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Report for 1962

Full Table of Content

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REPORT FOR 1962

Soil Survey of England and Wales

Rothamsted Research

Rothamsted Research (1963) *Soil Survey of England and Wales ;* Report For 1962, pp 227 - 235 **- DOI: https://doi.org/10.23637/ERADOC-1-95**

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SOIL SURVEY OF ENGLAND AND WALES

D. A. OSMOND

The untimely death of the head of the Survey in February was a sad blow to soil scientists at home and abroad, for Dr. A. Muir gave his advice willingly both to individuals and organisations. D. A. Osmond was appointed head of the Survey in April. B. Matthews and F. H. Cowell replaced G. R. Suggett and A. V. Vann respectively. R. A. Jarvis was awarded a Royal Society Nuffield Foundation bursary to study soils in New Zealand similar to some that occur in England; D. C. Findlay was seconded for soil survey with the Sudan Government.

B. W. Avery presented a paper at a conference on Soil Classification in Ghent, and R. A. Jarvis presented one at a symposium on the Interpretation of Aerial Photographs at Delft. D. A. Osmond accepted an invitation to Moscow to attend the 1st Seminar on Soil Correlation for Europe. B. W. Avery with J. W. Muir (Soil Survey of Scotland) visited centres in England and Scotland in continuation of their studies of soil classification. J. H. Rayner (Pedology Department) and J. C. Gower (Statistics Department) have attempted to apply numerical methods to the classification of soils (see Pedology Department Report, p. 76). The Joint Field Meeting was held in Inverness, during which neighbouring soils were inspected and discussed. I. Tunckale returned to Turkey after visiting centres in England and Scotland, and five visitors were given tuition in survey methods in the field and laboratory.

Lectures, demonstrations, exhibits at agricultural shows and courses of lectures on aspects of soil survey were given by several surveyors. The Proline Soil Corer continues to give satisfactory service and to arouse interest. The Cartographic Section produced numerous maps and diagrams in addition to preparing maps for publication.

Including some revision, 116 sq miles were mapped at the scale of 1 : 63,360 and about 1,300 sq miles at 1 : 25,000; over 350 sq miles were surveyed for special requests.

Northumberland

Sheet 77, 7th Series (Hexham). Mapping was concentrated mainly on the Northumbrian Plain, where the complicated soil pattern has necessitated further detailed work. The area surveyed consists of several, shallow, post-glacial lake-basins with differing patterns of deposition. The deposits in the Plain differ from those at higher altitudes and to the west, so that associations will differ from those previously used for drifts mainly derived from Carboniferous rocks. Soils on these rocks are distinguished by their dull brown and olive colours from those on the reddish-brown deposits near the east coast. The dissimilarities between the drift of Carboniferous

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origin and the lake-basin deposits are important agriculturally, though they are difficult to appreciate in the soils.

Podzols are more widespread than had been thought, and occur on north-facing hill slopes under a rainfall of about 28 in. Their formation has been accentuated by coniferous afforestation, which has frequently resulted in the podzolisation of medium-textured *sols bruns acides*.

A soil sequence at Kip Hill illustrated both the catena and profile development. Near the crest of the hill, composed of calcareous sandstone, the profile includes, at 13 in., a narrow horizon of bright-red, haematitic material, either as a sandstone or an earthy deposit. The boundary with the soft, yellowish, weathering sandstone is sharp. On the southern dip-slope this horizon is replaced by a thick, red-coloured B horizon of sandy loam overlying the calcareous sandstone. Near the foot of the slope the profile is similar, but at 22 in. the red B horizon overlies grey, tenacious lacustrine clay. (Ashley)

Yorkshire

Sheet 90, 7th Series (Wensleydale). Survey was made of a further 100 sq miles in which no new soil series were encountered; use was made of aerial photographs despite their rather poor quality.

Sheet 97, 7th Series (York). Some 36 sq miles were mapped in an intensely arable area where the parent materials include Triassic and Jurassic rocks as well as various superficial deposits; their complexity and the low relief considerably slow the rate of reconnaissance mapping. Around Buttercrombe blown sand extends about a mile east of the boundary shown on the Geological Survey Map (Drift Edn.), and several soils were differentiated on boulder clay.

Previous detailed work around Leeds and Selby simplified mapping on the eastward extension of the York and Escrick moraines near Bossall and Catton, but around Scrayingham, Nunburnholme and Pocklington soils with Jurassic components were encountered. Near Skirpenbeck and Bugthorpe are soils developed in reddish drift associated with Keuper marl. At Newton-upon-Derwent the recognition of blown sand overlying morainic and fluvio-glacial outwash material necessitated revision affecting some 28 sq miles of previous mapping. (Crompton and Bullock)

Lancashire

Sheet 100, 7th Series (Liverpool). A further 90 sq miles between Liverpool and Warrington were covered where, although isolated outcrops of Middle Coal Measures and Triassic sandstone occur, the plain is mainly covered by till with occasional spreads of other superficial deposits. South of St. Helens, the Middle Coal Measures and till give rise to shallow, freely drained, brown-coloured soils of light or medium texture of the Ashurst group. The Haydock group, associated with the ridges of Triassic sandstone, includes shallow, free-draining, reddish-brown, loamy sands which are slightly podzolised when under heath. Freely and imperfectly drained soils of the Burscough group are restricted to the narrow valley sides in

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the till mainly derived from Triassic rocks, whereas the main components of the more extensive Wrightington group on the same till are gley soils and peaty gley soils in which surface water lies above a clay subsoil.

Soils of the Ormskirk group on Shirdley Hill Sand occur between Garston and Hale and around Great Sankey, and drainage is variable in this gently undulating landscape. The dark-coloured and invariably sandy surface soil overlies grey sand that may be up to 3 ft thick and humus–iron podzols occur sporadically.

Freely drained, acid brown earths and podzolised soils mainly compose the Kenyon group on glacial sands and gravels. On the flat terrace landscape associated with the Mersey and Sankey Brook the Rufford group consists of poorly or very poorly drained soils on fluvio-glacial sands and gravels.

Sheet 101, 7th Series (Manchester). One hundred square miles were surveyed around Bolton and Manchester. The Rufford and Wrightington groups are extensive with less frequent occurrences of the Burscough and Ashurst groups. There are large expanses of peat—the Mosses—which, since reclamation, are highly productive. In basin sites these developed from fen carr of semiaquatic origin to the typical raised moss stage where the main peat-formers are *Sphagnum* spp., *Eriophorum angustifolium*, *E. vaginatum* and *Calluna vulgaris*. Around Glazebrook, laminated fine sands and silts in a gently undulating relief from the Glazebury group of gleyed soils. East and north of Leigh the grey and orange-coloured till of Carboniferous origin gives rise to soils of the Aspull group, most of which occur on long, gentle slopes or flat sites where gley soils develop.

Sheet 94, 7th Series (Preston). A detailed survey of about 1,000 acres on the slopes of the Forest of Bowland provides a basis for further mapping on this sheet. As a result, five reconnaissance groups were constructed and 70 sq miles were mapped, extending the survey area to the Lune–Wyre watershed.

The most extensive group comprising hill peat occurs on the flat hilltops and gentle slopes. Peat hags and gullying are evidence of active erosion, which strikingly exposes the Millstone Grit or till. The main components of the Bowland group on steep slopes are peaty gley podzols. Cliffs with scree and steep slopes with stony podzols and brown earths are separated as the Gillsbrook group. The Wingates group occurs on locally derived drift, the matrix of which varies from loamy sand to silty clay. Situated below steep scarp slopes, the sites are very poorly drained and peaty gley soils or, in the wettest areas, 12–15 in. of peat occur. With decreasing elevation and below 450 ft these soils give way to a broad zone of the Aspull group. (Hall and Folland)

Shropshire

Sheet 129, 7th Series (Ludlow). The reconnaissance survey of the Clun Forest area was completed and, in addition to the freely drained soils, peaty gley podzols and peaty gley soils were mapped on local drift derived

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from reddish-brown Downtonian siltstone at elevations above 1,200 ft. Impedance of drainage is evident at depths of from 4 to 24 in., below which reddish-brown colours predominate. On uncultivated sites a peaty layer 2–6 in. thick occurs, and in some places a thin iron pan or a thin, diffuse, ferruginous B horizon.

The survey was continued eastwards towards Ludlow, where the Bromyard, Munslow and Wooton series are widespread. Near Bromfield pebbly terrace deposits are easily separated from finer-textured modern alluvium; in Corve Dale the distinction is more difficult. The extent of the present natural flood-plains is a feature that should be recorded, as soil textures tend to be finer and drainage poorer than on the terraces. An attempt was also made in the field to grade all alluvial areas by site characters and inferred adaptability.

One hundred square miles were mapped, and the survey is completed to the southern county boundary and a line east of Clee Hill–Tenbury Wells. Head deposits with dolerite were found west and south of Titterstone Clee similar to those on the north and east sides of Brown Clee; the soils developed on Head are seldom poorly drained and are included in the Haymore complex. (Mackney and Burnham)

Cambridgeshire

Sheet 135, 7th Series (Cambridge and Ely). A further 160 sq miles were mapped on the north, west and south edges of the sheet. In the north between March and Methwold, where peat overlying fen clay is extensive, and to the west of the Bedford River, where it is associated with the silt of the rodens, the soils can be correlated with those of the Downholland complex in W. Lancashire. Near Hilgay the remains of a system of pools that persisted until a late period occur in about 6 sq miles of an undulating landscape. The hollows are occupied by peaty loam or peat overlying silty clay which, on the elevations, are covered by calcareous, shelly marl. The course of the Old Croft River is now marked by a large roden that was never covered with peat. The fine-textured soil is continuous with similar deposits in the Wash.

Fen soils occur along the western edge of the sheet from March to Somersham, whereas soils developed on gravels, including the Landbeach series, occur around Somersham and Bluntisham. Midelney and Earith soils are associated with the Ouse here and, further south, Wicken and Denchworth series occur north of the Stretham and Hanslope series on Chalky Boulder Clay near Childerley and Hardwick.

Along the southern edge two associations, formed of the Swaffham Prior and Wantage series, and the Icknield and Swaffham Prior series respectively, occur east of Cambridge with soils of the Moulton and Newmarket Associations around Six Mile Bottom. Near Westley Waterless, the Ashley and Moulton Associations occur together with Stretham and Hanslope soils further east.

The detailed survey of 84 sq miles of Forestry Commission land in the Breckland is complete, and the final maps and reports are being prepared. Of new series recognised the Broomhouse occupies stabilised dune sand

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in which there is little profile development. The Brandon soils have been separated from the Santon series. Developed on gravel, the soil profile has a black, cemented humus B horizon with more evidence of iron accumulation than other podzols in the area. The upper part of the profile of the Lakenheath soils is like a normal humus podzol but the lower part is mottled because the water-table is close to the B horizon. (Hodge, Seale and Corbett)

Cardiganshire

Sheet 127, 7th Series (Aberystwyth). Mapping at the scale of 1 : 25,000 was continued in the southern part of the sheet, where 90 sq miles were completed; a further 16 sq miles of a previously surveyed area were also revised. A classification of soils based on three climatic zones is being attempted. The soils of the lowlands and uplands having been described, more attention was paid to soils in mountainous land. The zone is characterised by large areas of deep blanket peat interspersed with mineral soils which, occurring as "islands" and on the edges of plateaux, range from rankers to peaty gleyed podzols and peaty gley soils commonly with iron pan. (Rudeforth)

Bedfordshire and Hertfordshire

Sheet 147, 7th Series (Bedford and Luton). The reconnaissance survey is almost complete, 100 sq miles having been mapped in the valley of the Great Ouse from Turvey to Roxton and thence eastward to Gamlingay in Cambridgeshire.

The mapping units previously described were adequate for most of the area; the relatively higher ground of the North Bedfordshire Plateau, like that of West Cambridgeshire, is dominated by soils of the Hanslope series, and the low-lying featureless plain stretching east from the Ouse at Temsford is characterised by poorly drained clay loams and clay soils grouped with the Denchworth Association. Farther east, at Everton, Tetworth and Waresley the land rises sharply to the outcrop of the Lower Greensand, an area of coarse-textured, freely to excessively drained, acid soils of the Woburn Association. These extend beyond Gamlingay until the land rises to the extensive area of the Hanslope series around the Hartleys; the transition is marked by a narrow belt of soils of the Wicken series formed on an outcrop of the Gault. The gravel-covered flats in Biddenham and on the south side of the Ouse between Kempston and Blunham give soils similar to those around Biggleswade, deep, coarse, loamy sands, often stony, with indications of seasonal waterlogging in the deeper subsoil.

New units will be required for the small areas associated with outcrops of Middle Jurassic beds on the slopes above the Ouse west of Bedford. (King)

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Hertfordshire and Essex

Sheet 148, 7th Series (Saffron Walden). Field work for the reconnaissance survey of this sheet covering about 700 sq miles, mainly of intensively farmed arable land, is now complete. The final map is being prepared at the scale of 1 : 63,360 from the 1 : 25,000 field sheets.

In the choice of mapping units, conventionally termed associations, various criteria were used, and the associations represent a reasonable compromise between the desirability of grouping similar soils and the exigencies of rapid survey. A separation of naturally calcareous soils from leached or non-calcareous soils was attempted wherever possible, as many other important soil characteristics are related to these properties. In addition, many of the associations, though including two or more distinct series, are grouped around a common feature, such as a similar parent material or drainage category or a narrow range of surface textures. Some anomalous or complex groupings result from the necessity of choosing differentiating criteria broadly related to landscape form, easily identified in the field and therefore suited to rapid survey. (Thomasson)

Monmouthshire

Sheet 154, 7th Series (Cardiff). The survey of 290 sq miles completed the mapping on this sheet. The area includes the Monmouthshire extension of the Welsh Coalfield, the Monmouthshire Moors and the intervening lowland.

The relief in this part of the Coalfield is more pronounced than in Glamorgan, but the topographic zoning of the soils persists. *Sols bruns acides* and podzolised *sols bruns acides* occupy the lower, steeper slopes, while podzols with some gleying, which carry bilberry and moor mat-grass, cover the less-steep upper slopes. Peaty gleyed soils carrying moor mat-grass occupy the crests of ridges, particularly towards the north; eastwards there is a gradual development of iron pan, until in the extreme east of the Coalfield peaty gleyed podzols with iron pan become extensive.

In the lowland soils of the Pendoylan Association and the Radyr series were mapped on the drift, mainly derived from Carboniferous rocks, circumscribing the Coalfield and where the Old Red Sandstone sufficiently influences the soil, the poorly drained Frog Moor series and the freely drained Castleton series occur.

The Monmouthshire Moors, comprising Wentlloog and Caldicot Levels, separated by the Usk, occupy the low-lying land adjacent to the Severn. The estuarine deposit of grey, calcareous silty clay overlies bands of peat which approach the surface on the landward side. The predominant soils are of the poorly drained Wentlloog series, with a considerable depth of grey silty clay; where this material overlies peat or peaty clay it is mapped as the Midelney series. The Caldicot soils, which are also extensive, differ from the Wentlloog soils in that they contain more sand and are redder, probably because of the landward origin of the deposits.

Survey was also continued on the north edge of the sheet to link it with the area surveyed in Brecknockshire. (Crampton)

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Berkshire

Sheet 268, 3rd Edn. (Reading). A further 50 sq miles were mapped in detail, 10 sq miles being north of the Kennet Valley, the remainder within a triangle Yateley–Stratfield Mortimer–Reading. The main geological formations in both are Bagshot Beds and London Clay.

In the smaller block steep slopes prevented the deposition of eroded material, which has been removed from the district by the Kennet. The soils, therefore, are mainly derived from geological materials *in situ*: Swanmore and Shedfield series from Bagshot Beds clay and sand respectively, Woolhampton series from the upper part and Windsor series from the main part of the London Clay, while on some of the steeper slopes a truncated, calcareous variant of the latter is found.

In the larger block, however, colluvium accumulated and subdued the relief by occupying depressions in the terrain. On Bagshot Beds sand the Shedfield series occurs together with a deep, moderately well drained, sandy soil overlying Bagshot Beds clay on slopes below. On middle slopes Wickham soils are common where a thin sandy drift overlies Bagshot Beds or London Clay; Woolhampton and Windsor series also occur. The lowest slopes are occupied by the Swanwick series, a ground-water gley soil and by soils with gravelly sandy loam and sandy clay textures also influenced by seepage. River terraces are mainly occupied by the Hurst series, a poorly drained sandy loam subject to seepage, and by the Warsash series of freely drained, gravelly, fine sandy loam. The flood plains of the Loddon, Whitewater and Foudry Brook are occupied by the Loddon series, a non-calcareous, ground-water gley soil. One series on the recent alluvium of the Blackwater is possibly derived from a lacustrine deposit, the other, the Blackwater series, is a ferritic brown earth. (R. A. Jarvis and M. G. Jarvis)

Somerset

Sheet 156, 7th Series (Bristol and Stroud). South of the city of Bristol about 45 sq miles were surveyed. The cambered top of Dundry Hill composed of oolitic limestone consists mainly of the Sherborne series, while the main slopes, severely slumped in places, are dominated by the imperfectly drained soils of the Martock series. The lower slopes and a broad belt of surrounding land are occupied by poorly drained soils of the Charlton Bank and Long Load series on which pastures are rather poor and rushy. Between Whitchurch and Corsham Liassic Limestones are dominant, and the commonest soils are of the Somerton series, though the less-well-drained Haselor and Evesham soils occur frequently where clay bands outcrop.

Superficial deposits of Head and old alluvium cover much of the Triassic vale, giving deep, loamy, relatively stoneless soils similar to those of the Tickenham series and to thin, gravelly loams such as the Brinsea soils. The Worcester series, developed on red Keuper Marl, is uncommon.

The Lulsgate and Wrington series are associated with steep slopes on Carboniferous Limestone and Trias Conglomerate respectively. Between Failand and Leigh Woods the Nordrach series occupies shallow depressions

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in the flat elevated sites where similar soils, but with poorly developed textural B horizons, occur under oak woods. The Old Red Sandstone and Head derived from it mainly yield soils of the Ross series, although podzolised soils and medium-textured Bromyard soils also occur locally. (Findlay)

Devon

Sheet 176, 7th Series (Exeter). Including the Lower Teign Valley, the Exe Vale, Woodbury Common and the Otter Valley, approximately 150 sq miles were mapped almost entirely on red Permo-Trias rocks. Breccia, sandstone, marl and pebble beds are the most important lithological types and, as each produces a distinct landscape, the distribution of the provisional associations is closely related to geology.

Permian breccia without limestone fragments yields a reddish brown, freely drained, gravelly loam extending to 2 ft (Association E); where it contains limestone fragments, however, a clay loam textural B horizon develops and some soils are imperfectly drained (Association F). Soils of the Bridgnorth series, and humus–iron podzols developed on Permian sandstones are included in Association G. The podzols where cultivated around Kenton and Starcross are referred to as "black sands". Association H, on low terraces fringing the Exe estuary, consists of freely drained, brown, fine sandy loams or silt loams with less-well-drained soils in depressions. The most extensive soil in Association 1, developed mainly on Permian marl, has about 16 in. of moderately well-drained reddish-brown loam over brownish-red silty clay with grey ped faces that passes into tough red marl which may be calcareous at 4 ft; some imperfectly drained soils resembling the Brinsea soils are also included. Iron–humus podzols, formed on Head overlying Budleigh Salterton Pebble Beds, and, in wetter sites where marl approaches the surface, peaty gley soils are included in Association J, much of which is ungrazed common with a dry heath vegetation. In the Otter valley the Trias sandstone yields mainly sandy brown earths, and podzols are rare (Association K), although they occur on terraces in the valley. (Clayden and Manley)

Sussex and Hampshire

Sheets 316 and 317 (Chichester). Detailed mapping was continued and about 22 sq miles were surveyed west of Chichester. No new series were needed to describe the soils on Brickearth around Denvilles, Warblington and on Hayling Island, nor on the Chalk between Racton and the Lavant valley.

As in earlier work, parent materials derived from Eocene rocks were grouped lithologically. The Curdridge series thus covers a wide belt on sandy and loamy beds near the junction of the Reading Beds and London Clay; the profiles are strongly gleyed, and the differences in texture between horizons are clearly pedological in origin. Eocene clays with negligible contamination of drift give rise to the Swanmore series, the profile of which has a clay loam or silty clay loam top-soil overlying a considerable depth

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of clay with prominent grey and reddish-yellow mottling. The Shirrell Heath series was mapped on an outlier of Bagshot Beds capping Gammon's Hill and probably occurs on similar outliers to the west. This well developed humus–iron podzol, now under scrub woodland, has a bleached A_2 horizon that may be as much as 24 in. thick. In places there appears to be fragipan below the B horizon.

In the Lavant and Ems valleys the pattern of calcareous and acid soils developed on alluvium bears no obvious relation either to relief or to former water-courses, and it is often further complicated by a system of abandoned water-meadows. (Hodgson)

Other Work

1. Special surveys undertaken for the National Agricultural Advisory Service, the Agricultural Land Service, the Nature Conservancy, the Forestry Commission and other official bodies necessitated mapping over 350 sq miles.
2. Surveyors took part in describing soils at the sites of field trials of various kinds.
3. Meetings of the Regional Land Restoration Committee and the Regional Opencast Coal Restoration Panel were attended. Survey investigations indicate that the main problems of crop growth at restored opencast mining sites are concerned with soil structure and drainage. (Ashley, Crompton and Hall)
4. The soils were surveyed at a proposed site near Garstang, Lancs, for a County Institute of Agriculture. (Hall and Folland)
5. Surveys of experimental catchment areas in Wales covering about 10 sq miles were made at the request of the Hydraulics Research Station. (Rudeforth and Mackney)
6. The soils of a large area near Sleaford, Lincs. were mapped and good correlation was found between soil conditions and crop growth. (Hodge and Seale)
7. A survey was made of land adjacent to the Grassland Research Institute at Hurley, Berks. (R. A. Jarvis and M. G. Jarvis)
8. Investigations were made at several archaeological sites. (Crompton and Mackney)
9. At the request of the Trent River Board a map was compiled to show approximately the areas where cultivation is particularly dependent on proper drainage.
10. Considerable assistance was given in making arrangements and providing monoliths for exhibition at the meeting of the British Soil Science Society held at Aberystwyth. (Rudeforth)

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