaccurate and therefore useless coverage. The surveyor should not be discouraged by his initial slowness. After a few days practice, the uncertainties will have become narrowed down to many fewer occasions and to a restricted part of the check list. The rate of survey should steadily improve with time.

EXPLANATION OF COLOUR CONVENTION

SETTLEMENT



Commercial and Residential



Houses with gardens



Newly built-up areas



Caravan sites

INDUSTRY



Manufacturing



Extractive



Tips



Public Utilities

TRANSPORT



DERELICT LAND



OPEN SPACE



GRASSLAND



With juncus rush



With scrub

ARABLE LAND



Cereals



Ley legumes



Roots



Green Fodder



Industrial crops



Fallow

MARKET GARDENING



Market gardening



Nurseries



Allotments



Flowers



Soft Fruit



Hops

ORCHARDS



With grass



With arable land



With market gardening

WOODLAND



Deciduous



Coniferous



Mixed



Coppice



Coppice with standards



Woodland scrub

HEATHLAND & ROUGH LAND



Heath



Heath scrub

WATER AND MARSH



Water



Marsh

UNVEGETATED



In the foregoing definitions, references have been made to field mapping symbols. These constitute a code of notation which permits the use of a single medium: the HB pencil. Direct colour recording in the field is undesirable, because even experienced surveyors have second thoughts, and it is not easy to erase a colour wash. The full list of field mapping symbols is given below. The abbreviations of crop and animal names are shown in heavy type.

SETTLEMENT

Built up areas Pencil Shading.
Caravans Car.

INDUSTRY

Manufacturing Outline of area. **I** plus type number. Notes on back or margin of map.
Extractive Pencilled cross hatching. Name type of extraction if not already named.
Tips Outline area and name "Tip".
Public Utilities Tick existing names and check area *or* name new utilities.

TRANSPORT

T (This should be written on all metalled roads).

DERELICT LAND

Heavy pencil dots.

OPEN SPACE

O.S.

GRASSLAND

With juncus rush **G** (If an undoubted ley, add **L**).
With scrub **G** |||
G -o-

Horses, Donkeys, Sheep, Calves or Cattle not identified, Beef Cattle, Dairy Cattle, Pigs, Goats, Chickens, Ducks, Geese, Turkeys and Bees.

ARABLE LAND

Cereals Wheat, Barley, Oats, Rye, Dredge.
Ley legumes Clover, Lucerne, Trefoil, Vetch, Sainfoin.
Roots Turnips, Swedes, Kohl Rabi, Mangolds, Sugar Beet, Fodder Carrots.
Green Fodder Kale, Rape, Peas, Beans, Mashlum, Mustard, Maize, Lupins, Linseed, Fodder Cabbage.
Industrial Crops Flax, Chicory, Black Mustard, Sugar Beet, Birdseed.
Fallow Fallow.

MARKET GARDENING Mixed crops, Potatoes, Brassica, others named in full.
Nurseries, Allotments.
Flowers; name type
Soft Fruit; name any dominant concentration.
Hops.

ORCHARDS

A notation in three parts separated by strokes.

Tree Name	Ground Use Name	Animal Name, as given under Grassland
Apple	/Market Gardening or Soft Fruit/	
Pear	/Fallow or arable	/
Plum	/Grass	/
Cherry	/	
Nut	/	

HEATHLAND, MOORLAND AND ROUGH LAND

H (plus symbols for vegetation types. See page 14).

WOODLAND

Deciduous	}	Symbols as on centre pages.
Coniferous		
Mixed		
Coppice		
Coppice with standards		
Scrub		W -o-

WATER AND MARSH

Note any special use.
Distinguish fresh water and salt marshes.

UNVEGETATED

X

The surveyor will soon become well-acquainted with most categories of use, and others will not appear on his sheet at all. He should be warned, however, of certain difficulties of identification which may affect crops he thinks he has learned. As an example, an apparent field of grass with sheep seen across a valley, may prove to be a field of oats stubble submerged in spontaneous autumn grass growth, or a field of lucerne which has been recently mown so that the grass is temporarily more in evidence than the legume. In the appendix on crop identification, pitfalls of this kind have been indicated.

After crop identification, the most difficult part of the survey is settlement. Careful watch should be kept for new houses extending old roads or existing individually in the country. Only the areal extent of new building estates is required. The surveyor is not asked to map the road plan, but open spaces, etc., should be shown.

As soon as possible after a day's mapping, the 6" field map should be coloured. The same colour system as on the printed 2½" map should be used, and the 6" field mapping symbols for crops, etc., re-entered in ink over the colour. The use of colour immediately reveals any gaps, which are often difficult to locate on the uncoloured map, and thus permits them to be filled in soon afterwards. It is advisable not to colour the outermost fringe of the surveyed area, until it has been rechecked when the survey is extended. Fields marked as fallow should also remain uncoloured in the hope of subsequently discovering the past or anticipated use. To achieve countrywide uniformity of colouring, surveyors are asked to use "Derwent" crayons in the colours specified on page 6.

V. FINANCIAL BASIS OF THE SURVEY

It is not possible to finance the survey lavishly, and while the survey headquarters will be responsible for raising grants for publication and administration, the local surveyors are requested to undertake actual survey expenses. The latter include:

- (a) Equipment. Six-inch maps, and "Derwent" crayons.
- (b) Transport to and within the survey area.

VI. DEPOSITION OF MAPS

Surveyors are asked to complete the colouring of the 6" maps and send them to the survey headquarters.

The field maps are the property of the surveyors, but it is hoped that they will be presented to form a complete national collection available for consultation.

VII. LAND USE REPORTS

- (a) *Sheet Reports.* Where possible, upon completion of the work, surveyors are asked to submit a report on the whole sheet area, commenting on the main features, the sub-regional characteristics and changes since the first land use survey.
- (b) *County Report.* Memoirs are to be prepared as parts of a series entitled "The Changing Land of Britain".

APPENDIX I

Practical Identification of Crops

Surveyors who have studied Section III will probably experience no difficulty in recognizing the non-agricultural groups. Crops, however, are likely to present problems to some, not only because they

are initially unfamiliar, but also because they change significantly during the course of the year.

CEREALS

Cereals are first recognizable in the spring by their grass-like blades more widely spaced than newly sown grass. After leaf and stalk have become differentiated it is possible to distinguish the four species by examining the auricle and leaf sheath, as shown in Fig. 1.

After the appearance of the ear, identification is easier. Oats alone branches its stalk and bears separated grains in a delicate flowering head. Wheat, rye and barley have an unbranched stalk bearing a single, closely packed ear.

There are three major diagnostic features used in distinguishing these species: the whiskers, the cross profile of the ear, and its uprightiness. In general, wheat has no whiskers, rye has short whiskers, and barley has very long whiskers. Wheat has a round profile with grains protruding in all directions. Rye has a cross-shaped profile as the grains are packed in four vertical rows, while barley is two-rowed and has a flat profile. Wheat stands stiffly upright, rye bends a little, and barley droops so much that its ear comes to hang downward. In each case rye is an intermediate form between wheat and barley. In applying these criteria, the surveyor should observe the ears closely and familiarize himself thoroughly with them, as he will then be better equipped to cope with rather uncommon varieties of wheat and barley which do not obey the rules.

- (a) Bearded wheat does in fact have whiskers. They are short and spreading, something like those of rye, but the grains are arranged in cylindrical clumps quite unlike rye's four rows.
- (b) Six-rowed barley is a little more difficult as sometimes the six rows resemble four in plan. The long whiskers assist identification, however.

Rye is the tallest of the cereals. Oats are also tall, and in dredge stand up above the barley layer. If very few oats are seen, they are probably a legacy from the previous year's crop, rather than true dredge, as oat seeds set themselves with great facility.

After harvesting it may remain possible to identify cereals for a long time. At first one looks for stray ears among the stubble. Later there is the evidence of ear stalks from which the grains have fallen. A branched stalk signifies oats, a bold zigzag outline wheat, while neat little grain sockets in rows denote barley or rye.

Colour is not a reliable guide to cereal type, as it changes from week to week, and with varieties within the species. Its best use is to indicate whether the cereal field is homogeneous or whether

there are changes of species within it—a point which is difficult to ascertain at a glance before the ear or after cutting, and needs a closer inspection.

The only things liable to be confused with cereals are grass (if it grows prolifically with stubble) and mashlum.

LEY LEGUMES

The ley legumes are frequently at their most nutritious just when the first few flowers appear. They are then cut and so the flowers are rarely seen. It is not very useful, therefore to depend on flowers for their identification, and the surveyor should concentrate on the leaves and habit of growth (Fig. 2).

All the legumes have compound leaves. In the clovers, lucerne, and trefoil, the leaflets are grouped in threes whereas those of vetch and sainfoin are arranged in pairs along both sides of the mid-rib.

Sainfoin has a terminal leaflet at the end of the mid-rib. It is an upright plant about twenty inches high topped by a deep pink flower spike. In vetch the terminal leaflet is missing; it is replaced by tendrils. Vetch is the only ley legume to possess tendrils and is therefore easily identified. It has a trailing, prostrate habit of growth, and reddish-purple flowers.

Of the three trifoliate legumes the red clovers are readily recognized by most people. Their leaves are rounded, and both leaves and stems are hairy. Trefoil also has rounded leaves and flower heads, but both are smaller than clover, and the flowers are yellow. Lucerne is somewhat similar, but the leaves are much more hairy but the stems are not. The plant grows taller than clover, and after the first year is more branched. It normally has violet to blue flowers.

Once known, the ley legumes are not easily confused with other crops. The chief pitfall is that some of them, especially lucerne, may sometimes be mistaken for grass at a casual glance, particularly just after mowing when dried rows of legumes in the field may resemble hay. In the last year of a ley, the lucerne may become so sparse that grass may appear to be the dominant crop. Nevertheless the field should be mapped as ley legume.

ROOTCROPS

The diagnostic features of root crops are the leaf, the neck, and the shape, colour and position of the bulb (Fig. 3). The roots themselves are present during part of the surveying season only and it is easier for the surveyor if he makes a habit of identifying these crops by their leaves.

The first tiny pair of leaves which emerge from the ground are the seed leaves. These are quite different from the subsequent foliage leaves and will not be described here.

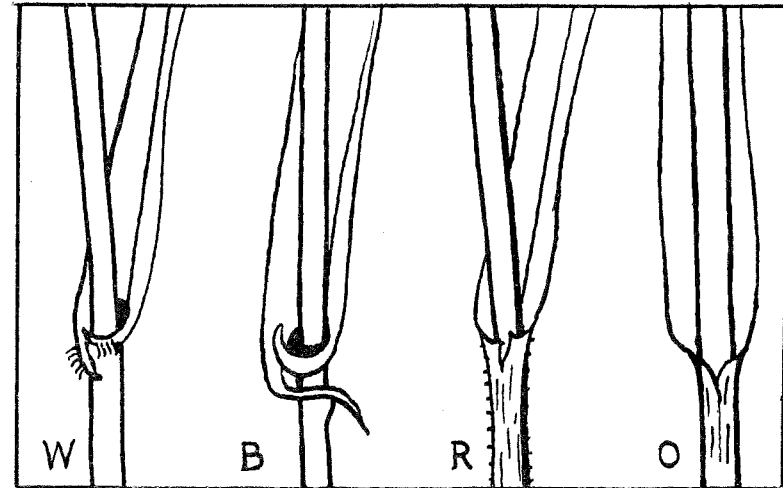


Fig. 1. Identification of cereals by means of the auricle. Barley has long, curly overlapping auricles, those of wheat are shorter, pointed and hairy, and those of rye still smaller with fewer hairs. The leaf sheath enclosing the stalk of rye is often reddish-purple. Oats have no auricles.



Fig. 2. (a) Sainfoin; (b) Vetch; (c) Clover; (d) Trefoil; (e) Lucerne.

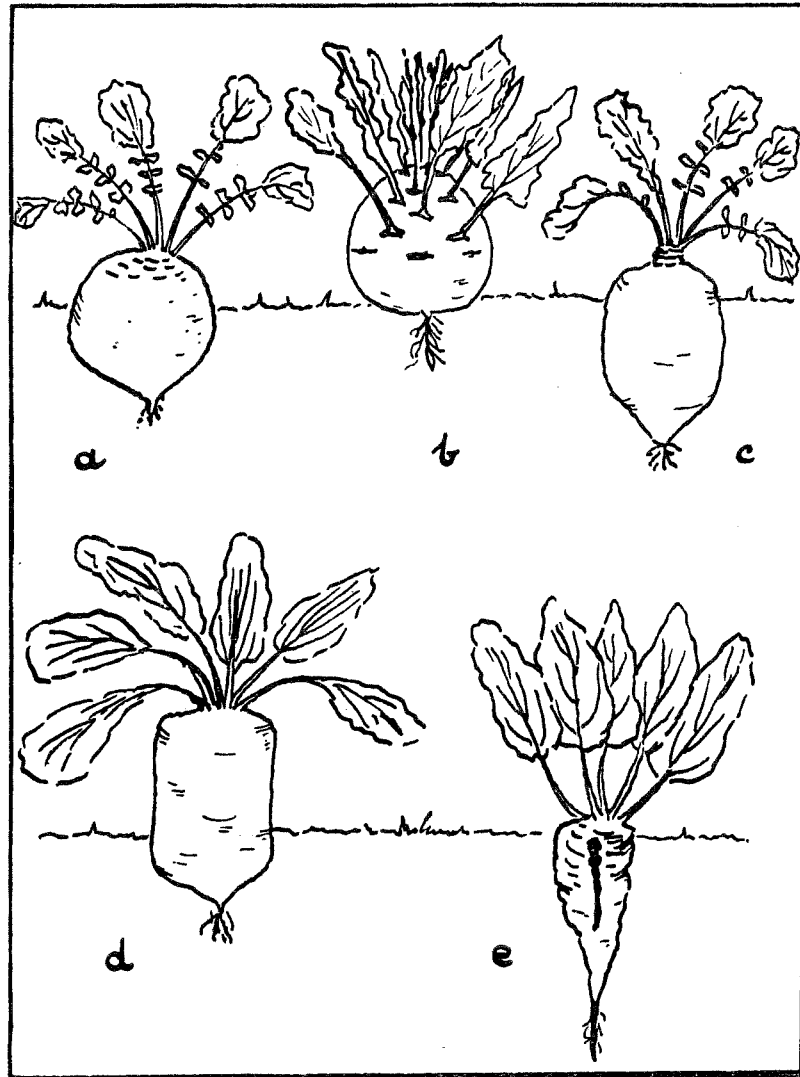


Fig. 3. (a) Turnip; (b) Kohl rabi; (c) Swede; (d) Mangolds; (e) Sugar beet.

The foliage leaves of swedes and turnips are similarly shaped. They consist of a lobe with a rounded top and a number of large indentations near the base. Turnip leaves alone among the roots have hairs and are rough to the touch. They are pale green and almost always badly eaten by insects. They grow directly out of the greenish crown of the globular white or yellowish root.

Swedes have smooth leaves with a glaucous bloom. The root, which is longer than that of a turnip, is yellow, tinged with purple, bronze or green at the crown. The leaves meet the crown in a solid stalk or "neck", a feature not shared with any other root crop.

Kohl rabi has a very large greenish or purplish "root" which narrows upwards almost to a point. This "root" is actually a swollen part of the stem which loses its leaves as it swells, and so bears triangular leaf scars. It stands wholly above the ground and is economic for folding as there is no buried part to be left uneaten as with other roots.

Mangolds and sugar beet have large smooth and almost heart-shaped leaves. Bright green in colour, they grow directly out of the crown, those of mangold in a spreading habit, and those of sugar beet more upright. Apart from this they are not distinguishable, and it is necessary to see the root. In mangolds the roots may be globular, straight-sided or spindle-shaped. In colour it ranges from red to yellow, and may have red leaf stalks too. Sugar beet has a white or yellowish root which is green at the crown. This is somewhat similar to green-top swede, but it is more submerged in the ground and has a quite different leaf.

Fodder carrots are easily recognised by their well-known feathery leaves. The problem is to distinguish those grown for fodder from those for market gardening. The best guide apart from asking the farmer is probably the context in which it grows. If found in association with narrow storage clamps rather than with other market gardening crops it is more likely to be fodder carrot.

Root crops are quite distinct from cereals and ley legumes, but to the inexperienced eye they may seem disconcertingly similar to some of the green fodders, as well as to sugar beet, beetroot and chicory. When first grappling with the identification of roots, the surveyor could profitably check through the section on green fodder.

Roots and green fodder are sometimes grown as mixtures, e.g. turnips with rape. All such mixtures are classed as green fodder.

GREEN FODDER

This category embraces ten crops. It is simplest to deal first with those that are distinctive and unlikely to be confused with other crops.

Maize is a very large member of the grass family with broad leaves marked by numerous parallel veins and thick tough stems. For fodder purposes it is grown in close masses and cut green. Only very occasionally in this country is it seen in well spaced rows grown for its cob. In this case it ranks as a market-garden crop.

Flax and linseed are closely related varieties of the same species. Both can be used as industrial crops but linseed in this country is grown for animal fodder in the form of seed and is

therefore described here. It grows about two feet high in a number of thin upright stems which branch at the top. It has very small leaves and gives a general impression of thin wiriness. It has red flowers. Flax by contrast is wanted for its long straight stem fibre, and therefore is taller, 40 inches, with only a single unbranched stem. It has a blue or white flower.

Green fodder includes three members of the leguminosae family, lupins, field or fodder peas, and broad beans. These are well known to most people. Fodder peas are closely similar to market-garden peas but have coloured flowers instead of white. Peas and beans grown in combination with cereals are termed mashlum.

The difficult members of the green fodder category are the four remaining, which are all crucifers. They are fodder cabbage, kale, rape and white mustard.

Fodder cabbages are spherical with solid hearts and smooth round, close-packed leaves which grow directly out of the stalk. This type of cabbage is sometimes grown for human consumption also and is then associated with savoys, curly kale, broccoli and brussels sprouts and perhaps with other market-garden crops.

Kale in its earlier stage is somewhat similar to broccoli having a loose heart and spreading leaves. The leaves are thick and longer than broad with wavy margins and a bluish bloom. Unlike broccoli it is usually broadcast and grows in close profusion not as individual plants. This is the chief distinguishing feature between kale and broccoli when young. Eventually kale grows to a height of about five feet and once it has risen beyond broccoli level it is easily recognizable.

Rape is the most difficult crop to identify. According to variety its leaves resemble either turnips or swedes. When it is well grown identification is assisted by the virtual absence of a root and the presence of a stem and long leaf stalks.

If checking of fallow fields is carried out fairly late in the year, roots, kale and rape will all be well grown and easy to identify.

Mustard grows in single slightly branching stems about two feet high. The leaves are a very bright green with a coarsely indented outline. The crop is either broadcast or drilled and has a yellow flower. It is closely similar to black mustard which is grown for its seed and counts as an industrial crop. Since black mustard is a very localised speciality the individual surveyor is likely to be prepared for its occurrence. Mustard is somewhat similar to the weed charlock which also has yellow flowers but which is more branched and has larger oval leaves.

INDUSTRIAL CROPS

Several members of this group have already been described. For sugar-beet refer to the section on root crops, and for flax and black mustard to that on green fodder.

Chicory has smooth leaves rather similar to those of a dandelion but larger. When allowed to run to seed it grows tall, with blue flowers.

There are several kinds of birdseed, of which the chief is buckwheat, used for chickens and pheasants. This plant has a slender, branched stem about two feet high. Its reddish-green arrow shaped leaves are widely spaced on alternate sides of the stem. From the angle of the leaf stalk rises a thin flower stalk bearing a closely packed head of small white flowers. The fruits are brown.

Other industrial crops are restricted to special localities where generally they are well known.

MARKET GARDENING AND ORCHARDS

It is not thought that market garden crops will cause difficulty, especially as the rare kinds are likely to be components of mixed market gardening, and need not be identified separately.

Orchard trees, when not in fruit, can be distinguished by their bark, leaves and habit of growth. The bark of apple and pear is rough and flakey, with vertical cracks, whereas that of cherry and plum shows a horizontal stripping with small resinous bumps. Growth habit is much affected by pruning, but in general apple and pear branches begin low and are directed upward, while cherry and plum have taller trunks and a more sudden multiple branching from the same point. Apples are heavily pruned in the centre: the tree often has an open empty appearance. Pears distinguished by the strongly vertical direction of new twigs, and plums, which are often used as windbreaks, have a much denser branchwork, with twigs growing both inward and outward.

The most distinctive leaves are those of pear, which are a bright shiny green, smooth both in outline and in surface. They are regularly spaced along the twigs. The other three all have oval leaves with a finely serrated edge. Those of cherry are the largest, and as they are closely packed give the appearance of a solidly leafy twig. Apple leaves are of medium size and irregularly spaced, so that a bare length of twig is often seen behind the top few leaves. Plum leaves are small, rather dark in colour and often somewhat disease wrinkled. They grow in prolific abundance all over the densely branched tree.

APPENDIX II

Vegetation Survey

1. MARSH COMMUNITIES (see section 12, page 14).

These are recorded as two broad groups shown by blue symbols on a white ground.

(a) *Salt Marsh* $\underline{\underline{V}}$

The plants are low growing and tend to be either blue-grey in colour or succulent. Salt marsh is located either along the coast or along tidal estuaries.

(b) *Freshwater Marsh* $\underline{\underline{V}}$

Plants are tall with broad leaf blades and large flowering heads in subdued colours, e.g. bullrushes and reeds. In a coastal or estuarial location, freshwater marsh is protected from saline waters by a bank. Inland it normally has a valley or lowland site. It thus receives not only rain, but surface run-off and groundwater, which are richer in nutrients, and therefore if peat is formed it is more fertile than the acid peat of the uplands, and supports larger plants. These often grow actually in water.

2. HEATH, MOORLAND AND ROUGHLAND (see Section 11, page 14).

Each category is an important species or community which is represented by a black symbol on a yellow ground. Where necessary up to four symbols may be assembled in order of abundance and this allows a very large number of potential permutations. Boundaries are drawn in black.

(a) *Heather* — HC

This category includes:

- (i) *Calluna vulgaris* (ling), which grows up to 2 ft. 6 in. high and has strong woody stems, dark olive foliage and small, wide-open pinkish flowers with four petals.
- (ii) *Erica cinerea* (bell heather), which grows up to one foot high and has more delicate stems and foliage, and reddish-purple flowers consisting of a single egg-shaped corolla.
- (iii) *Erica tetralix* which has a pale grey cast, due to a whitish hairy down on the branches and upper leaves. The leaves are set distinctively in fours around the stem. The flowers are pinker in colour and more closely packed than those of *cinerea*.

(b) *Bilberry* — HV

This category is mainly *Vaccinium myrtillus*, a small shrub with numerous erect green branches 6 in. to 1 ft. high. The small, oval, toothed, deciduous leaves are a conspicuous pale green in spring and darken into late summer when the berries mature. These have a grey-black bloom. In very exposed sites bilberry may grow only an inch or two high.

(c) *Gorse and Broom* — HU

Gorse is a many-branched prickly shrub occurring in two main forms. *Ulex galli*, the western furze, is denser and grows to about nine inches high. *Ulex europaeus* has thick woody stems and grows to about five feet. Broom has long green twigs, few leaves and no prickles. All three have yellow pea-like flowers.

(d) *Scrub* — H—o—

This category consists of brambles, bushes and stunted trees. If these occur contiguously they are mapped as woodland scrub instead of heath scrub.

(e) *Bracken* — H Pt

This fern is easily recognized by its large fretted fronds which are light green in late spring, purple-bronze in autumn and a dead russet through the winter. It is a pernicious invader of well-drained hill-grazings and valley-side fields.

(f) *Festuca - Agrostis Grasses* — HF

Species of *Festuca* (fescue) are normally 6 in. to 2 ft. high, with very narrow, almost cylindrical leaves and compact upright flower heads up to 4 in. long. Green scales are borne on both sides of the stem apex. Species of *agrostis* are typically creeping but the flowering stems may reach 2 ft. and bear light feathery brownish heads with whorls of branches.

Both occupy well-drained, open sites and are usually heavily grazed, thus retaining a green appearance throughout the winter.

(g) *Molinia* — HM

Also known as blue or purple moor grass, *Molinia* is a rather coarse perennial, often 3 ft. high with long, flat, rather stiff leaves, slightly hairy on the upper side. The leaves show seasonal changes through pale olive through purple-bronze to a pale orange sepia in winter when the detached dead leaves blow about in the wind. The greenish or purplish flower heads are between 6 in. and 1 ft. long, blooming in late summer and autumn.

Molinia grows either in large tussocks or in meadow-like "prairies". It occurs in poorly-drained acid locations, mainly in areas of high rainfall.

(h) *Nardus* — HN

Mat grass is a densely tufted wiry grass, 6 in. or more high. It has little or no grazing value and is light green for only about six weeks in early summer. For the rest of the year it is a dull white and forms a shaggy disordered mat. The leaves are fine and cylindrical, but nevertheless stiff and bristle-like. The inflorescence is narrow, with pale purple scales on one side of the stem only and persisting all the year. *Nardus* is usually found on gentle, moderately-drained slopes below peat moors.

(i) *Eriophorum* — HeV

Species of cotton grass, or cotton sedge, grow in large tussocks of erect green shoots up to 1 ft. 6 in. high and difficult to walk over.

Its leaves are round in cross-section, and sharply pointed. The flower spikelets are a deep olive green with golden stamens and fluffy white bristles like cotton wool. Flowers occur alone or in threes according to species.

(j) *Tricophorum caespitosum* — HE

Deer sedge also grows in tufts but these are lower and less tussocky than those of cotton grass, about 9 in. high. There are no leaves and the inflorescence grows at the tip of the stem, where scars are left in the winter and help to distinguish this species from cotton grass with its pointed tips. The plant is a brownish green.

(k) *Juncus* — H |||

The rushes grow in clumps of pithy, pointed, dark green shoots one to two feet high with brown flowers bursting out from their sides. They are locally dominant in damp patches, especially where the surface has been disturbed.

(i) *Juncus squarrosus* — H †

The moor rush is distinguished from the rushes in general because it grows in a rosette with spreading basal leaves that are palatable to grazing animals. Its stem is non-pithy and bears the flowers at the tip where a cluster of seeds persists all the winter. It occurs on gentle, moderately-drained slopes and forms a continuous mat about a foot high over large areas.

(m) *Sphagnum* — HS

Sphagnum and similar mosses are dominant on wet boggy ground which may be too dangerous for animals or human beings to traverse. The elongated stems bear rosette-like bundles of various types of branches which, when fully saturated are bright green, brown, orange or tinged with red, but when dry are whitish and very brittle.

Sphagnum is occasionally dominant but typically forms a spongy undercarpet through which occasional flowering plants may protrude, particularly *Calluna*, *Erica tetralix*, *Molinia*, *Eriophorum* and *Tricophorum*. On the drier margins of a sphagnum expanse *Erica tetralix* and possibly *Calluna* are more common. These areas are safer to walk over and potentially reclaimable.

(n) *Arctic-Alpine Heath* — HA

This is restricted to the highest exposed summits in England and Wales but is widespread in Scotland above 2,500 feet. It consists of very low-growing plants which barely form more than a surface skin and are liable to be torn up by the wind. One of the commonest plants is the woolly hair moss, *Rhacomitrium*, which is a dark, greyish-green, prostrate or trailing moss forming loose mats often a foot or more across. From the stem grow up a great number of branches of varying length, closely covered with leaves that have long, white tapering hair-like tips, giving the moss a shaggy, grizzled appearance.

(o) *Erosion symbol* — ||||

Peat erosion or gullying should be indicated on the map by the symbol shown above.

(p) *Fixed Dunes* — FD

This category consists of sand dunes fixed by vegetation.

3. UNVEGETATED OR PARTIALLY VEGETATED LAND — X

Bare rock, scree, beaches, mud flats and other unvegetated areas are left white and marked X.

If vegetation covers up to half the area, the symbol X can be followed by the appropriate symbol for the species concerned, printed over white. For example XD stands for unfixed sand dunes.

4. PASTURE INFESTATION

Certain of the species described above may invade farmland without actually converting it into the yellow category. The appropriate symbols, notably Pt, U, —o—, |||, are then printed over pasture green.

If the infestation covers more than half the area of the field these symbols are suffixed to HG and printed over yellow. This signifies that run-down grassland has deteriorated too far to remain in the pasture category and must rank as a reversion to moorland.

MAPS OF THE SECOND LAND UTILISATION SURVEY

13 St. Austell	253 Pontardawe	637 Wallasey
44 Yarmouth (I.O.W.)	254 Hirwaun	640 Manchester
45 Shanklin	255 Merthyr Tydfil	654 Doncaster
50 Exeter	263 Thame	655 Hatfield Moors
56 Bournemouth	264 Chesham	666 Hemsworth
77 Brighton	271 Haverfordwest	667 Thorne
91 Southampton	274 Pontyberem	675 Dewsbury
110 Winchester	278 Abergavenny	676 Castleford
118 Dungeness	279 Monmouth	677 Goole
138 Folkestone	281 Gloucester	679 Kingston-upon-
140 Lynton	287 Harpenden	Hull (South)
158 Dover	355 Bedford (South)	687 Leeds
160 Cheddar	388 Presteigne	688 Sherburn-in-Elmet
174 Deal	425 Aberystwyth	689 Selby
175 Llantwit Major	442 Thetford	698 Tadcaster
176 Barry	448 Newtown	699 Elvington
187 Croydon	452 Wolverhampton	708 York (West)
192 Isle of Thanet	(South)	709 York (East)
193 Bridgend	454 Nuneaton	713 Lancaster
194 Cardiff (West)	461 Methwold	719 Barton-le-Willows
205 South London	464 Loddon	723 Dalton-in-Furness
206 Bexley	465 Lowestoft	724 Grange-over-Sands
210 Port Eynon	481 Downham Market	725 Ingleton
211 Port Talbot	486 Great Yarmouth	730 Malton
212 Ogmore Valley	487 Cader Idris	742 Kirkby Moorside
213 Pontypridd	499 Crowland Fens	753 Rosedale
214 Newport (Mon.)	515 Stafford	757 Ambleside
224 City of London	525 Fakenham	793 Spennymoor
227 Southend-on-Sea	558 Stoke-on-Trent	794 The Hartlepoons
230 Llanelli (South)	570 Pen-y-Groes	801 Durham City
231 Swansea	571 Capel Curig	815 Tyneside
232 Rhondda	572 Pentrefoelas	820 Whitley Bay
233 Mountain Ash	573 Ruthin	825 Blyth
235 Chepstow	586 Caernarvon	838 Coldstream
244 North London	587 Bethesda	S138 Dunfermline
249 Milford Haven	589 Denbigh	
252 Llanelli (North)	620 Llanerchymedd	

*All communications concerning this Survey
should be addressed to the Director :*

MISS A. COLEMAN, M.A., F.R.G.S.
University of London Kings College,
Department of Geography,
Strand, W.C.2

Telephone: 01-836 5454