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## Soil Survey of England and Wales

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## SOIL SURVEY OF ENGLAND AND WALES

D. A. OSMOND

In spite of the exceptionally unseasonable weather for mapping, an additional 370 sq. miles have been surveyed, and field work on Sheets 75 (Preston), 95 (Rhyl), 107 (Denbigh) and 188 (Cambridge) is almost complete. Surveying is continuing on Sheets 238 (Aylesbury), 70 (Leeds) and 280 (Wells), and the last two sheets should be completed next year. New surveys have been started on Sheets 125 (Derby) and 166 (Church Stretton). This year has seen the publication of the map and memoir describing Sheet 138 (Wem), and the memoir to accompany Sheet 296 (Glastonbury) is in the press.

A. Muir visited Nigeria at the invitation of the Colonial Office to inspect the progress of soil survey work and afterwards attended the 2nd Inter-African Soil Conference and the 5th International Congress of Soil Science in the Belgian Congo, and visited some of the territories in Central and East Africa. After his return from Cyprus D. A. Osmond attended, at Ghent, the first meeting of a sub-group set up under the auspices of the Food and Agriculture Organization of the United Nations to study soil classification and survey in Europe.

During the year a Pool of Colonial Soil Surveyors has been started, the members of which are available for short-term soil surveys in places overseas where it is uneconomic to appoint a full-time surveyor; when not abroad, the staff participate in the soil surveys of Great Britain. Under this scheme A. O. Ballantyne has been sent to Northern Rhodesia, and C. A. H. Hodge (vice G. F. M. Murdoch) to Aden and the Somaliland Protectorate. L. F. Curtis has been sent to Iraq to carry out soil surveys in connection with irrigation schemes. R. D. Green spent a short time in the Netherlands studying methods of soil survey of land similar to that found in Romney Marsh.

### LANCASHIRE

#### *Sheet 75 (Preston)*

The survey of this sheet is complete except for a small part of the high moorland which has been too waterlogged for satisfactory mapping in this phenomenally wet season. The 20 sq. miles mapped on the 6 inches to 1 mile scale include a revision of about 10 sq. miles around Freckleton that had been mapped before the final classification had been established. The work has been mainly in the Longton and Freckleton districts, where till of Triassic material is frequently overlain by an alluvial deposit. The Salop, Cottam, Clifton and Salwick are the most widespread series on the boulder clay, but some variants occur as a result of the influence of the alluvium in the surface soil. On the alluvial deposits of the Ribble estuary the soils are very diverse owing to differences in texture and drainage.

## SOMERSET

### *Sheet 280 (Wells)*

Sixty-six sq. miles have been surveyed, including 32 sq. miles of the Mendip Hills, the northern extremity of the Wedmore ridge and the Winscombe-Banwell district.

The main interest in the Mendip Hills lies in the widespread occurrence of a fine sandy and silty superficial deposit, often accompanied by cherts, covering much of the Carboniferous and certain other formations, which normally gives rise to a brown earth soil. Where the rainfall is more than 40 inches a peaty gley soil with thin iron pan, the Priddy series, occurs on this deposit. Under similarly high rainfall, Lias Limestone gives rise to the Ston Easton series, which is more acid, lighter in texture and warmer in colour than the Somerton series developed on the same rock under drier conditions. A small area of Coal Measures sediments encountered in the east gave an introduction to soils that are more extensive in the north, but large areas covered by the remains of old surface workings necessitate the use of soil complexes as mapping units.

The soils of the northern portion of the Wedmore ridge were found to fall into previously established series, with the exception of a soil developed on thin Liassic shales and, while it is similar to the Evesham, it is much shallower and devoid of calcium carbonate; it was named the Ashton series.

The Winscombe-Banwell district presented a complex soil pattern due to the variety of geological formations exposed and the extent of Head and colluvial deposits on the slopes and in the valleys. A sandy deposit gives rise to the Tickenham series, in which about 24 inches of loamy sand or sandy loam overlies heavier material or gravel; as it frequently occurs on gentle slopes and is easily worked, it is an excellent soil for orchards, market gardens and nurseries. The Star series, a thin, loamy soil overlying a yellowish brown sandy facies of the Dolomitic Conglomerate, is also of interest in this district.

## SHROPSHIRE

### *Sheet 166 (Church Stretton)*

After a reconnaissance of the district had been made it was apparent that the complex distribution of the soils is largely the result of the considerable lithological variety of parent materials, although other factors are dominant at certain places. All geological formations from the Pre-Cambrian to the Carboniferous era are present; the Palaeozoic sediments are deposited against the Pre-Cambrian mass of the Longmynd, generally with a south-easterly dip. Glacial deposits which originated to the north and west of the region are more extensive than had been previously reported, but the Palaeozoic sediments are only partially obscured by them.

Of the 25 sq. miles mapped, selected areas were surveyed on the 6 inches to 1 mile scale to establish mapping units, the remainder being mapped at the scale of 2½ inches to 1 mile.

The parallel ridges of Silurian age, i.e., Wenlock Edge and the dissected ridge of the Ludlovian, that are aligned north-east to south-west, have been mapped from Easthope in the north-east to

Norton Camp in the south-west. A close correlation has been found between soils, parent material and relief, and there are four principal topographic units. On the south-east aspect of the Wenlock Limestone dip slope the main soil series is the Wilderhope developed on crystalline limestone interbedded with calcareous argillaceous deposits. The heavy-textured soil is a brown colour, freely drained and of variable depth, although normally limestone occurs within 3 feet of the surface.

In Hopedale, a strike valley in the Lower Ludlow Shales, the Stanway and Speller series are slightly gleyed and gleyed soils respectively. Medium to heavy in texture, they are mainly sedentary, but occasionally are influenced by colluvium.

On the south-east aspect of the Upper Ludlow Shales dip slope the Munslow series consists of brown to yellow-brown, silty or fine sandy light to medium loam. Shallow soils develop also on the Upper Ludlow Shales and some thin limestone bands.

The soils on the north-west aspect of the Ludlow Shales are more varied. The steep phase of the Munslow series is an immature, yellow-brown soil of light texture occurring on the steep upper slopes of the escarpment, which are subject to erosion. In the depositional zone the Yeld series is partly developed on colluvium. Together with the Stanway and Speller series it forms an association.

Approximately 4 sq. miles were mapped on the 6 inches to 1 mile scale in Corvedale on the basement beds of the Downtonian, the younger Ledbury red marls and alluvium of the Corve. Soils similar to the Eardiston and Bromyard series were identified, but the soil pattern is so confused owing to the repetition of thin marl and sandstone bands that the soils have mainly been mapped in an as yet unnamed complex in which the Bromyard series is the dominant member.

## YORKSHIRE

### *Sheet 70 (Leeds)*

Surveying has continued on the scale of 6 inches to 1 mile, and about 50 sq. miles, including some revision, have been mapped. Work started near the northern boundary at Bilton in the hummocky country at the western end of the York and Eskrick moraines overlying Triassic rocks. Soils of light and medium texture predominate on the higher ground with clay or silty soils, both in the depressions notably occurring east of Wetherby and in the slightly lower country about Catterton, north-east of Tadcaster.

To the west, the junction with the Permian limestone occurs near Wetherby, where the soil pattern is complicated by the Kirk Deighton glacial overflow channel with its associated gravels and alluvial soils. About 1 mile west of Kirk Deighton is the junction of the Permian and Carboniferous formations, but most of the country is covered with heavy till mainly derived from the shales of the Millstone Grit. In the extreme north-west at Rigton High Moor (about 700 feet O.D.), moorland variants of impeded soils on heavy-textured Carboniferous drifts have been mapped. Notwithstanding the greater altitude, sharper relief and unpromising parent materials compared with most of the area, the land is moderately productive if well managed, and carries a heavy stock of sheep and dairy cattle

on the better farms, where lime and phosphatic manures are plentifully used.

On the western edge of the sheet the Wharfe valley is crossed by the Arthington moraine, below which some of the best arable soils in the district are found on the fluvio-glacial terraces. Mainly arable crops are also grown on the alluvium, which generally has a fine sandy to silty loam texture and is freely drained, though liable to occasional floods even in summer. The southern face of the Wharfe valley is generally moderately steep between Pool and Harewood, and the interbedded sandstones and shales produce a complicated soil pattern.

From the Wharfe valley to the suburbs of Leeds, heavy-textured till of Carboniferous origin gives soils with impeded drainage, broken by outcrops mainly of coarse-textured sandstone on higher ground, and in the Bramhope district these gritstones produce podzolized soils. Most of the Aire valley on the sheet has been built over, but where this has not happened, and especially outside the western edge of the sheet, the alluvium is intensively used for market-garden crops and rhubarb growing.

#### HERTFORDSHIRE AND BUCKINGHAMSHIRE

##### *Sheet 238 (Aylesbury)*

A further 57 sq. miles have been surveyed, and a little more than half of the sheet has now been completed. On the Chiltern plateau the survey was continued in the south-west around the Hampdens, Great Missenden and Lee, and in the north-west around Redbourn, Flamstead and Markyate. In general, the soil pattern conformed to that described in previous reports, although in the latter district the more gentle relief modifies the distribution of the soils; the Batcombe series being less extensive on the level tops, and correspondingly the Winchester series is more widespread. In the Ver valley around Redbourn there is an extensive stretch of valley gravel which may be water-sorted and, in places, appears to be covered by as much as 18 inches of relatively stoneless loam. Somewhat similar soil has been observed overlying the Head deposits in the Tring and Wendover gaps, and provisionally grouped as a variant of the Charity series. Slightly higher up the valley sides near Redbourn and on the western sides of Harpenden dry valley near Luton Hoo, some very gravelly soils have been grouped with the Berkhamsted series.

In the Vale of Aylesbury, work was continued between Wiltstone and Wingrave, where a new series has been named after the latter village. The soil is formed on the glacial gravels capping the 400-foot ridge running west from Mentmore, and consists of a brown, gravelly, sandy clay loam, 2-4 feet thick, overlying Gault clay. A poorly drained variant of the Gubblecote series has been named the Wiltstone series.

#### CAMBRIDGESHIRE

##### *Sheet 188 (Cambridge)*

Mapping continued in the south-west and north-west of the sheet, where 31 sq. miles were surveyed; no new series were required, and the sheet is practically complete. The south-west district

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includes the city, and is divided into two parts by the Cam. The eastern part, reaching to Cherry Hinton, Horningsea and Quy Water Bridge consists of a low ridge about 25–30 feet O.D. of Chalk Marl with soils of the Wantage and Burwell series, and large stretches of the Swaffham Prior series, where traces of drift are present. The Lode series, developed on the Cambridge Greensand, forms a narrow band crossing from north-east to south-west. Small patches of Gault occur, and in the river valley the soils are of the Cam series. The western part, as far as Coton and Girton, lies between 30 and 90 feet O.D., and consists mainly of Gault, on which the Peacock and Wicken series are developed, while on sands and gravels the Landbeach and Milton series are found. Madingley Hill (200 feet O.D.) consists of Chalk Marl capped by Boulder Clay, the latter giving rise to the Stretham series. The Lode series again occurs at the foot of the hill.

The north-west district, mainly north of the Old West River and between Haddenham and Earith, consists of Fenland from which the Haddenham ridge rises to over 100 feet O.D. In the Fenland the soils range from peat to sandy clay loam with patches of the Clay-hythe series. Part of the area, especially in the north-west corner and along the Old West River, is occupied by the Cam series, which is generally non-calcareous except where shell marl occurs as in Willingham Mere. At the foot of the Haddenham ridge, Kimmeridge Clay appears on which Wicken and Peacock soils are developed. At the junction of the clay and the Lower Greensand, soils of the Oakington series are found and, higher up the slope, the latter formation gives rise to the Cottenham series. On the summit of the ridge the Stretham series is found on the capping of Boulder Clay.

#### DENBIGHSHIRE

##### *Sheet 95 (Rhyl) and 107 (Denbigh)*

The mapping of a further 98 sq. miles that includes the greater part of the Vale of Clwyd completed the survey of these two sheets. In the main the soils are developed on parent materials described in previous reports with the addition of chert beds of the highest beds of the Carboniferous Limestone, sandstones of the Millstone Grit formation and small outcrops of Triassic sandstone. The first two mentioned give rise to loams and sandy loams in the districts around Gronant and Llanasa. Soils of the Triassic sandstones contain variable amounts of material from the Silurian shale, but generally not in sufficiently high qualities to warrant the establishment of a new series, and they have been mapped with the Newport series. Only in two small areas near Llanrhiadr are there any soils formed directly on the sandstone.

Extensive areas of river alluvium were mapped between Llanrhiadr and Bodfari, where soils of four drainage categories were recognized and separated. Peat is formed locally in the wettest areas. On much of the ground bordering the alluvium, especially near Denbigh, the soils of the Penrhyn series tend to be gravelly. The gravels are probably outwash deposits from an ice-front, and are composed entirely of shale material. Morainic mounds of mixed shale and Northern Boulder Clay occur near Newmarket. The soils

on the crests of features resemble the Eriviat series, but are distinguished on the basis of their mixed origin.

On the eastern side of the Clwyd river between Bodfari and Tremeichion, and to the west between Green and Trefnant, soils of the Aber series merge almost imperceptibly into a deep phase of the Cottam series. Although the soils of the latter closely resemble those of the Aber series in texture, they have only a small amount of shale in the surface soil. To establish satisfactory boundaries it was necessary to examine a number of selected surface soil samples and determine the approximate amounts of shale material present.

#### OTHER WORK

Following a request from the Agricultural Improvement Council, work has started on a detailed soil survey of Romney Marsh, and about 3,000 acres have been examined. The soil pattern is exceedingly complex, and is related to the nature and mode of deposition of the alluvial deposits composing the Marsh, the micro-relief and the drainage conditions. It is considered that the nine series established during an earlier survey by L. W. Cole and J. K. Dubey of Wye College, with some additions and modifications, will provide a satisfactory basis for classifying the soils in many parts of the Marsh. For mapping purposes, it will probably be necessary to group two or more series into defined complexes, the distribution of which will frequently be related to micro-relief and the mode of deposition.

At the request of the Ministry of Agriculture a survey of some 15 sq. miles was made of the Sussex coastal plain between the rivers Arun and Adur. Only two new soil series were described, the others had already been established by earlier work of the Survey and by Dr. F. F. Kay during a survey of the strawberry-growing area in Hampshire.

In Devon, a large farm was surveyed belonging to the Devon School of Agriculture on which the soils are derived from Triassic sandstones and alluvial deposits of differing ages. In Somerset, an experimental husbandry farm was surveyed for the Ministry of Agriculture. Soils of established series developed on Devonian shales were recognized.

The Agricultural Land Service requested a survey to be made of relic mosses in Lancashire. A report was prepared describing their general character and their agricultural potentialities, together with detailed accounts of Holiday and Holker Mosses.

A reconnaissance was made of soils in opencast ironstone mining areas as a basis for further study of some of the problems of soil restoration, and investigations are proceeding on the variation of the weathering rates of different kinds of limestone, since these appear to differ considerably, and locally constitute the major part of the restored material.

Some 4,000 acres were surveyed in detail in the Vale of Belvoir with a view to the production of a reconnaissance survey map. Several established soil series were recognized on the clays and limestones of the Rhaetic, Lower and Middle Lias formations.

A survey of some thirty farms has not shown any correlation between incidence of Johne's disease in cattle and soil series or

conditions present in the pastures. Analysis of pasture samples for fifteen major and minor elements has given no indication that incidence of clinical cases can be correlated with an abnormality in mineral nutrition derived from the pasture. Milk fever, which is a failure of calcium-magnesium metabolism, is commonly reported in these herds.

This survey has again confirmed that the disease assumes very serious proportions in many apparently well-managed herds, Channel Island herds showing a high incidence of clinical breakdowns. Considerable difficulty is experienced in obtaining true incidence data, because in the absence of an acceptable diagnostic test the disease has not yet been made notifiable.

Analytical work on soils associated with several archaeologically interesting sites has been carried out. These included the Piltdown Skull site and also a round barrow, where an interesting deposition of  $MnO_2$  inside the silted up coffin was still quite obvious. This deposition had apparently been caused by the presence of the decomposing organic matter.