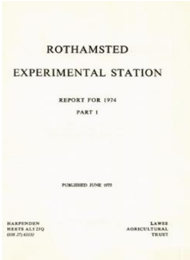
ROTHAMSTED RESEARCH

Report for 1974 - Part 1

Full Table of Content



Soil Survey of England and Wales

K. E. Clare

K. E. Clare (1975) *Soil Survey of England and Wales ;* Report For 1974 - Part 1, pp 257 - 286 **- DOI: https://doi.org/10.23637/ERADOC-1-131**

SOIL SURVEY OF ENGLAND AND WALES

K. E. CLARE

Staff

Head of Survey K. E. Clare, B.SC.

Headquarters

B. W. Avery, B.SC.
D. W. King, B.SC.

Mineralogists

P. Bullock, PH.D.
P. J. Loveland, B.SC.
C. P. Murphy, B.SC.

Chemists

C. L. Bascomb, B.SC.
K. Thanigasalam, B.SC.

Cartographers

E. M. Thomson
M. J. Williamson

Assistant Staff

Mrs. Sylvia Bloomfield
Mrs. Barbara Cain
Diana J. Carter
Mrs. Betty Creighton
Mrs. Joan K. Foster
H. Hakesley
M. D. Harding
J. H. Kenton
P. Mayton
Mrs. Elizabeth A. Merriman
Mrs. Penelope Murphy
Mrs. Ruth Murphy
A. G. Pollock
Mrs. Janet Y. Shuttleworth
Mrs. Teresa A. Toghill
Mrs. Anne E. Williams

Northern England

R. A. Jarvis, B.SC.
J. W. Allison, B.SC.
V. C. Bendelow, B.SC.
D. M. Carroll, B.SC.
R. R. Furness, PH.D.
R. Hartnup, B.SC.
I. N. L. Kilgour, B.SC.
S. J. King, B.A.
B. Matthews, PH.D.
Mrs. Joan Robinson

East Anglia

C. A. H. Hodge, B.SC.
R. G. O. Burton, B.A.
W. M. Corbett, M.SC.
D. J. Eldridge, B.SC.
R. Evans, PH.D.
R. S. Seale, M.A.
Mrs. Barbara N. Scott

East Midlands

A. J. Thomasson, M.SC.
H. George, B.SC.
D. G. M. Hall, B.SC.
F. W. Heaven, B.SC.
M. J. Reeve, B.SC.
J. D. Robson, B.SC.
Mrs. Virginia M. Eaton
Valerie E. Ward

West Midlands

J. M. Hodgson, B.SC.
G. R. Beard, B.SC.
J. M. Hollis, B.SC.
R. J. A. Jones, PH.D.
R. C. Palmer, B.SC.
W. A. D. Whitfield, M.SC.
Mrs. Cynthia M. Gosney

South-east England

D. Mackney, B.SC.
R. H. Allen, B.SC.
S. J. Fordham, B.SC.
R. D. Green, M.SC.
J. Hazelden, B.A.
M. G. Jarvis, B.A.
R. G. Sturdy, M.SC.
R. Webster, D.PHIL.
Mrs. Marie F. Cox

South-west England

D. C. Findlay, M.A.
G. J. N. Colborne, M.SC.
D. W. Cope, B.SC.
T. R. Harrod, PH.D.
D. V. Hogan, B.SC.
S. J. Staines, M.SC.

Wales

B. Clayden, B.SC.
R. I. Bradley, B.SC.
J. W. Lea, M.SC.
C. C. Rudeforth, M.SC.
T. R. E. Thompson, B.SC.
P. S. Wright, M.SC.
Mrs. Patricia D. Rees

Introduction

Under the new arrangements for funding agricultural research, an appropriate commission for the Soil Survey of England and Wales is now being worked out by the Ministry of

https://doi.org/10.23637/ERADOC-1-131 pp 2

Agriculture, Fisheries and Food in consultation with the Agricultural Research Council and meanwhile all the costs are being met by MAFF. Most of the Survey's work falls within the field of review of the Arable Crops and Forages Board of the Joint Consultative Organisation (JCO), which is supported by a Soil Science Committee under the chairmanship of Professor E. W. Russell. K. E. Clare was invited to join the Committee, which in October examined and reported on the Survey's work.

Under the new arrangement the detailed management of the Survey's work will become a matter for the Agricultural Research Council rather than the Soil Survey Research Board, which has therefore been disbanded. It is fitting to record here our thanks to the Board and the many distinguished people who served on it. It was first formed in 1947 under the chairmanship of Professor G. W. Robinson, F.R.S., Director of the Survey since 1939, who was succeeded by Sir William G. Ogg, F.R.S.E., then Director of the Rothamsted Experimental Station. In 1966, Sir William Ogg was succeeded by Professor E. W. Russell, C.M.G. The Survey is in debt to all three for wise guidance over a period of a quarter of a century, which has seen a near ten-fold increase in staff and activity.

The aims of the Soil Survey of England and Wales will continue to be to describe, classify and map the different soils of the two countries. The soils are described in profile, and kinds of soil profile are differentiated at four successive categorical levels, termed major group, group, subgroup and soil series. Classes in the three higher categories are defined partly by the composition and mode of origin of the soil material, and partly by the presence or absence of particular horizons, within specified depths, using properties that can be observed or measured in the field or inferred from field examination by comparison with analysed samples. Soil series are distinguished chiefly by lithologic characteristics. When a map unit is identified by the name of a soil series or a class, it is implied that most of the soil in each delineation on a map conforms to that class. More heterogenous units (complexes or associations) are similarly identified by the names of two or more series or classes.

The properties of the soils shown on maps are described in accompanying publications, as are the geography, geology, climate and land use of the district surveyed. A soil map and text together are a permanent record of the distribution and properties of the different kinds of soils.

The mapping programme continues, with the surveying of districts in each county chosen for their geomorphological and agricultural interest, and with the compilation of maps at a scale of 1 : 25 000. Forty-two such areas were worked on during the year and the weather allowed 940 km^2 to be surveyed in detail in 28 of them. Twenty-nine maps at a scale of 1 : 25 000 have now been published, with explanatory publications—usually *Soil Survey Records*—for 22 of them. Progress in reconnaissance survey included compilation of maps of soil associations at a scale of 1 : 250 000 for the counties of Avon, Berkshire, Cheshire, Derbyshire, Gloucestershire, Greater Manchester, Kent, Lancashire, Merseyside, Norfolk, North Yorkshire, Pembrokeshire, South Yorkshire, Suffolk and West Yorkshire.

Northern England

Cheshire

Sheet SJ 45E/55W (Burwardsley). The remaining 5 km^2 were mapped and the writing of the *Record* was begun. (S. J. King)

County map. Mapping at 1 : 250 000 was completed and work on the explanatory text continues. (Furness)

Cumbria

Sheet NY 36 and part of NY 37 (Longtown). Some 45 km^2 have been mapped in

https://doi.org/10.23637/ERADOC-1-131

this area, which extends from north of Carlisle to the Scottish border and is bounded by the Solway Firth to the west. It is almost entirely drift-covered, the underlying Triassic sandstone appearing only in riverside exposures. Reddish fine loamy till is widespread on undulating or flat land, where typical and cambic stagnogley soils are dominant, with stagnogleyic brown earths on steeper slopes, and peat, stagnohumic and humic gley soils in the hollows. Brown earths, sometimes fragmental, are common on the Esk river terraces but silty alluvial gley soils have been mapped near Westlinton. Very fine sandy marine alluvium, with sandy and humic-sandy gley soils, occurs in the south-west. Glaciofluvial sands and gravels flank the river alluvium: sandy gley soils, podzols, and typical and gleyic brown earths have been mapped, with small areas of gley-podzols. An account of the vegetation is being prepared by the Nature Conservancy and there has been collaboration with the Scottish Soil Survey. (Kilgour)

Sheet NY 55 (Penrith). The writing of the *Record* was begun. (Matthews)

Lancashire

County map. A 1 : 250 000 map was compiled of the new county, with Merseyside and Greater Manchester. (Carroll and Furness)

North Yorkshire

Sheet SE 39 (Northallerton). Reconnaissance began late in the year. This Sheet is in the Vale of Mowbray, the northern extension of the Vale of York. Parent materials include extensive till and glaciofluvial desposits. (Hartnup and Allison)

Sheet SE 58 (Rievaulx) with parts of SE 49/59 (Upper Ryedale). The remaining 25 km² were mapped and the *Record* commenced. The fine loamy soils on the Jurassic limestone plateau are mostly brown rendzinas, first mapped as Murton (1) series, and deeper brown earths of the Waltham series. Loess-like silty drift occupies about 3 km² on the Hambleton plateau, with brown earths of the Malham (2) series or humus-ironpan stagnopodzols of the Daletown series which, apart from its prominent Bh horizon, resembles the Priddy (3) or Lonsdale (2) series in silty drift over Carboniferous Limestone in other parts of England. In Bilsdale where Lias rocks are exposed, the valley is floored by the Long Load (3) series formed from clays and clay shales, with the Dundale series over the sandstones which crops out on the valley sides. Although 'boulder clay' occurs, the associated soils resemble those on the local solid formations. (Carroll and Bendelow)

Sheet SE 63/73 (Selby). This represents part of the 3rd Edition 1 : 63 360 Sheet 71 (Selby) originally surveyed between 1946 and 1949. Reconnaissance and sampling of the original area have been completed and a survey of the remaining area to the south has commenced. This district, largely glacial sands, silts and clays of the '25 foot drift' of the Vale of York, has soils similar to those described by Bullock (4). In addition, alluvial soils occur along the Ouse below Selby. (Furness and S. J. King)

Sheets SE 79E/89W (Pickering Moor) and Sheets SE 88NE/89SE/98NW/99SW. ***(Troutsdale).*** The *Record* was completed. (Carroll and Bendelow)

County map. Reconnaissance was continued in the uplands, aided by photo-interpretation: 45 km² were mapped in the Pennines and approximately 500 km² on the North York Moors. Apart from a brown calcareous earth between Pickering and Scarborough, all the soils encountered have already been recorded during earlier detailed mapping. (Carroll, Bendelow and Guardiola Saenz)

https://doi.org/10.23637/ERADOC-1-131

Northumberland

Sheet NZ 07 (Stamfordham). The last 13 km² were mapped and work done before 1966 checked. The principal soil is the Brickfield (5) series. In collaboration with ADAS, experiments were set up on comparable drained and undrained sites on this soil to assess the effect of drainage. (George)

Sheet 19 (Hexham). The writing of the *Memoir* was begun. (R. A. Jarvis)

South Yorkshire

Sheet SK 59 (Maltby). The remaining 45 km² were mapped and a legend drawn up. (Hartnup and Allison)

County map. Field work was completed in the lowland eastern half of South Yorkshire to complement the photo-interpretation of the upland western half done in 1973. A 1 : 250 000 soil map of the county was prepared for joint publication with West Yorkshire. (Carroll, Hartnup and Allison)

West Yorkshire

County map. The explanatory text was completed. (Carroll and R. A. Jarvis)

East Anglia

Cambridgeshire

Sheet TF 00E/10W (Barnack). Some 80 km² have been mapped and 27 map units differentiated, 12 in Jurassic parent materials and 15 in Pleistocene and recent deposits. One new series occurs, a typical stagnogley soil, fine silty or clayey in the white heterogeneous siliceous Upper Estuarine Series of the Middle Jurassic. Bracken is strictly limited to this soil on non-agricultural land. (Burton)

Norfolk

Sheet TL 99 (Caston). The remaining 40 km² have been surveyed. The Lakenheath (6) series, a typical gley-podzol, has been identified on former sandy heathland. In minor depressions where impervious layers are closer to the surface, localized iron-rich *raseneisen* desposits occur, similar to those on the Attlebridge Sheet (TG 11) where they give rise to humus-ironpan stagnopodzols of the Felthorpe series.

Chalky Boulder Clay outcrops at Snetterton giving Ashley (7) soils with fine loamy upper horizons. East and west of Griston small areas of Ragdale (8) series occur although with fine loamy plough layers. Coarse loamy upper horizons covering decalcified till are found around Stow Bedon and Rockland and classed as Euston series. (Eldridge)

Suffolk

Sheet TL 76E/86W (Risby). Sixty-five km² were mapped, and the Barrow series, examined on Broom's Barn Experimental Farm, is recognised for the first time. This soil is in cover sand on chalky drift and is near the margins of the Chalky Boulder Clay plateau. It has coarse loamy upper layers over a fine loamy subsoil and is probably a typical palaeo-argillic brown earth. It occurs with Moulton and Swaffham Prior soils (9). (Seale)

County map. A 1 : 250 000 county map was started, sampling by the pattern used last year in Norfolk of 400 auger bores clustered by grid references on each 1 : 25 000

https://doi.org/10.23637/ERADOC-1-131

map sheet. Alternate 1 : 25 000 sheets (TL 97, TM 06, TM 17, TM 26, TM 37 and TM 46) were chosen to form a chequerboard in north Suffolk.

These sheets cover the Breckland, the Chalky Boulder Clay Plateau and the Sandy Coastal Plain soil provinces. Worlington, Freckenham, Methwold and Newmarket series (6) were the main soils on Sheet TL 97 which lies partly in Breckland, and Freckenham soils in sandy drift over Crag are common on the coastal TM 46. On the Chalky Boulder Clay Plateau between these two areas the chief soils are the Beccles (7) and Ragdale series occurring in varying proportions and in intricate local patterns. Aldeby (7) soils also occur but are not as extensive as in south Norfolk. (Corbett)

East Midlands

Derbyshire

County map. Reconnaissance was completed in the High Peak area (parts of sheets SE 00, 10; SJ 97, 98, 99; SK 07, 08, 09, 18, 19, 28), mainly by random traverse on moorland, detailed mapping of sample farms below 300 m and the use of air photographs. Map units were correlated with those used in the neighbouring counties of West Yorkshire and Cheshire.

Although varying slightly with aspect, an important soil-landscape boundary roughly follows the 300 m contour. Above that elevation, raw oligo-fibrous peat soils (Winter Hill (5) series) dominate high plateaux with ironpan stagnopodzols and humic rankers (Belmont (5) and Revidge series) on steep slopes and convex hill tops, and cambic stagnohumic gley soils (Wilcocks and Roddlesworth series (5)) on moderately sloping flush sites. Below 300 m, humose or peaty topsoils are rare. Typical brown earths of the Swindon Bank (10) and Rivington (5) series, with subsidiary brown podzolic soils (Withnell (5) series) between 220 and 300 m, dominate sandstone materials, while cambic stagnogley soils of the Brickfield and Hallsworth series (5) occupy moderately or strongly sloping lower ground in Head or till.

Surveys in west Derbyshire (SK 13 and 14) indicate that plateau land is dominated by stagnogley soils of the Salop (5), Clifton (5) and Dunkeswick (10) series developed mainly on reddish boulder clay. Valley sides are complex with thin Head over sedentary Triassic rocks of varying lithology. The associated soils are predominantly stagnogleyic and typical brown earths including Hodnet, Worcester, Flint and Wick series (11) with some Whimple (12) series. The Dove floodplain near Doveridge includes clayey alluvial gley soils of the Fladbury (11) series and loamy brown alluvial soils of the Trent (11) series.

Around Chatsworth and Matlock (SK 26, 27 and 35), most soils on Millstone Grit sandstones are Swindon Bank or Rivington series, with some included brown rankers. Cambic stagnogley soils of the Bardsey (10) and Brickfield series dominate lower slope Head, while on upper slope till and associated Head, Dunkeswick and Brickfield series are dominant. Typical podzols (Anglezarke (5) series) occur on the coarser sandstones (e.g. Rough Rock and Chatsworth Grit) of the relatively dry East Moors.

On the Coal Measures lowland around Chesterfield, cambic stagnogley soils (Dale (10) series with subsidiary Bardsey and Ticknall (11) series) are dominant on the shales with typical brown earths of the Swindon Bank series on sandstones. However, much of the Derbyshire Coal Measures lowland has been restored after open-cast mining and has many man-made soils. (Reeve and Thomasson)

Lincolnshire

Sheet TF 04 (Sleaford). The map was completed and the *Record* is in preparation. (George)

https://doi.org/10.23637/ERADOC-1-131

Sheet TF 39 (Covenham). Reconnaissance revealed that the two main parent materials are the reddish boulder clay or Marsh Till and the fen silt deposits. There are also small areas of alluvial terraces and sand and gravel deposits. The boulder clays are sometimes under thin deposits of sandy or loamy material usually not more than 60 cm thick. The Marsh Till also occurs in Humberside (see page 194), and correlation there will be needed. (George)

Sheet TF 45 (Friskney). Some 18 km² were mapped in detail. Grid survey is being used in the 11 separate km squares which aerial photographs suggest are typical of several distinctly different landscape/soil map units. The remaining areas are being mapped by free survey to confirm the composition of map units revealed during the grid survey.

Several soils mapped in Witham fen (13) were found, e.g. Downholland, Timberland, Romney, Tanvats, but the clayey alluvium of Friskney Fen tends to be thinner.

The marsh land has mainly fine sandy silt loam soils with a zone 100–150 m wide of soils with finer textured plough layers seaward of each successive sea bank. This zone represents higher saltings formed as the rate of accretion of marine deposits increased when the construction of sea banks reduced the tidal scouring of the foreshore. (Robson)

Sheet TF28 (Donington on Bain). The remaining 35 km² were mapped, and the map and *Record* prepared for publication.

Soils of the Andover and Coombe series (14) predominate on the Chalk dipslope with Winchester (14), Carstens and Batcombe (14) series on drift over Chalk. Denchworth (14), Rowsham (8), Ollerton (15), Arrow (16) and Crannymoor (15) series are common over the rest of the area. (Heaven)

Northamptonshire

Sheet SP 66 (Long Buckby). This sheet represents much of the gently undulating south-western half of Northamptonshire. Soil parent materials are varied; Jurassic rocks from Middle Lias to Great Oolite with glacial and glaciofluvial drift forming a patchy cover on certain slopes, and alluvium associated with upper tributaries of the Nene. Approximately 45 km² were mapped involving 16 existing and six newly defined soil series. On the drift-free Upper Lias shale outcrop, Long Load (8) soils are dominant, with Martock and Belvoir series (8) on moderately sloping facets. The last two soils are also common on Middle Lias rocks. Stagnogley soils of the Rowsham (8) series and stagnogleyic brown earths of the Harpole series (fine loamy over clayey) and the Brockhall series (fine loamy over fine silty) occur where thin drift overlies the Lias clays and silts.

The Marlstone Rock Bed separates the Middle and Upper Lias. Although very ferruginous elsewhere (8), locally this bed forms an attenuated outcrop of only slightly ferruginous limestone and is dominated by fine loamy typical brown earths of the Flore series. The lowest beds of the Upper Lias are calcareous shales and give typical non-calcareous pelosols of the Horton series.

Many hilltops are capped by Northampton Sands. Fine loamy ferritic brown earths of the Banbury (8) series are common on the lowest beds while typical coarse loamy brown earths of the Tadmarton series are common on the rest of the outcrop and small areas of brown rankers (often ferritic) can occur on convex slopes. Head from Northampton Sand over Upper Lias shales gives Wigginton soils (stagnogleyic brown earths).

Small outcrops of Lower and Upper Estuarine clays and Great Oolite limestone carry an unnamed clayey calcareous pelosol and rendzinas of the Sherborne (8) series respectively.

Clayey soils of the Hanslope and Ragdale series (8) are common on the chalky Wolstonian Till, with Stowe series, a loamy argillic brown earth, occurring where calcareous

https://doi.org/10.23637/ERADOC-1-131

glaciofluvial outwash locally covers the till. The Brington series is a fine loamy over clayey stagnogleyic (possibly argillic) brown earth mapped where thin Head from the outwash overlies the till. Alluvium associated with the Watford Gap tributary of the Nene carries Wyre (17) and Fladbury (11) series. (Reeve)

Nottinghamshire

Sheet SK 57 (Worksop). The soil map and text were completed. (Reeve)

West Midlands

Herefordshire and Worcestershire

Sheet SO 74 (Malvern). The soil map and *Record* were prepared for publication. (Palmer)

Sheet SO 85 (Worcester). A reconnaissance survey was carried out on 15 selected farms each of about 100 ha, and 15 km² mapped in detail. Twenty map units were established and profile pits dug to characterise 5 series.

The area was chosen to study soils developed in (a) glaciofluvial terrace deposits associated with the rivers Severn, Teme and Salwarpe, (b) Severn and Teme alluvium and (c) Triassic rocks. It straddles the southward-flowing river Severn and has the city of Worcester at its centre. Keuper Marl underlies much of the district but there is a small area of Lower Lias clay in the south-east.

Worcester (8) and Spetchley (3) soils predominate in Spetchley and Warndon parishes in the east where the Keuper Marl is drift-free. Elsewhere drifts ranging from sandy to fine silty mask the clayey marl. Whimple (12) and Brockhurst (15) map units are probably most widespread where thin fine loamy or fine silty drift overlies Keuper Marl. The deposits of the five terrace levels of the Severn and Teme are mainly sandy and coarse loamy usually giving Newport (12), Wick (16) and Arrow (16) soils. Where coarse loamy Head from these deposits overlies Keuper Marl at less than 80 cm depth Dunnington Heath (8) soils have been mapped.

The alluvium of the Severn is dominantly brown or dark brown but variable in particle-size class. Most profiles are fine silty or fine loamy and where slightly gleyed have been correlated with the Tewkesbury series (18). Clayey Compton (16) soils often occur in depressions in the Severn alluvium and along many tributary streams. Coarse loamy typical brown alluvial soils occur in a thin strip along the Severn levee.

Six km² in the parishes of Norton-juxta-Kempsey, Stoulton, Drakes Broughton and Wadborough, and Whittington in the south-east were mapped in an earlier survey in the Vale of Evesham (17). Several other areas were surveyed in 1949 but not published. These surveys are useful in mapping although several soil series and map units have since been changed. For example, the concept of the Dunnington Heath series was wider than now defined, and, as mapped in earlier surveys, includes many Whimple, Brockhurst, Wick, Arrow and Newport soils. (Palmer)

Salop/Staffordshire

Sheet SO 79E/89W (Claverley). Approximately 40 km² were mapped in detail and 10 profiles described and sampled using the new *Handbook* (19). A provisional legend of 21 series has been established.

About 70% of the soils are in drift deposits. Typical brown sands of the Newport (12) series are most widespread, while soils of the Clifton and Salwick series (5) in fine loamy till are also extensive. Soils of the Ollerton (15), Blackwood (4), Wick (16), Arrow (16), and Quorndon (8) series commonly fringe the till and small areas of Blackwood soils

https://doi.org/10.23637/ERADOC-1-131

have been mapped on the lower terraces of the Worfe. Sandy stagnogley soils in glaciofluvial deposits over till have been mapped near The Beeches Farm, Seisdon and a small area of stagnogleyic brown sands in similar parent materials fringes the till near Oaklands Farm, Rudge. These, as yet unnamed soils, could be correlated with the Rufford (5) and Astley Hall (16) series, and often occur within the Clifton, Salwick, Ollerton and Blackwood map units. An unnamed argillic brown sand, also in glaciofluvial deposits over till, is on the crest of the deeply dissected plateau around Barnsley.

Soils in solid rocks occur only on eroded slopes and brows, or on steep scarp faces. Bridgnorth and Bromsgrove series (12) are the main soils on Triassic rocks, while on the Upper Coal Measures around Gatacre and Beobridge typical brown earths of the Shifnal (20) series are in reddish sandstones and typical argillic brown earths of the Lilleshall (20) series or stagnogleyic argillic brown earths of the Dodmoor (20) series occur in reddish marl. (Hollis)

Staffordshire

Sheet SK 12 (Draycott in the Clay). A further 30 km² were mapped in detail and the draft legend prepared.

Keuper Marl in the north and around Dunstall in the south supports mainly Worcester soils (8) with Whimple (12) and Brockhurst (15) soils where it is under thin drift. Spetchley (3) soils occur only in drift-free depressions.

Typical calcareous pelosols of the Hurcot series (16) occur on outcrops of Tea Green Marl in Newborough, where they are associated with an unnamed pelo-stagnogley soil developed where there is thin drift over the Marl. In Marchington and Newborough soils of the Belvoir series (8) occur on Rhaetic shale and unnamed typical (argillic) stagnogley soils have been recognized where the Rhaetic shale is thinly covered by drift.

Distribution of the till corresponds closely with that shown on the 1 : 63 360 *Geological Survey Sheet* 140. Salop soils (16) predominate and Crewe (18) soils occur sporadically, the till being calcareous below 70 cm in some profiles. Reddish and brownish subsoil phases of both series have been recognized. Ragdale (8) soils on Chalky Boulder Clay occur on isolated pockets within the main body of the till, and this material possibly belongs to an earlier glaciation. Areas of fine loamy drift are inextensive and give Salwick and Clifton soils (5). Newport (12) soils are found on the upper slopes of the Swarbourn valley and brownish pelo-alluvial gley soils in reddish and brownish river alluvium in the Dove valley have been correlated with the Compton series (16). The dry spring and early summer this year produced large deep cracks in many of the heavy soils, notably those of the Hurcot, Worcester and Crewe series. Some spring sown cereals suffered seriously from drought and did not recover until late July. The heavy rain in late August and September caused difficulties for many farmers, particularly those harvesting cereal crops on heavy land. Salop, Crewe, Worcester and Hurcot soils puddled and suffered compaction with severe surface deformation under the weight of tractors and combine harvesters. Poaching of intensively grazed pastures on Salop and Worcester soils particularly in Hanbury and Anslow had become serious and widespread by early October.

Samples were taken for laboratory analysis, micromorphological analysis and moisture release studies. Soils were described using the new *Handbook* (19). (Jones)

Sheet SJ 82 (Eccleshall). A land capability map at a scale of 1 : 25 000 was prepared. (Jones)

Warwickshire

Sheets SP 47/48 (Rugby West/Wolvey). The remaining 100 km² were surveyed in detail and the maps and *Record* prepared for publication; 55 representative profiles and

https://doi.org/10.23637/ERADOC-1-131

more than 8000 auger borings were described. The legend includes 24 soil series, three of which are new.

Surface-water gley soils of the Ragdale (8) and Oak (21) map units are extensive on the Chalky Boulder Clay north of Stretton under Fosse. They include small areas of gleyic argillic brown earths, as yet unnamed. There are also small areas of stagnogleyic calcareous pelosols correlated with the Hanslope series (8), and stagnogley soils of the Aldeby series (7).

Flint (11), Salop (16) and Crewe (18) series are widespread on till south of Stretton under Fosse and on the Lower Wolston Clay below the main Chalky Boulder Clay outcrop which caps high ground centred on Cloudesley Bush. A small area of typical calcareous pelosols on till mainly from Triassic rocks has been recognised, but not named, around Harborough Magna and Pailton.

Wick and Arrow soils (16) are extensive on glaciofluvial deposits on which small areas of Quorndon series (8) have also been mapped. Fine loamy gleyic brown earths on the Wolston Sands have been named Hopsford series, and are differentiated from the Arrow soils by their fine loamy texture.

Rowsham (8) and Podimore (18) series are in thin fine loamy drift on Lias clay, and Chadbury series (17) is in thin clayey drift over Jurassic clay. Calcareous pelosols of the Evesham series (16) are on the drift free slopes of the Jurassic outcrop at Frankton, Dunchurch and near Rugby. Worcester (8) and Whimple (12) series have a limited distribution in the south-west. Fladbury soils (16) are on the clayey alluvium flooring the river valleys. (Whitfield and Beard)

South-east England

Berkshire

County map. A bulletin was prepared and the map is in line proof. Means and variances of data from ADAS analyses of samples at grid intersections were calculated on the Rothamsted computer. (M. G. Jarvis and Hazelden)

Buckinghamshire and Berkshire

Sheet SU 88 (Marlow). The *Record* was completed, and an agronomic report and land use capability map prepared in cooperation with ADAS. (Mackney)

Essex

Sheet TM 12 (Weeley). The remaining 55 km² were mapped and a soil map, land use capability map and *Record* are in preparation.

Air photographs taken this year during the severe early summer drought clearly show polygonal crop patterns. Poorer growth corresponded with sandy, and better growth with loamy over sandy soils; the patterns correlated sufficiently well with soil type to give an accurate map. Dark-toned areas lacking polygonal patterns represented London Clay, colluvium, alluvium and thick Cover Loam where, with more available water in the associated soils, a more uniform crop cover is produced.

Micromorphological study confirmed the presence of Bt and Btg horizons within the Cover Loam and in the lithologically distinct reddish layers (hoggin—large sand, small and very small, clay and silt fractions) which commonly lie below the Cover Loam over much of the district.

Otherwise similar soils in Norfolk appear not to have accumulated such illuvial clay, either within or below Cover Loam, so that correlation at subgroup level has been abandoned (9). (Sturdy and Allen)

https://doi.org/10.23637/ERADOC-1-131

Kent

County map. About 2200 km² were surveyed and map and legend revised to include 22 soil associations. Eight profiles were described and sampled and selected undisturbed cores obtained to study development or degree of expression of argillic horizons.

Survey of the strongly dissected and lithologically varied High Weald showed that geological boundaries between silty to very fine sandy rocks (Tunbridge Wells Sands and Ashdown Beds) and clays (chiefly Wadhurst Clay) are mostly boundaries between two soil associations; soil patterns and frequencies are similar to those in the district near Paddock Wood (22). Stagnogley soils are dominant overall, chiefly Cranbrook (23) series on silty rocks and Thorne and Hildenborough series (14) on the clays. Stagnogleyic brown earths grouped as Curtisden (23) series are commonly with Cranbrook soils. About ten other soil series are important locally, e.g. the shallow Brandfold and Brenchley series (23) with siltstone or sand rock by 50 cm which often occupy a narrow zone shouldering hill slopes.

On the Low Weald there are notable differences east and west of the Medway floodplain. To the east, land is flat except for low hills marking limestone and sandstone bands in the Weald Clay. Stagnogley soils predominate, chiefly Thorne series in clay, with Hildenborough soils where silty or loamy drift thickens over clay fringing Hastings Beds outcrops. To the west, the landscape is more dissected, with most higher ground capped by relict Head; Thorne soils dominating the lowland are interspersed with stagnogleyic brown earths or stagnogley soils in the very stony, silty to loamy over clayey, Head.

Where the Medway and its tributaries cross the Low Weald there are wide meandering belts of clayey alluvium, mapped as Fladbury (14) series, flanked by widespread river brickearth and remnant terraces with several other ground-water gley soils. Park Gate (14) soils which predominate in brickearth, and associated stony or gravelly profiles, often include a dark horizon below 50 cm containing much ferrimanganiferous material. In many places this is cemented and in some stream banks there is a hard shelf about 1 m down.

Denchworth (14) soils are dominant on Gault except in an area straddling the Darent near Sevenoaks where variably stony silty to clayey Head is widespread. Stagnogleyic brown earths and stagnogley soils are dominant, mostly skeletal and some calcareous.

Oxfordshire

Sheet SP 30 (Witney South). The remaining 20 km² were mapped and the *Record*, together with the final map and legend, is being prepared.

Water levels were measured through the winter at four dipwells in Denchworth and four in Rowsham soils (14). Draw-down tests to assess permeability were limited by low winter water levels, as in 1972–73. (Hazelden and M. G. Jarvis)

Sheet SP 60 (Tiddington). Reconnaissance was begun, and 5 km² mapped in detail. The geology of the area is complex with Gault clay in the south-east separated from Oxford and Ampthill clays in the north-west by a zone of sandy Upper Kimmeridge, Thame Sand, Portland Beds, Wealden Beds, and Lower Greensand. Around Milton Common much of the Gault is under flint gravels.

Sonning (21) series was found on the gravel terraces, Denchworth, Rowsham and Evesham (8) on the clay lands, and Fladbury (14) on the floodplain of the Thame. (Hazelden)

South-west England

Avon

County map. Twenty-two traverses were made to check soil association boundaries

https://doi.org/10.23637/ERADOC-1-131

and content of included soils. A map and legend have been prepared at scales of 1 : 250 000 and 1 : 100 000. A bulletin is in preparation. (Colborne)

Cornwall

Sheet SW 53 (Hayle). The remaining 70 km² were mapped and profiles sampled and described. Whilst much of the Devonian slate outcrop carries fine loamy soils of the Highweek and Dartington series (24), coarser textured brown podzolic soils occur on metamorphosed slates around the Lands End granite. There are more basic intrusive rocks (greenstones) than was thought and they support brown soils of variable depth which give a positive allophane test. These soils are generally fine loamy and due to the complicated outcrop pattern of the parent rock are not always separable from the surrounding slate soils.

Man-made humus soils occur around Marazion whilst soils with modified surface horizons due to added beach sand extend well inland. Similarly a thin cover of blown calcareous shell sand occurs inland of the main dunes on the north coast.

Much alluvium is disturbed by mining but fine loamy and silty humic-alluvial gley soils occupy undisturbed areas of slate-derived alluvium whilst coarser textures are apparent where the source is granite. (Staines)

Devon

Sheet SS 61 (Chulmleigh). A further 60 km² was mapped in detail. (Harrod)

Sheet SS 63 (Brayford). The remaining 68 km² were mapped and the *Record* is being prepared. (Hogan)

Gloucestershire

County map. Gloucestershire now covers 2640 km² (652 000 acres) following transfer of districts in the south to the new county of Avon. About 700 km² were mapped previously and a reconnaissance has now been made of a further 800 km². The survey covered the Jurassic clay vales, the Cotswold escarpment, the alluvial tract of the Severn, and parts of the Forest of Dean and the district around Newent. North of Dursley the Lias vale is less dissected than to the south and soils of the Denchworth (18) series are replaced by Podimore (18) soils in thin non-calcareous clayey drift accompanied by Sutton (25) and Isle Abbotts (18) soils, and Evesham (18) soils on low ridges. Isolated hills such as Robins Wood and Churchdown are covered by land-slipped Martock (8) soils. The Cotswold scarp is also extensively land-slipped and soils are dominated by the Martock and Long Load series (8). There is much slumped calcareous oolitic material between Cheltenham and Winchcombe, north of which the scarp is dominated by Long Load soils. The northern Cotswolds are mainly covered by Sherborne (25) series and Tetbury soils are rare.

In the Campden and Moreton vales the Middle Lias has extensive patches of Atrim (26) soils. The Moreton drifts give Ragdale (8) soils on Chalky Boulder Clay with unnamed loamy over clayey stagnogleyic paleo-argillic brown earths and paleo-argillic stagnogley soils over reddish till at Moreton. Wick and Norton soils (18) occur in associated outwash deposits. Soils of the Sutton and Badsey series (25) have been mapped on the Upper Thames terraces with Carswell and Thames soils (25) in valley bottoms.

At Newent soils of the Bridgenorth, Newport and Bromsgrove series (12) are derived from Triassic sandstones, sands and loams respectively. Whimple, Brockhurst and Worcester soils (12) overlie the Keuper Marl. In the Forest of Dean the Carboniferous siltstones, silty shales and sandstones and derived drift give a range of non-humic and

https://doi.org/10.23637/ERADOC-1-131

humic gley soils. Brown soils occur over sandstone bands and in deep drift from them on upper slopes, and podzols in conglomerates of the Drybrook Sandstone.

The alluvial tract of the Severn can be divided into two main associations. One dominated by Compton and Tewkesbury soils (18) occurs north of Minsterworth, whereas to the south is an association dominated by unnamed silty gleyic brown calcareous alluvial soils on levees, with alluvial gley soils in the backlands and also on the levees south of Frampton. (Cope)

Wiltshire

Sheet SU 05N/SU 065 (Devizes). Additional mapping was done for a detailed study of Upper Greensand soils by Loveland. (Findlay)

Wiltshire/Somerset

Sheet ST 73 (Stourhead). Here the Upper Greensand crops out higher than in the Vale of Pewsey and is mainly represented by Chert Beds. Around Stourton the commonest soil is a typical argillic brown earth of sandy loam over silty clay loam, cherty throughout. Near the chalk escarpment there are sandier glauconitic and stoneless soils resembling the Ardington (25) series near Devizes. (Findlay)

Wales

Clwyd

Sheet SJ 17 (Holywell). A further 37 km^2 were mapped. Much of the Carboniferous Limestone which occupies 60% of the Sheet is under loamy drift up to 5 m thick, sometimes with a thin layer of clay above the rock. Slightly stony coarse loamy drift containing mudstone is most widespread, though fine loamy material also occurs, and limestone with or without sandstone, quartzite, chert, shale or metamorphic stones can be present. The soils are mainly brown earths and sometimes have fragipans. Further west (27) brown earths of the Dinorben and Pentraeth series are in drift over Carboniferous Limestone, the Pentraeth containing only limestone and the Dinorben including material from Silurian mudstone. In this district Dinorben soils are more extensive.

The soils in drift over mudstone are typical brown earths and typical brown podzolic soils, with humic brown podzolic soils on open moorland above 300 m. Typical brown sands and typical brown calcareous sands occur in glaciofluvial deposits in the Wheeler valley.

Stagnogley soils occur in several different till deposits. It is difficult to identify series lithologically in boundary zones between major ice sheets, where there can be more intergrades than typical profiles of well known soils. (Thompson)

Sheet SJ 24 (Llangollen). Reconnaissance began with the description of 27 profiles and mapping of 10 km^2.

The district is in the Dee catchment and south-west of Sheet SJ 35 (Wrexham). The Dee flows across the south through steeply dissected land floored by Silurian sedimentary rocks. Creigiau Eglwyseg, a Carboniferous Limestone escarpment rising above 400 m, extends south to the Dee and dips eastward beneath the Millstone Grit of Ruabon Mountain. A narrow strip of red Basement Beds follows the foot of the limestone outcrop. East of Ruabon Mountain, moderate slopes over Middle and Upper Coal Measures contrast with the steep slopes in the west. The highest land is in the north-west at 500 m on Cyrn-y-brain, formed of Ordovician sedimentary rocks.

Much bedrock in the south and west is under fine silty or fine loamy drift from Lower Palaezoic sediments in which the soils are largely typical brown earths and typical

https://doi.org/10.23637/ERADOC-1-131

brown podzolic soils of the Denbigh and Manod series (27), with some brown rankers of the Powys series (27) and associated humic and grey rankers. Above 365 m ironpan and ferric stagnopodzols of the Hiraethog (27) and Hafren (28) series, cambic stagnohumic gley soils of the Ynys (27) series and peat soils predominate. In the east, soils are in fine loamy drift from Carboniferous rocks and mostly stagnogleyic brown earths of the Nercwys (29) series and cambic stagnogley soils of the Talog (29) series. Typical podzols of the Anglezarke (5) series occur in stony coarse loamy material on Ruabon Mountain. Rendzinas, paleo-argillic brown earths and brown calcareous earths are found along the limestone outcrop, and reddish brown fine loamy brown earths in material from the Basement Beds. (Lea)

Dyfed

Sheet SN 24 (Llechryd). A provisional legend was constructed and used to map 20 km². The sand deposits around Penparc have a relatively sharp boundary, and the associated soils a characteristic strong brown B horizon above a paler BCu. Some were seen with thin clay lamellae in the sand. Similar sharp limits were encountered when mapping the extent of the clay in one of the old Teifi river channels near Cwmcoy. The soils here have two types of clay within the profile, an upper 10–20 cm layer that is a mainly yellowish brown slightly stony silty clay with grey mottles, and a lower purplish grey clay with very few stones and common calcium carbonate concretions.

Nineteen cores have been described and sampled, several samples being taken to help classify profiles as either typical brown podzolic soils or typical brown earths. (Bradley)

Sheet SN 50 (Llanelli North). The remaining 10 km² was surveyed. (Clayden)

Sheet SN 62 (Llandeilo). Following a reconnaissance in which 92 soil profiles were described, 25 km² were mapped in detail.

Lower Palaeozoic rocks, mainly mudstones, sandstones and grits are under most of the area, passing in the south-east to sandstones and siltstones of the Old Red Sandstone. Glacial and periglacial processes have mantled most of the landscape with drift, but little has crossed the Lower Palaeozoic—Old Red Sandstone boundary. The valley floor of the Tywi, which can be nearly 2 km wide runs through the centre of the district.

The Tywi anticline exerts a strong structural control over relief and the main ridges, following beds of sandstone and grit, run south-west to north-east along the strike. More than 80% of the land is below 180 m, the highest ground rising to 408 m at Trichrug. The landforms, away from the Tywi valley, range from gently undulating hills to moderate and steep hills and ridges.

Over Lower Palaeozoic rocks soil textures are mainly fine loamy and fine silty. Cambic stagnogley soils of the Cegin (27) series are widespread on slopes of less than 5° with minor occurrences of stagnohumic gley soils (Ynys series). On steeper slopes they pass into typical brown earths (Denbigh series) and typical brown podzolic soils (Manod series) with small areas of rankers. It is often difficult to separate the Denbigh and Manod series except under woodland and unimproved pasture. Stagnogleyic brown earths (Sannan (27) series) and stagnogleyic brown podzolic soils commonly occur between the drier and wetter land. Raw oligo-amorphous peat soils are found in some depressions and valley bottoms, and above 250 m there are stagnopodzols and rankers.

Over the Old Red Sandstone, fine loamy and fine silty textures also predominate. Typical brown earths of the Milford (30) series appear to be the most widespread with typical brown podzolic soils locally; indurated horizons are common. Cambic stagnogley

https://doi.org/10.23637/ERADOC-1-131

soils (Fforest (30) series) and cambic stagnohumic gley soils (Wenallt (30) series) are found in wetter land. Above 250 m there are stagnopodzols and rankers.

There is a complex pattern of soils on the Tywi floodplain and occasional subsurface bands of gravel and sand make mapping difficult. The alluvium is mainly from Lower Palaeozoic rocks, except near the tributary rivers Sawdde and Cennen where there is reddish brown alluvium from Old Red Sandstone rocks. The alluvium has a wide textural range, but coarse and fine loamy and fine silty soils predominate. Brown alluvial soils are most common with alluvial gley soils in some backlands and in old river channels. (Wright)

Pembrokeshire. A 1 : 25 000 map is being prepared from air photographs and now covers 1025 km^2. An edited hand-coloured reduction at 1 : 50 000 has been started. (Rudeforth and Bradley)

Basic research

Soil water regimes

Moisture release characteristics were determined for 581 tinned samples from 66 profiles. (Hall and Ward)

A fall-cone penetrometer was used to measure resistance to overburden pressure of reconstituted topsoils with varying bulk density. Resistance is measured with a pocket penetrometer on samples in tins at different suctions but it is hoped to replace this method by using a cone penetrometer. (Hall)

Water levels were recorded at 33 places in Essex during the winter of 1973–74, six on Sheet TM 12 (Weeley). Using W_{40} and W_{70} values to compute wetness classes (19), stagnogleyic argillic brown earths at Writtle were either class II or I, often having been a class drier the winter before due to very low rainfall. Ragdale and Windsor soils near Brentwood were in wetness class III during both winters, but Oak and Essendon series tended to be a class wetter during the wetter winter of 1973–74. Drained Wallasea series on Southminster marshes has been persistently dry to 1·5 m during the winters of 1972–73 and 1973–74, and so placed in wetness class I; this contrasts markedly with its classification as a non-calcareous pelo-alluvial gley soil, and with its grading as capability class 3sw.

Dipwell measurements from one season on Sheet TM 12 placed the Windsor series in wetness class IV, but, by contrast, revealed four gley soils in Cover Loam to be in class I, due to a dry season and effective underdrainage. (Sturdy and Allen)

Since March, 1974 moisture content at two fen sites (Downholland and Romney series) and two chalk sites (Andover series) in Lincolnshire has been measured to a depth of 150 cm and 90 cm respectively with a neutron probe. With climatic data, the results will assess the overall water balance in these soils. (George, Hall and Heaven)

Piezometers in stagnogley soils in mid-Devon show sufficient hydrostatic pressure to raise water above the surface at some part of the winter in eight out of 20 sites. At four sites this high head was maintained through the summer. At most other sites hydrostatic pressure was related to the rainfall-evapotranspiration cycle. (Harrod)

Dipwell water level readings are being recorded for a second year at sites in loamy stagnogley soils and stagnopodzols in west Devon (Tavistock) and north Devon (Brayford). (Hogan)

Water-table levels have been recorded in dipwells in Clifton, Crewe, Hallsworth, Salop and Talog soils of the Holywell district (Sheet SJ 17) and is an unnamed stagnogleyic brown podzolic soil with fragipan. (Thompson)

Levels are also being recorded at six places in the Llandeilo district (Sheet SN 62) in soils of the Cegin, Sannan, Conway, Clwyd and Teme series. (Wright)

https://doi.org/10.23637/ERADOC-1-131

Technical Monograph No. 7, *Soils and Field Drainage* was completed, including a 1 : 2 000 000 soil water regime type map, on which six classes have been distinguished. (D. B. Trafford and R. A. Walpole, ADAS Drainage Arm, Thomasson and Mackney)

Soil temperature

Grant miniature recorders measured soil temperatures in the A and Bg horizons of the fine loamy Clifton series (argillic stagnogley soil) and in the A and Bs(g) horizon of the sandy Udford series (stagnogley-podzol) near Penrith, to compare the temperature regimes and help to characterise map units. Both sites were kept clear of plants. Probes were inserted at 10, 20 and 30 cm depth at both sites and also at 45, 65 and 75 cm in the Udford series. During the critical spring (April–May) germination period the poorly conducting sandy Udford soil was warmer, by up to 4°C, than the loamy Clifton soil and had a mean daily temperature of 10°C at 10 cm compared with 9°C. It also had a greater daily temperature range throughout May. At both sites maximum temperatures at all depths were reached at midnight, reflecting the lag between air and soil temperatures.

Measurement of frost-heave with a continuous pen-arm recorder was continued at the Clifton site on bare soil. Only 13 heaves, all less than 5 mm occurred in the 1973–74 winter, the lowest number since recordings began in Yorkshire in winter 1962–63 on a similar soil. Normally there are at least 20 frost-heave cycles each winter and the low number and small intensity in 1973–74 did not break down clods on ploughed land sufficiently to produce a good tilth. (Matthews)

Physical measurements

Shrinkage potential was measured on clod samples from nine clayey profiles (Long Load, Hornton, Ragdale, Hanslope, Wyre, Fladbury and unnamed series) on Sheet SP 66 and from seven clayey profiles from other regions (Foggathorpe, Dale, Worcester, Hanslope, Ragdale, Denchworth series). Atterberg limits, moisture release characteristics, particle-size distribution (including $<0{\cdot}2\ \mu m$ clay), bulk density and clay mineralogy were also determined for most profiles. The aim is to quantify the shrinkage potential of major clayey soil series, assess its importance in soil structural recovery, and to study criteria for soil classification. (Hall and Reeve)

Random sampling of Waveney series on Sheet TM 49 (Beccles North) show significantly greater soil extract conductivity values in summer than in winter at depths of 50–60 cm and that the series is saline in summer. (Corbett and Stevens—student)

Minor element studies

Pembrokeshire. Significant relationships have been found between totals of 12 minor elements and their distribution in land units in the north-west of the former county. Topsoils in unit A1 (31), which contains generally well drained lowland soils on Lower Palaeozoic mudstones, shales and sandstones, have more Mn, As, Pb, Zn and probably more Cu than subsoils whereas Ni, Sr, Zr and probably Rb and Y are concentrated in the subsoils. There is more Mn and Cu in well drained (A1) than poorly drained (A4) topsoils but less Pb. Well drained lowland topsoils (A1) have more ferric oxide, Ni, Cu, Zn, Mn and probably Zr than well drained upland or heath topsoils (A7). Br and Pb show the opposite relationship. Arsenic is more abundant in topsoils from Carboniferous shales and sandstones (B1) than those from the Lower Palaeozoic sediments (A1). Rb and ferric oxide are more abundant in the A1 topsoils than in those of the acid extrusive (R1) and the acid and intermediate intrusive rocks (G1). Yttrium and probably As compare in the same way between the A1 and R1 units. Zr and Pb are apparently more

https://doi.org/10.23637/ERADOC-1-131

abundant in the G1 and R1 units respectively than in the A1 unit. (Rudeforth, C. Williams (Pedology Department) and Bradley)

Cardiganshire. Fifteen topsoil samples were analysed for Pb, Zn, Cu and Cd as a preliminary to a larger study of Pb, Zn, Cu, Cd, Mo, B, Ni and Co contents in the Llechryd district (Sheet SN 24). (Bradley)

Clywd. Some 2–300 samples are being taken on an incomplete 0·25 km grid of the Holywell district (Sheet SJ 17) for determination of Cu, Co, Mo and Zn to relate trace element problems to particular soil series on Carboniferous Limestone. (Thompson)

Cornwall. Contents of available arsenic and other metals in soils, grass and broccoli have been measured at several places in west Cornwall to assess pollution from old mines. Arsenic occurs near many old spoil heaps whilst moderate amounts occur further away. Pot trials are under way to determine the effect of such pollution on crop growth. (Staines, with ADAS staff)

Organic soils

Further samples of hill and raised bog peat from near Aberystwyth and flush peat from near Llanelli were described in the field and sampled to help develop criteria for classifying peats. (Burton)

Upper Greensand soils

The Upper Greensand formation includes glauconitic and other facies of unusual lithology, giving soils that differ significantly in morphology and composition from each other and from those derived under similar conditions from other rocks. A study was initiated to characterise the main soil-forming facies in southern England and to follow mineralogical changes in representative soil profiles developed on them. Seven profiles representing well drained and poorly drained soils on glauconitic marl (Ardington and unnamed series), glauconitic sand (Urchfont, Pewsey and Puckshipton series) and malmstone (Harwell series), were described and sampled in Berkshire and Wiltshire. Particle-size distribution was determined on all samples and the mineralogy of the $> 63\ \mu m$ fractions is now being studied. (Loveland, Bullock, Findlay and M. G. Jarvis)

Cover Loam

Thickness of Cover Loam in relation to relief was further investigated at Hole Farm, Hempstead, near Holt, Norfolk. Transects measuring the depth of Cover Loam were carefully sited after examination of a closely contoured map and air photographs showing complex crop patterns. (Corbett and Eldridge)

Stagnogley soils

A study of the genesis of stagnogley soils in tills was begun. Profiles from the Clifton, Crewe and Salop series in tills from Triassic rocks, the Dunkeswick series in till from Carboniferous rocks, the Deighton series in a brown till of mixed origin, and the Ragdale series in decalcified Chalky Boulder Clay, were described in detail. Samples were taken for thin section, bulk density and porosity measurements, and for chemical and mineralogical analyses. (C. P. Murphy and Bullock)

Dry valley soils

The characteristics and origin of dry valley soils and parent materials around Marlow

https://doi.org/10.23637/ERADOC-1-131

were studied. The Smalley digger provided deep sections revealing a succession of four parent materials, from the surface downwards:

(i) Calcareous or non-calcareous loamy or silty hillwash (colluvium) with flints and other stones; buried A horizons are common.
(ii) Loose sands and gravels (stream deposits); occasionally gravels with a sparse loamy or silty matrix.
(iii) Flinty clays or clay loams (probably solifluxion deposits); this layer is reddish brown, strong brown or brown and meets criteria for Bt horizons.
(iv) Chalky Head.

Charcoal from one buried A horizon was collected for ^{14}C dating. (Mackney)

Methodological research

Particle-size and chemical analyses

Horizon samples from 413 profiles were analysed in the Headquarters laboratory. Most were collected in current survey areas and others were from Rothamsted departments. Determinations were made by methods given in *Soil Survey Technical Monograph* No. 6. (Bascomb and Thanigasalam)

Automation of particle-size analysis is being developed using a commercial pressure transducer to record sedimentation rates. (Bascomb)

Analysis of samples from Sheet TF 62 (King's Lynn (North)) shows that whereas Chalky Boulder Clay has less than 15% of carbonate of silt size and less than 10% of clay size, loamy drift has 10–35% carbonate of silt size and more than 10% of clay size. (Corbett, Bascomb and Seale—student)

Random sampling on Sheet TM 28 (Harleston) showed that Shotford and Mendham series are potential acid sulphate soils. (Corbett)

Organic soils

Laboratory methods for characterising organic (peat) soils, based on pyrophosphate solubility and amounts of 'fibre' retained by a 212 μm sieve after mechanical pretreatment, were further developed. Measurements were made on a wide range of samples from various parts of England and Wales, and the results compared with field estimates of fibre content and degree of humification. (Bascomb)

Mineralogical analysis

The mineralogy of the < 2 μm fractions of 166 samples from Northern, East Midland, South-eastern and South-western Regions was determined by X-ray diffraction supported by measurements of cation exchange capacity and non-exchangeable potassium.

Most samples were from current mapping areas and were analysed to help characterise main soil series. Samples were also taken from previously mapped areas to study the overall clay mineralogy of the most widespread parent materials. (Bullock, Loveland and Mrs. P. Murphy)

A reconnaissance investigation of 35 Cheshire and Cumbria soil samples was completed. The augite content of the samples differs strongly between the two counties. Other marked differences are due to the geological complexity of the Lake District, which was the source of much of the drift in both counties. Results are being interpreted. Analysis of 50 soil samples, from the Penrith district is now in progress. (Kilgour)

https://doi.org/10.23637/ERADOC-1-131

Soil microstructure

Six hundred and fifty thin sections of soil samples were made of which 250 were described in detail. The remainder were described by field staff or added to the reference collection.

The samples were mainly from current mapping areas in Clwyd, Cumbria, Staffordshire, Suffolk, Worcestershire and Yorkshire, and the data were primarily for classification, particularly in distinguishing argillic, and spodic horizons.

Progress was made in the use of the image analysis computer (Quantimet) to measure pore space in thin sections. Parameters such as area, perimeter, and vertical and horizontal intercepts, were used to characterise void patterns. Size distributions were made according to area, longest chord or perimeter. (Bullock, C. P. Murphy and Tipping)

Selective dissolution of iron in thin sections

A technique to study optically the effects of three different extraction procedures for removing iron from soils was developed. The treatments were: (1) removal of total free iron using dithionite-citrate-bicarbonate (32); (2) removal of amorphous material by 0·2 M ammonium oxalate in the dark at pH 3 (33); and (3) removal of organic-bound iron by 0·1 M K pyrophosphate (34).

Three slices were taken from a resin-impregnated sample of a stagnogley soil. Half of each slice was immersed in one of the three extracting solutions for 24 h, at room temperature to avoid softening of the resin. The slices were then washed clean of the extracting solution, allowed to dry, and 30 μm thin sections prepared. Differences between treated and untreated parts of each section were described using a petrological microscope. (Bullock, Loveland and C. P. Murphy)

National soil map

The 1 : 1 000 000 soil map of England and Wales is in line proof. (Avery, Findlay and Mackney)

Soil classification

The application of set theory and acronymic codes to soil classification was studied. The codes could be alternatives to the geographic names now used to label soil profiles and map units. Profiles could be systematically named according to the main classes of a modern soil classification, even by non-specialists. (Green)

Data management

A program was developed to screen files of coded soil data and translate relevant records into text. A new text conversion table was prepared to handle the codes and format given in the new Field Handbook (19). Two versions of the program are available. One is for private study in which the user can specify criteria relevant to his search, the properties that he needs translated and their layout in tabular form. It can be run in the RIRO (interactive) stream on the 4–70 machine. The other translates complete records for archiving and publication, and gives running text with punctuation. This version is somewhat larger and can be run only in a batch stream. Some 900 profile descriptions, mainly from Oxfordshire and Berkshire, were translated. (Webster, with Lessells, Statistics Department)

Automated cartography

Research in collaboration with the NERC Experimental Cartography Unit on automatic drafting of soil maps from soil survey field sheets was successfully completed with the

https://doi.org/10.23637/ERADOC-1-131

production of two maps of soil in Oxfordshire. These are of soil series at 1 : 25 000 of the Faringdon district and at 1 : 63 360 showing predicted underdrainage treatment in the Abingdon and Wantage districts.

Data collected at 6000 100 m × 100 m grid intersections in the Ivybridge district (Sheet SX 65) were displayed as maps using the Edinburgh Regional Computing Centre's IBM 370 machine and specially adapted line printer. Attributes mapped included gradient and aspect, soil colour, texture, depth and inferred drainage. The technical problems of presenting soil data in this way are now largely solved. (Webster)

Remote sensing

Norfolk silt fenland. Soils of 280 km² of north-west Norfolk were studied with 1 : 10 560 air photographs. Many photo units were differentiated mainly by soil tonal characters and the probable date of enclosure from the sea.

Information on soils and deposition features are being obtained from traverses which so far total 7·3 km. About 2·3 km of clean ditch sections have also been examined in Clenchwarton.

The six most seaward enclosures have calcareous fine loamy or clayey upper layers about 40 cm thick over sandy or coarse loamy layers. The soils are mainly gleyic brown calcareous alluvial soils with calcareous alluvial gley soils and pelo-calcareous alluvial gley soils. The inland and earlier enclosures have deep clayey deposits of variable carbonate content over sandy or coarse loamy deposits at 2–3 m. The main soils are pelo-calcareous alluvial gley soils and calcareous alluvial gley soils with gleyic brown calcareous alluvial soils. (Evans)

Soil and crop patterns. Tonal contrasts on air photographs are often greater than on oblique photographs taken at ground level, probably because they are only exposed in good or excellent visibility when the atmospheric aerosol content which reflects light and reduces tonal contrast, is low. Ground photographs are taken in all conditions, however.

Soil patterns are best recorded when the ground is dry or just after ploughing before weathering reduces the tonal contrast, although stony soils show best when rain has washed the surface.

Crop patterns can reflect soil variation in both spring and summer. Stripe patterns in shallow chalk soils were seen in young crops in Berkshire when adjacent bare fields showed no pattern. This could be due to variable availability of nitrogen, possibly linked with soil pH; more nitrogen being available in the deeper less calcareous than in the shallower more calcareous soils.

Crop patterns are much more frequent in summer probably due to the differential availability of soil moisture and nutrients. Where effective rooting depth is restricted to 30–80 cm by a pan, by stones or by a sandy layer without nutrients or available water, deeper soils provide better growth which contrasts with the poorer growth on the shallow soils. Tone patterns on the shallowest soils appear when the moisture deficit is about 50 mm which is often about the moisture capacity of 30 cm of topsoil. In East Anglia such deficits occur every year and soils with an effective rooting depth of 30–40 cm will show crop patterns each year. Large deficits occur rarely and only about once in 10 years is the summer soil moisture deficit great enough to dry out and produce crop patterns in soils where the effective rooting depth is 80 cm. (Evans and Jones)

Crop patterns were widespread during the dry spring and early summer of 1974, particularly in Essex and associated with differences in plant density. This was similar in wheat and barley on shallow soils on gravel but 37% greater in barley and 22% greater in wheat on deeper soils. (Evans)

https://doi.org/10.23637/ERADOC-1-131

Pilot studies of moorland and arable land on the North York Moors have been completed and the results used to aid wider reconnaissance survey. The area is mostly free of glacial drift and good correlations are found between patterns of soil and solid geology, well defined landforms being clearly seen on air photos. Soils over Jurassic limestone were found to vary widely in depth, stoniness, particle-size class, reaction and horizonation. Although these differences could not usually be predicted, brown rendzinas could often be separated from deeper soils under grass. Difficulties of interpretation and even of exact ground location arose where there are extensive areas of undulating heather moorland; these are regularly burnt in irregular stripes, so that ground detail no longer corresponds with the photo-image. Soil patterns are relatively simple here, however, and can often be related to minor breaks and inflections of slope. (Carroll and Bendelow)

Work on the analysis of false colour and multispectral photography of parts of upland Yorkshire and Cumbria has continued, including the use of additive viewing devices and densitometers. Few positive results can be reported and constraints are more complex and varied than hitherto reported. It seems unlikely at the present that these techniques will be of value as operational methods for soil survey. (Carroll, with Miss V. Brack, Remote Sensing Unit, University of Aston)

Multispectral photography has also been used to aid mapping in the former county of Pembrokeshire. Six areas, each typical of a known pattern, have been chosen for more detailed evaluation and comparison of the different films used. A scheme of 80-column card recording has been devised to assist data handling. (Carroll and Rudeforth)

Data from an airborne radio-frequency sensing system operating in Lancashire were made available through the courtesy of the Water Resources Board (now Water Resources Planning Unit). Little is known about the properties of soil in this region of the electromagnetic spectrum, and the frequencies used were probably less than the ideal. Some anomalies recorded, however, appear to coincide with known changes in soil parent material and warrant further investigation. (Carroll and Bendelow)

Soil variability

Seven per cent of Avon county consists of soils in estuarine alluvium, and field-work suggests they might vary more than those in Somerset. Eighty-four sites were examined by Dutch auger to a depth of 100 cm in Somerset, Avon and Gwent. Features recorded included texture, colour, carbonate content and type and moisture state. Most soils are classed as pelo-alluvial gley soils (Wentlloog series). Near rivers and streams crossing the alluvium, over-bank sediments up to 1 m thick reflect geology of the river catchment with respect to colour and particle size and soils are classed as gleyic brown alluvial soils or gleyic brown calcareous alluvial soils. The location of the better drained soils could be important to future agricultural growth in the region. (Colborne and Walker—student)

Time series analysis continued, to measure spatial variation in soil and to guide future sampling. Correlograms computed for several morphological properties recorded at 10 m intervals on a transect in north Oxfordshire show two main sources of variation. One is thought to be due to outcrop lithology, with an average spacing of 115 m, and the other to changes within 10 m. (Webster)

Applications research

Land capability

Exposure could be an important limiting factor on the distribution of some horticultural crops in western coastal locations in Cornwall (Sheet SW 53). To assess the impact of

https://doi.org/10.23637/ERADOC-1-131

windiness on crops and the relation of exposure to landform, 'tatter' flags and anemometers were established in several places. The results will be used to classify land on the basis of exposure. (Staines)

Sugar beet and soil

Since 1957 the soil at all sites of fertiliser experiments with sugar beet carried out by Broom's Barn Experimental Station have been recorded. The information was analysed to discover which soil factors affect yield and response to fertiliser, and the extent to which a classification of soil helps to predict either yield or response. Preliminary results show that silt soils and soils of moderate drainage yield most. There are appreciable differences between the main types of soil but not between different series. (Webster and Hodge, with Draycott and Durrant, Broom's Barn)

Cereals and soil

Barley yields on Sheet TM 12 in 1973, estimated from 1 ha plots within map units, gave the same average yield (4·25 t/ha) for soils in Cover Loam, and coarser textured thin loamy and sandy soils. Average yield of wheat in the same year was apparently 0·3 t/ha larger on the sandy map units. Cereal yields on sandy soils were estimated more reliably in 1974 by locating smaller plots in strongly patterned ground, clearly evident in the crop at harvest time, and accurately delineated. The 'good' and 'poor' elements of the pattern were harvested separately and the soil examined at each site. Crop vigour, in loamy over sandy soils associated with narrow bands bounding polygons, was strikingly greater and yields were 1·9 to 3·5 t/ha more than given by sandy soils in the polygons—results which probably reflect differences in moisture reserves in the two soils. The smallest average yield from the poor growth areas was 2·75 t/ha, and the least individual yield was 2·2 t/ha. (Sturdy and Allen)

An ADAS/NIAB winter barley variety trial on Sheet TM 12 had one block of low Nitrogen plots on deep fine loamy cambic gley soils (clay loam over sandy clay loam), and the other block had deep coarse loamy gleyic brown earths (medium sandy loam). High Nitrogen blocks were similarly divided by texture, but more variable with respect to profile class. Moisture reserves were not likely to be severely limiting in any plots.

Comparison of yields from duplicate plots within the separate blocks showed an effect due to soil. Averaged over all ten varieties in the trial, barley on low N, coarse loamy, plots yielded 5·9 t/ha, which was 0·5 t/ha greater than low N, fine loamy plots. The overall average yield on high N plots was slightly lower than low N plots, and the difference between coarse and fine loamy blocks was less (0·3 t/ha).

Lodging was greater on the fine loamy plots and could account for lower yields. (Sturdy)

Three year average yields for wheat and barley measured on different series within fields on the Cromer Ridge show larger yields on the deeper more silty soils; yields are in the order Sheringham > Hall > Freckenham series. The differences are accentuated in dryer years. Barley yields over the same three years on Aldeby, Beccles and Ragdale map units at Harleston are larger than on the Cromer Ridge, but there are no obvious differences in yields between map units. Wheat yields are similar to barley in this area although greater than barley on the Cromer Ridge. (Eldridge)

Dot-distribution maps of potential crop land, made by computer were developed further. Pembrokeshire shows distinctive differing clusters of the best potential barley land compared with early potato land. (Rudeforth)

https://doi.org/10.23637/ERADOC-1-131

Special surveys

Part of the Pwllpeiran Experimental Husbandry Farm was surveyed at the request of the Welsh Plant Breeding Station and the Ministry of Agriculture, Fisheries and Food in conjunction with a mountain grassland improvement scheme. Potentially improvable soils and their site properties are being studied to enable them to be identified from air photographs throughout Wales without spending excessive periods ground checking. (Rudeforth and Bradley)

The Ddol Uchaf reserve of the North Wales Naturalist Trust is being surveyed to aid management. (Thompson)

A detailed survey was made of 10 ha at Luddington Experimental Horticulture Station, Luddington. (Whitfield)

The Yorkshire Naturalist Trust's Tow Hill nature reserve near Hawes was mapped, the soils found being typical of a Pennine valley. The Trust hopes to open a number of permanent profile pits with display notices to illustrate the soils. (Bendelow, Allison and Guardiola Saenz)

Soil and land capability maps of 1200 ha of farmland around Gringley on the Hill, Notts, at 1 : 10 560 scale were prepared in support of an ADAS field demonstration. (George, Heaven, Reeve, Robson and Thomasson)

The 1·5 km^2 Castor Hanglands Nature Reserve, Cambridgeshire were surveyed and a 1 : 10 560 map prepared. (Burton)

Three km^2 of farmland on Chalky Boulder Clay at Widdington, Essex were mapped at 1 : 10 560 as a contribution to a Farming and Wildlife Advisory Group Project co-ordinated by the Nature Conservancy Council. (Allen and Sturdy)

Parndon Wood Nature Reserve was mapped (22 ha) to aid management by the Harlow District Council. (Allen)

Eight ha of Essex Naturalist Trust land at Shadwell Wood, Saffron Walden, were surveyed. (Allen)

The Warbury Nature Reserve, Bix Bottom, Henley was surveyed for a monograph on the ecology of the Reserve. (M. G. Jarvis and Hazelden)

Other work

Two sites of Special Scientific Interest on southern Dartmoor, High House Waste and Dendles Wood were surveyed for the Nature Conservancy. Granite is the dominant parent material and soil patterns are similar to those near Ivybridge although a small area of typical podzol was identified. (Harrod and Hogan)

Following a trial by ADAS of the effect of subsoiling granite soils, a map of suitable sites for subsoiling the Bodmin Moor is in preparation. (Staines)

Advice and assistance was given to:

1. Institute of Geological Sciences.
2. ADAS Drainage and Water Supply Officers in Cheshire, Devon, Essex, Staffordshire and Wales.
3. Archaeologists in Bedfordshire, Devon, Essex, Oxfordshire and Staffordshire.
4. ICI Jealotts Hill.
5. Nature Conservancy, Cornbury Park, nr. Charlbury.
6. Queen Mary College, London.
7. Writtle Agricultural College.
8. Sible Hedingham WEA.
9. Soil Science Department, Aberdeen University.

https://doi.org/10.23637/ERADOC-1-131

The Institute of Geological Sciences has accepted the soil survey on 3rd Edition O.S. Sheet 173 (Ely) as the basis for a 1 : 50 000 scale provisional geological map of this area. (Seale with Mr. R. W. Gallois, IGS)

Six *Records* and three *Technical Monographs* have been published; 12 *Records*, two *Memoirs*, two *Special Surveys* and a *Technical Monograph* are being processed.

Sixteen maps have appeared including a generalised soil map of England and Wales at 1 : 2 000 000, two maps at 1 : 63 360, nine at 1 : 25 000 and four at 1 : 10 560. Twenty-one maps are in process of production.

Staff

M. G. Jarvis visited the USA and Canada for 10 weeks including six weeks at Cornell University, to study applications, interpretations and cost-effectiveness of soil survey.

Hartnup spent two weeks in the Netherlands studying application of soil survey to town and country planning, supported by a grant from the Royal Society.

Bullock visited the University of Stuttgart-Hohenheim, West Germany from 17–23 March to chair an International Working Group Meeting on the Micromorphology of Soil Organic Matter. The visit was sponsored by the British Council and the Agricultural Research Council.

Hodge attended the 10th International Soil Science Congress in Moscow and visited Georgia and Azerbaijan.

The International Working Group on Soil Micromorphology held a meeting at Rothamsted from 29 April–4 May. Participants were from Belgium, Canada, France, Poland, Scotland, The Netherlands and the USA.

Dr. J. L. Guardiola Saenz (Zaidín Experimental Station, Granada, Spain) made the first of two three-month working visits to Harrogate under the European Science Exchange Programme.

REFERENCES CITED IN REPORT

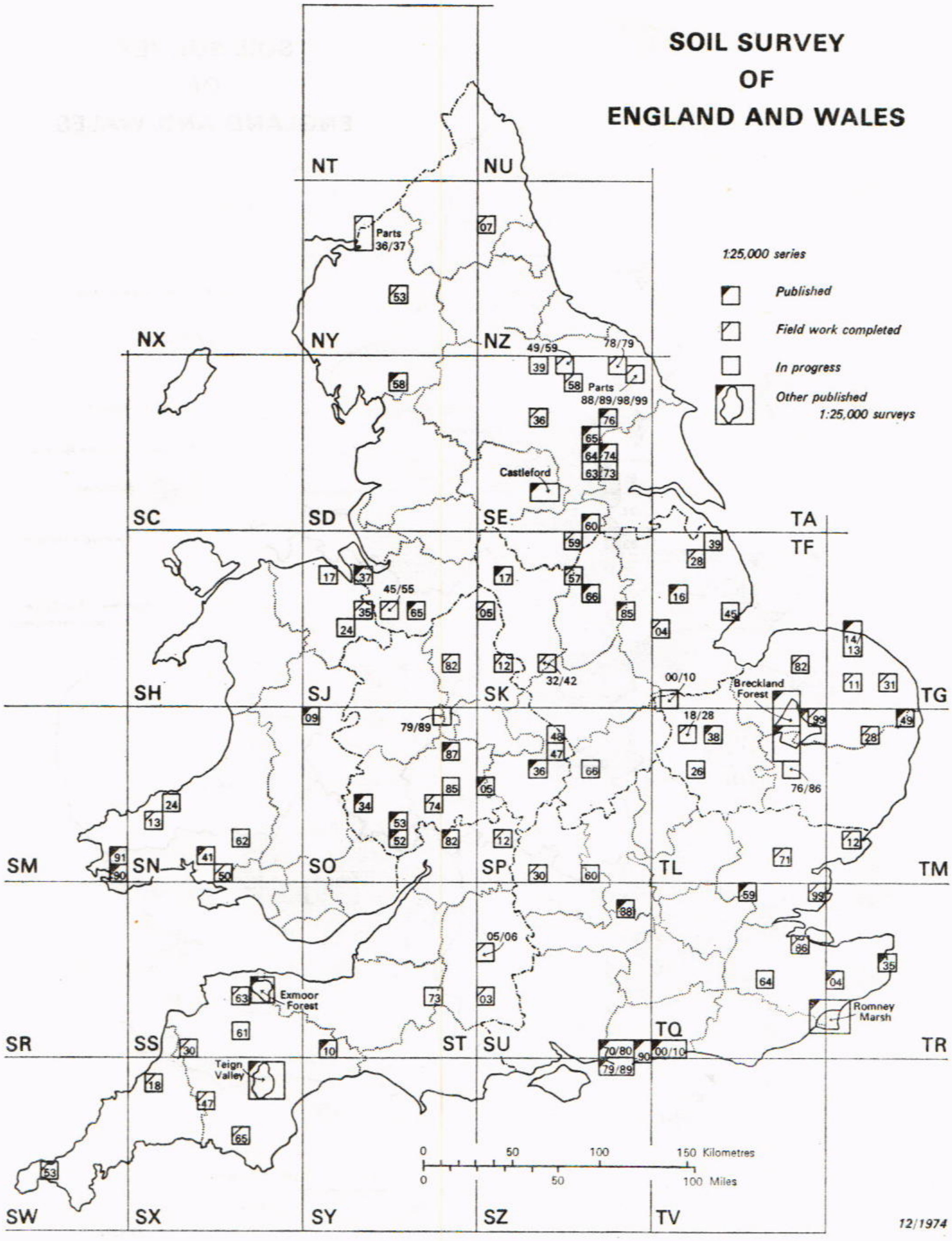
1. ANDERSON, G. D. (1958) A preliminary investigation of the soils of the North East Yorkshire Moors. Thesis, University of Newcastle upon Tyne.
2. FURNESS, R. R. & KING, S. J. (1972) Soils in Westmorland I: Sheet SD 58 (Sedgwick). *Soil Survey Record* No. 10.
3. FINDLAY, D. C. (1965) The soils of the Mendip district of Somerset. *Memoir of the Soil Survey of Great Britain.*
4. BULLOCK, P. (1974) Soils in Yorkshire III: Sheets SE 64/74 (Escrick/Barmby Moor). *Soil Survey Record* No. 16.
5. CROMPTON, E. (1966) Soils of the Preston district of Lancashire. *Memoir of the Soil Survey of Great Britain.*
6. CORBETT, W. M. (1973) Breckland Forest Soils. *Soil Survey Special Survey* No. 7.
7. CORBETT, W. M. & TATLER, W. (1970) Soils in Norfolk: Sheet TM 49 (Beccles North). *Soil Survey Record* No. 1.
8. THOMASSON, A. J. (1971) Soils of the Melton Mowbray district. *Memoir of the Soil Survey of Great Britain.*
9. CORBETT, W. M. & TATLER, W. (1974) Soils in Norfolk II: Sheets TG 13/14 (Barningham/Sheringham). *Soil Survey Record* No. 21.
10. BRIDGES, E. M. (1966) The soils and land use of the district north of Derby. *Memoir of the Soil Survey of Great Britain.*
11. REEVE, M. J. (1975) Soils in Derbyshire II: Sheet SK 32E/42W (Melbourne). *Soil Survey Record* No. 27.
12. HOLLIS, J. M. & HODGSON, J. M. (1974) Soils in Worcestershire I: Sheet SO 87 (Kidderminster). *Soil Survey Record* No. 18.
13. ROBSON, J. D., GEORGE, H. & HEAVEN, F. W. (1974) Soils in Lincolnshire I: Sheet TF 16 (Woodhall Spa). *Soil Survey Record* No. 22.
14. GREEN, R. D. & FORDHAM, S. J. (1973) Soils in Kent I: Sheet TR 04 (Ashford). *Soil Survey Record* No. 14.
15. ROBSON, J. D. & GEORGE, H. (1971) Soils in Nottinghamshire I: Sheet SK 66 (Ollerton). *Soil Survey Record* No. 8.
16. WHITFIELD, W. A. D. (1974) Soils in Warwickshire I: Sheet SP 36 (Leamington Spa). *Soil Survey Record* No. 19.

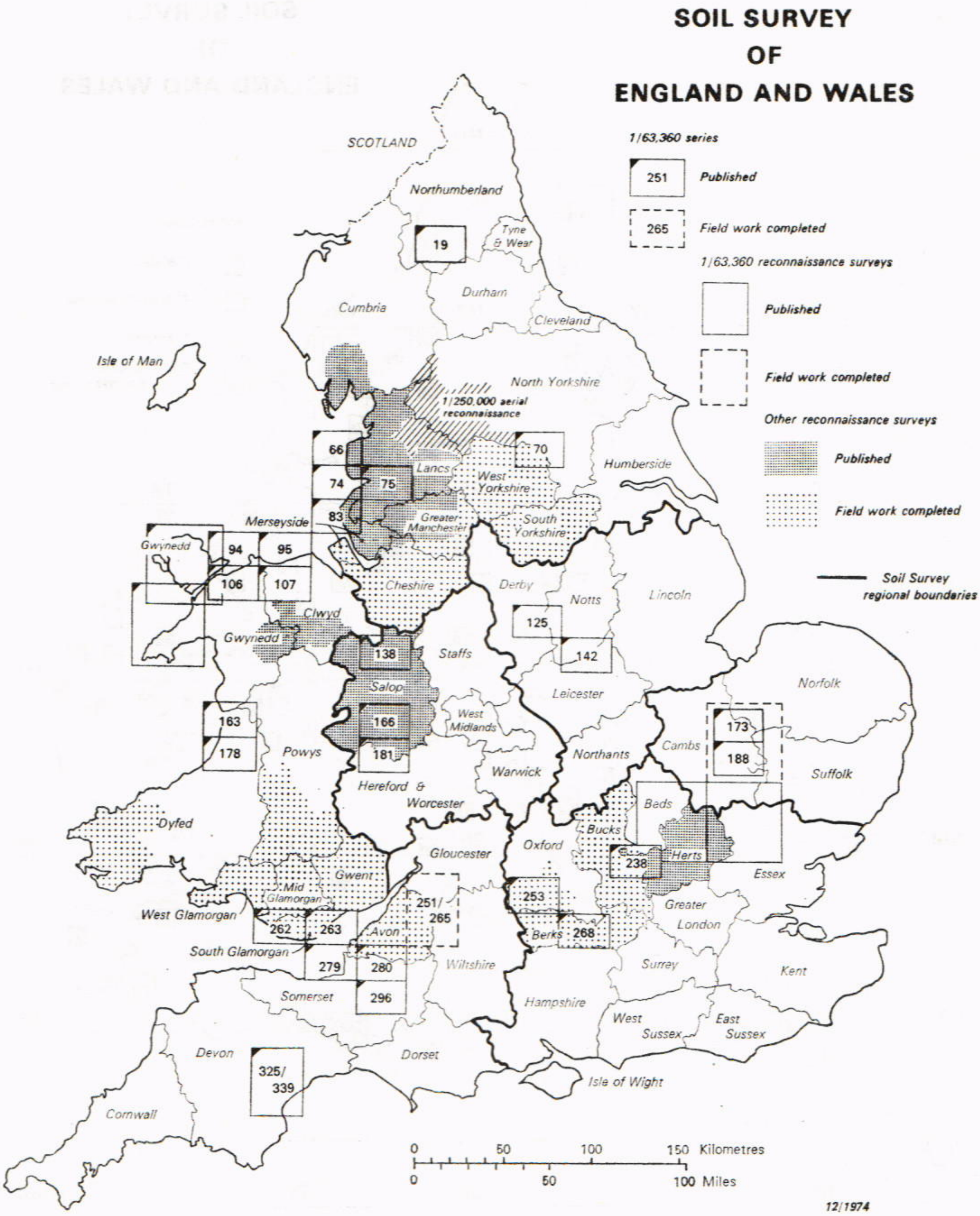
https://doi.org/10.23637/ERADOC-1-131

17. Osmond, D. A., Swarbrick, T., Thompson, C. R. & Wallace, T. (1949) A survey of the soils and fruit in the Vale of Evesham, 1926–34. *Bulletin of the Ministry of Agriculture and Fisheries* No. 116.
18. Cope, D. W. (1973) Soils in Gloucestershire I: Sheet SO 82 (Norton). *Soil Survey Record* No. 13.
19. Hodgson, J. M. (Ed.) (1974) Soil Survey Field Handbook. *Soil Survey Technical Monograph* No. 5.
20. Mackney, D. & Burnham, C. P. (1964) The soils of the West Midlands. *Bulletin of the Soil Survey of Great Britain* No. 2.
21. Sturdy, R. G. (1971) Soils in Essex I: Sheet TQ 59 (Harold Hill). *Soil Survey Record* No. 7.
22. *Rothamsted Experimental Station. Report for 1972*, Part 1, 305.
23. Bagenal, N. B. & Furneaux (1949) Fruit growing areas on the Hastings Beds in Kent. *Bulletin of the Ministry of Agriculture and Fisheries* No. 141.
24. Clayden, B. (1971) Soils of the Exeter district. *Memoir of the Soil Survey of Great Britain.*
25. Jarvis, M. G. (1973) Soils of the Wantage and Abingdon district. *Memoir of the Soil Survey of Great Britain.*
26. Avery, B. W. (1955) The soils of the Glastonbury district of Somerset. *Memoir of the Soil Survey of Great Britain.*
27. Ball, D. F. (1960) The soils and land use of the district around Rhyl and Denbigh. *Memoir of the Soil Survey of Great Britain.*
28. Lea, J. W. (1975) Soils in Powys I: Sheet SO 09 (Caersws). *Soil Survey Record*, No. 28.
29. Roberts, E. (1958) The county of Anglesey—soils and agriculture, *Memoir of the Soil Survey of Great Britain.*
30. Clayden, B. & Evans, G. D. (1974) Soils in Dyfed I: Sheet SN 41 (Llangendeirne). *Soil Survey Record* No. 20.
31. Rudeforth, C. C. & Bradley, R. I. (1972) Soils, land classification and land use in west and central Pembrokeshire. *Soil Survey Special Survey* No. 6.
32. Mehra, O. P. & Jackson, M. L. (1960) Iron oxide removal from soils and clays by a dithionite-citrate system buffered with sodium bicarbonate. *Clays and clay minerals* 7, 317–27.
33. Schwertmann U. (1964) Differenzierung der Eisenoxide des Bodens durch Extraktion mit Ammoniumoxalat-lösung. *Zeitschrift für Pflanzenernährung, Düngung und Bodenkunde* **105**, 194–202.
34. Bascomb, C. L. (1968) Distribution of pyrophosphate-extractable iron and organic carbon in soils of various groups. *Journal of Soil Science* **19**, 251–68.

https://doi.org/10.23637/ERADOC-1-131

SOIL SURVEY OF ENGLAND AND WALES





https://doi.org/10.23637/ERADOC-1-131

SOIL SURVEY OF ENGLAND AND WALES

Publications

BOOKS

1 AVERY, B. W. & BASCOMB, C. L. (Eds.) (1974) *Soil Survey laboratory methods.* Harpenden: Rothamsted Experimental Station, vi, 83 pp.

2 BULLOCK, P. (1974) *Soils in Yorkshire III: Sheets SE 64/74 (Escrick/Barmby Moor).* Harpenden: Rothamsted Experimental Station, viii, 137 pp.

3 CARROLL, D. M. (1974) *The soils of the Maiduguri-Bama area. Zaria, Nigeria.* Institute for Agricultural Research, Ahmadu Bello University, x, 41 pp.

4 CARROLL, D. M. & (HOPE, W. A.) (1974) *The soils of the Biu-Mubi area. Zaria, Nigeria.* Institute for Agricultural Research, Ahmadu Bello University, xvii, 57 pp.

5 CLAYDEN, B. & EVANS, G. D. (1974) *Soils in Dyfed I: Sheet SN 41 (Llangendeirne).* Harpenden: Rothamsted Experimental Station, viii, 148 pp.

6 CORBETT, W. M. & TATLER, W. (1974) *Soils in Norfolk II: Sheets TG 13/14 (Barningham/Sheringham).* Harpenden: Rothamsted Experimental Station, vii, 135 pp.

7 HODGSON, J. M. (Ed.) (1974) *Soil Survey field handbook.* Harpenden: Rothamsted Experimental Station, vii, 99 pp.

8 HOLLIS, J. M. & HODGSON, J. M. (1974) *Soils in Worcestershire I: Sheet SO 87 (Kidderminster).* Harpenden: Rothamsted Experimental Station, vi, 94 pp.

9 MACKNEY, D. (Ed.) (1974) *Soil type and land capability.* Harpenden: Rothamsted Experimental Station, vi, 153 pp.

10 ROBSON, J. D., GEORGE, H. & HEAVEN, F. W. (1974) *Soils in Lincolnshire I: Sheet TF 16 (Woodhall Spa).* Harpenden: Rothamsted Experimental Station, ix, 173 pp.

11 WHITFIELD, W. A. D. (1974) *Soils in Warwickshire I: Sheet SP 36 (Leamington Spa).* Harpenden: Rothamsted Experimental Station, viii, 100 pp.

GENERAL PAPERS

12 AVERY, B. W. (1974) Introduction. In: Soil Survey laboratory methods. *Soil Survey Technical Monograph* No. 6. Harpenden: Rothamsted Experimental Station, pp. 1–4.

13 BASCOMB, C. L. (1974) Physical and chemical analyses of < 2 mm samples. In: Soil Survey laboratory methods. *Soil Survey Technical Monograph* No. 6. Harpenden: Rothamsted Experimental Station, pp. 14–41.

14 BASCOMB, C. L. & BULLOCK, P. (1974) Sample preparation and stone content. In: Soil Survey laboratory methods. *Soil Survey Technical Monograph* No. 6. Harpenden: Rothamsted Experimental Station, pp. 5–13.

15 BENDELOW, V. C. (1974) Sampling the Levisham soils. *Dalesman* **35**, 954–5.

16 BULLOCK, P. (1974) The micromorphology of soil organic matter—a synthesis of recent research. In: Soil micromorphology. Ed. G. K. Rutherford. *Transactions of the 4th International Congress of Soil Micromorphology*, pp. 49–66.

17 BULLOCK, P. (1974) The use of micromorphology in the new system of soil classification for England and Wales. In: Soil micromorphology. Ed. G. K. Rutherford. *Transaction of the 4th International Congress of Soil Micromorphology*, pp. 607–631.

18 BULLOCK, P. (1974) Micromorphology. In: Soil Survey laboratory methods. *Soil Survey Technical Monograph* No. 6. Harpenden: Rothamsted Experimental Station, pp. 70–81.

https://doi.org/10.23637/ERADOC-1-131

19 Bullock, P. & Loveland, P. J. (1974) Mineralogical analyses. In: Soil Survey laboratory methods. *Soil Survey Technical Monograph* No. 6. Harpenden: Rothamsted Experimental Station, pp. 57–69.

20 Carroll, D. M. (1973) Remote sensing techniques and their application to soil science, Part 2. The non-photographic sensors. *Soils and Fertilizers* **36**, 313–20.

21 Carroll, D. M. (1974) The soils associated with Carboniferous rocks in Lancashire and Yorkshire. *Proceedings of the North of England Soils Discussion Group* No. 10, pp. 29–38.

22 Carroll, D. M. (1974) Classification and correlation of soils from Carboniferous rocks in England and Wales. *Proceedings of the North of England Soils Discussion Group* No. 10, pp. 68–76.

23 Clayden, B. (1974) Soils in materials from Carboniferous mudstone and sandstone in Wales. *Proceedings of the North of England Soils Discussion Group* No. 10, pp 39–62.

24 Evans, R. (1974) Multispectral remote sensing for identifying soils. In: Remote sensing evaluation flights, 1971. Eds. L. F. Curtis & A. E. S. Mayer. *The Natural Environment Research Council Publications Series C* No. 12, pp. 14–17.

25 Evans, R. (1974) Multiband sensing for Soil Survey. In: Remote sensing evaluation flights, 1971. Eds. L. F. Curtis & A. E. S. Mayer. *The Natural Environment Research Council Publications Series C* No. 12, pp. 17–19.

26 Evans, R. & (Bell, T. S.) (1974) Infra-red linescan imagery for recording crop and ground temperatures. In: Remote sensing evaluation flights, 1971. Eds. L. F. Curtis & A. E. S. Mayer. *The Natural Environmental Research Council Publications Series C* No. 12, pp. 35–9.

27 Harrod, T. R. (1974) Soils in Carboniferous sandstones and shales and derived drifts in Devon. *Proceedings of the North of England Soils Discussion Group* No. 10, pp. 62–67.

28 Hartnup, R. & (Casson, J.) (1974) Land capability classification in local government planning. In: Land capability classification. *Ministry of Agriculture, Fisheries and Food. Technical Bulletin* No. 30, pp. 125–40.

29 Hollis, J. M. (1974) The landscape, soils and agriculture of the region around Onecote, north Staffordshire. *Proceedings of the North of England Soils Discussion Group* No. 10, pp. 1–23.

30 Mackney, D. (1974) Land use capability classification in the United Kingdom. In: Land capability classification. *Ministry of Agriculture, Fisheries and Food. Technical Bulletin* No. 30, pp. 4–11.

31 Mackney, D. (1974) Soil survey in agriculture. In: Soil type and land capability. *Soil Survey Technical Monograph* No. 4. Harpenden: Rothamsted Experimental Station, pp. 13–26.

32 Smith, P. & Thomasson, A. J. (1974) Density and water-release characteristics. In: Soil survey laboratory methods. *Soil Survey Technical Monograph* No. 6. Harpenden: Rothamsted Experimental Station, pp. 42–56.

33 Thomasson, A. J. (1974) Soil type, water conditions and drainage. In: Soil type and land capability. *Soil Survey Technical Monograph* No. 4. Harpenden: Rothamsted Experimental Station, pp. 43–51.

Paper in Rothamsted Report, Part 2

34 Catt, J. A., King, D. W. & Weir, A. H. (1975) The soils of Woburn Experimental Farm. 1. Great Hill, Road Piece and Butt Close. *Rothamsted Experimental Station. Report for 1974* Part 2, 5–28.

https://doi.org/10.23637/ERADOC-1-131

Research Papers

35 Bullock, P. (1974) Palaeosol features in soils of the North York Moors. *Proceedings of the North of England Soils Discussion Group* No. 9.

36 Bullock, P., (Milford, M. H. & Cline, M. G.) (1974) Degradation of argillic horizons in Udalf soils in New York State. *Soil Science Society of America Proceedings* **38**, 621–8.

37 Evans, R. (1974) The time factor in aerial photography for soil surveys in lowland England. In: *Environmental remote sensing: applications and achievements*. Eds. E. C. Barrett & L. F. Curtis, pp. 68–86.

38 Harrod, T. R., Catt, J. A. & Weir, A. H. (1973) Loess in Devon. *Proceedings of the Ussher Society* **2** (Pt. 6), 554–64.

39 Hazelden, J. (1974) Soils and geology of the Orange Walk and Corozal Districts. In: *Interim report of the British Museum-Cambridge University Corozal Project*, pp. 74–85.

40 Hodgson, J. M., Rayner, J. H. & Catt, J. A. (1974) The geomorphological significance of clay-with-flints on the South Downs. *Transactions of the Institute of British Geographers* **61**, 119–29.

41 Pritchard, D. T. (1974) A method for soil particle-size analysis using ultrasonic disaggregation. *Journal of Soil Science* **25**, 34–40.

42 Seale, R. S. (1974) Geology of the Ely district. *Bulletin of the Geological Society of Norfolk* **25**, 21–38.

43 Webster, R. & (Burrough, P. A.) (1974) Multiple discriminant analysis in soil survey. *Journal of Soil Science* **25**, 120–34.

44 Whitfield, W. A. D. (1974) The soils of the National Vegetable Research Station, Wellesbourne. *Report of the National Vegetable Research Station for 1973*, 21–30.

Maps

45 Ashley, G. D., Rudeforth, C. C. & Suggett, G. R. (1974) Soil map, 1 : 63 360 Sheet 19 (Hexham), Southampton: Ordnance Survey.

46 Avery, B. W., Findlay, D. C. & Mackney, D. (1974) Generalized Soil map, 1 : 2 000 000 England and Wales. Harpenden: Rothamsted Experimental Station.

47 Corbett, W. M. & Tatler, W. (1974) Land use capability map, 1 : 25 000 Sheet TG 13/14 (Barningham/Sheringham), Southampton: Ordnance Survey.

48 George, H., Robson, J. D. & Heaven, F. W. (1974) Soil drainage map, 1 : 25 000 Sheet TF 16 (Woodhall Spa), Southampton: Ordnance Survey.

49 George, H., Robson, J. D. & Heaven, F. W. (1974) Land use capability map, 1 : 25 000 Sheet TF 16 (Woodhall Spa), Southampton: Ordnance Survey.

50 Hodgson, J. M., Hollis, J. M. & Stamper, C. P. (1974) Soil map, 1 : 25 000 Sheet SO 87 (Kidderminster), Southampton: Ordnance Survey.

51 Johnson, P. A. (1974) Soil map, 1 : 25 000 Sheet SK 85 (Newark-on-Trent), Southampton: Ordnance Survey.

52 Johnson, P. A. (1974) Land Use Capability Map, 1 : 25 000 Sheet SK 85 (Newark-on-Trent), Southampton: Ordnance Survey.

53 Lea, J. W. (1974) Soil map, 1 : 25 000 Sheet SO 09 (Caersws), Southampton: Ordnance Survey.

https://doi.org/10.23637/ERADOC-1-131

54 Mackney, D. (Western, S., Law, R. D., Holmes, D. A., Virgo, K. J., deVos, J. H. & White, L. P.) (1973) Soil map, 1 : 25 000 Sheet SU 88 (Marlow), Southampton: Ordnance Survey.

55 Seale, R. S. (1974) Soil map, 1 : 10 560 Sheets TL 38 NW, NE, SW & SE (Chatteris), Southampton: Ordnance Survey.

56 Seale, R. S. (1974) Post-glacial mineral deposits map, 1 : 63 360 Sheet 173 (Ely), Southampton: Ordnance Survey.

https://doi.org/10.23637/ERADOC-1-131