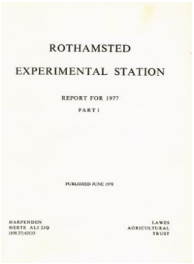
ROTHAMSTED RESEARCH

Report for 1977 - Part 1

Full Table of Content



Soil Survey of England and Wales

K. E. Clare

K. E. Clare (1978) *Soil Survey of England and Wales ;* Report For 1977 - Part 1, pp 247 - 270 **- DOI: https://doi.org/10.23637/ERADOC-1-134**

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

Draughtsmen

Mrs. Judie H. Read
Valerie R. Sandy
M. S. Skeggs
Leslie S. Small
Alison Wyatt

Assistant Staff

Mrs. Sylvia Bloomfield
Mrs. Barbara Cain
Diana J. Carter
Mrs. Joan K. Foster
H. Hakesley
M. D. Harding
Elaine R. Kavanagh
P. Mayton
Mrs. E. Ruth Murphy
Beverley Poulton
Mrs. Janet Y. Shuttleworth
Mrs. Teresa A. Toghill
P. J. Waller
Mrs. Anne E. Williams

Northern England

R. A. Jarvis, B.SC.
J. W. Allison, B.SC.
V. C. Bendelow, M.SC.
R. I. Bradley, M.SC.
D. M. Carroll, B.SC.
R. R. Furness, PH.D.
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.
R. Evans, PH.D.
Mrs. Jane R. Price, B.SC.
R. S. Seale, M.A.
Mrs. Barbara N. Scott, M.A.

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.
Gillian M. Mansey
Mrs. Hilda Roberts

Western 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.
N. E. G. Johnson, B.SC.
J. R. S. Menk, M.SC.
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.
Mrs. Carole M. Scott

Wales

B. Clayden, B.SC.
R. Hartnup, B.SC.
J. W. Lea, M.SC.
C. C. Rudeforth, PH.D.
T. R. E. Thompson, B.SC.
P. S. Wright, M.SC.
Mrs. Moira M. Beynon

https://doi.org/10.23637/ERADOC-1-134

Introduction

For the first year in recent times the Survey has not been able to afford the full range of scientific activity that has come to be regarded as desirable. A period of austerity may well be healthy in causing us to examine critically our style of work; continued over many years, however, it would almost certainly hinder good scientific progress, and it is to be hoped that the situation will improve fairly soon. Fortunately the weather was kind, and the better harvest was accompanied by a larger ingathering of soil information.

The aims of the Survey continue to be to describe, classify and map the different soils of the two countries. The soils are described in profile, and kinds of 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 mainly by lithology. When a map unit is identified by the name of a soil series or other 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 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. Soil and land use capability maps, with the text, are a permanent record of the distribution and properties of the different kind 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; 48 such areas were worked on during the year and some 1085 km² were surveyed in detail on 38 of them. Fifty-three maps at a scale of 1:25 000 have now been published with explanatory publications—usually *Soil Survey Records*—for 46 of them. In the Northern Region, upland areas have continued to be surveyed by field work combined with air-photo interpretation for eventual publication at a scale of 1:100 000. Progress in reconnaissance survey also included compilation of maps of soil associations at a scale of 1:250 000 for the counties of Derbyshire and Norfolk.

Northern England

Cumbria

Parts Sheets NY 04/05/14/15 (Abbey Town). The remaining 38 km² of the 113 km² sheet were mapped and writing the *Record* was begun. (Matthews)

Sheet NY 56 (Brampton). A further 55 km² were mapped. A composite map unit has had to be created which includes alluvial, terrace and valley-side soils, with gullies and landslips. (Kilgour)

Humberside

Sheet TA 14 (Brandesburton). A further 45 km² was mapped in detail. Although fine loamy stagnogley soils predominate on the Drab Till which covers much of the district, most fields contain small hollows or linear depressions containing stoneless pelo-alluvial gley soils, sometimes above peat.

Work on the long term leaching effects of rainwater on Drab Till soils continued in conjunction with the Soils and Plant Nutrition Department. (Furness)

https://doi.org/10.23637/ERADOC-1-134

North Yorkshire

Sheet SE 39 (Northallerton). Profiles were described, soil and land capability legends constructed, and the *Record* begun. (Allison and Hartnup)

Sheet SE 47 (Dalton). Following a reconnaissance, a provisional legend was drawn up and 20 km² mapped in detail. Parent materials include extensive glacial deposits, with Blackwood and Foggathorpe soils (1) among the most commonly occurring. (Allison, Bradley and Hartnup)

Sheet SE 97N/98S (Wykeham Abbey). Mapping continued and some 35 km² were mapped in detail. Contrary to popular belief, much of the Vale of Pickering deposits here are glaciofluvial, not lacustrine. The main soils are typical and gleyic brown earths (Wick and Arrow series (1)) and sandy gley soils (Blackwood series). (S. J. King)

Upland maps (1:100 000)

North-Central Pennines. Some 120 km² were mapped by reconnaissance survey, leaving 250 km² of a total 2400 km², still to be completed. About 50 profile pits were described and sampled and a provisional map legend prepared. Brown loamy soils over sandstone and related shallow Head have chemical properties typical of brown podzolic soils, but lack their associated morphological features; soils of similar composition over shale or limestone or in deep drift have no or only very weak podzolic characteristics. Stony loamy brown earths occur widely over terrace, glaciofluvial, morainic or Head deposits, and calcareous analogues are found in Wharfedale and Wensleydale; sandy glaciofluvial drift occurs in Garsdale. In the drier eastern parts, brown and stagnogley soils show argillic features and an attempt has been made to trace the boundary with non-argillic soils. Also in the east are humus-ironpan stagnopodzols similar to those of the North York Moors (2). Many profiles in deep hill peat were examined, but only minor variations noted; most profiles belong to the Winter Hill (2) series in semi-fibrous peat dominated by *Eriophorum* spp. remains. (Carroll and Bendelow)

Lake District. Preliminary air-photo analysis and background studies were begun. (Bendelow)

East Anglia

Cambridgeshire

Sheet TL 34 (Royston). About 56 km² were mapped. In the south-east, 2–3 km east of Royston coarse loamy drift soils with definite signs of clay translocation were found, mainly of the Moulton (3) series. Such soils have been found on Sheets TL 54 (Linton) and TL 76E/86W (Risby) but do not appear to occur elsewhere on this Sheet. The chalk around Royston itself appears to be unusually drift-free. Seven profiles were investigated and sampled. (Seale)

Sheet TL 39 (Benwick). A few traverses and deep bores were made which are probably typical of much of the Sheet which represents a mainly fenland area of peat remnants and estuarine deposits (Barroway Drove Beds). As much of the Upper Peat (Nordelph peat) has disappeared the surface deposits are largely of estuarine clays and silts, in a repetitive dendritic pattern of ancient tidal creeks. Deep bores show that although the depths of the basins in this area are similar to those in the basin to the east, the Lower Peat (beneath the estuarine deposits) is thicker here and the (estuarine) fen clay correspondingly thinner. (Seale)

https://doi.org/10.23637/ERADOC-1-134

***Sheet TL 54* (*Linton*).** A further 43 km² were mapped in detail and 17 profile pits were described. (Burton)

Norfolk

***Sheets TF 60/61* (*Downham Market/King's Lynn South*).** Some 48 km² were mapped and a preliminary legend produced. Proposed new series are the Leziate, a humus podzol on the Lower Greensand (Sandringham Sands) and the Lynn, an argillic ferritic brown sand on glaciofluvial sands over carstone (Lower Greensand). (Eldridge and Corbett)

***Sheet TL 99* (*Caston*).** The legend has been prepared and the Record written. (Eldridge)

County map. This has been fair drawn at 1:100 000 and 1:250 000 and the original legend simplified and improved. Forty soil profiles representing the most widespread series in the county were described and sampled. A *Bulletin* is being prepared. (Corbett)

Suffolk

***Sheet TL 76E/86W* (*Risby*).** Two profiles were studied in the valley deposits and samples analysed, with those of several other profiles dug during 1976. The various drift soils on the boulder clay were evaluated and classified. Three series were recognised in the shallow fine loamy drifts; the Ashley (4), Weasenham and Cannamore which represent stagnogleyic brown earths, typical brown earths and gleyic brown calcareous earths respectively. The Honingham series, a typical brown earth or argillic brown earth, was recognised in the shallow coarse loamy drift over boulder clay, and several additional phases were also found. (Seale)

***Sheet TL 94* (*Lavenham*).** Reconnaissance of this Sheet, an area almost entirely on Chalky Boulder Clay with thin incorporated surface loess, was completed. The northern part has a sequence of soils similar to those on Coverloam over boulder clay further north but with clay loam and sandy silt loam topsoils. In the south, upland soils are deeper with a thick decalcified surface. (Corbett)

East Midlands

Derbyshire

County map. Samples from Milldale and Biggin Dale on the Carboniferous Limestone showed that the change from brown to humic rankers occurred with an increase in slope above 15–20 ° and was little affected by aspect. (Reeve and Thomasson)

Lincolnshire

***Sheet SK 99* (*Kirton-in-Lindsay*).** The final 50 km² were mapped. Further large areas of Sherborne (4) series were found and brown rendzinas on marls of the Kirton Cementstones were provisionally named Kirton series. Calcareous sandy gley soils on calcareous river drift have been provisionally named Redbourne series. (Heaven)

***Sheet TF 39* (*Covenham*).** About 50 km² were mapped. Part of the north-west corner of the Sheet has typical stagnogley soils with 40–50 cm of sandy silt loam over fine loamy calcareous reddish till. This contrasts markedly with the more extensive loamy over clayey soils on reddish till of the district. Silty calcareous alluvial gley soils of the Agney (5) series are common on marine alluvium but a similar soil sampled from the

https://doi.org/10.23637/ERADOC-1-134

undulating land mainly in the north-east corner of the Sheet east of the Grainthorpe-Maronchapel road had strongly developed blocky subsoil structure, contrasting with the only moderately developed structure typical of Agney soils in the Friskney district on much older deposits. Further large areas of Newchurch (5) soils were mapped, but these are less calcareous than Newchurch soils originally found in Romney Marsh. (George)

Sheet TF 45 (Friskney). Some 30 km² were mapped. An area of peat in the north-west corner of the Sheet identified by the Geological Survey in the late 19th century has now virtually no organic soils owing to shrinkage and oxidation resulting from cultivations. The main soils here are clayey and silty typical humic-alluvial gley soils of the Downholland and Blankney series (6) and silty calcareous humic-alluvial gley soils of the Chatteris (6) series. Archaeological evidence has been used by Simmons (private communication) to identify probable coastlines of the Wash at *c.* 200 B.C. and A.D. 200 which has helped to explain some of the variation in the nature of marine deposits in this district. (Robson)

Nottinghamshire

Sheet SK 78N/79S (Gringley on the Hill). The remaining 50 km² were mapped. North of Gainsborough, deep silty warp deposits with Romney (6) and Blacktoft soils border the Trent. Ancient backswamp areas to the east of the river were artificially warped and have alluvial gley soils of the Walkerith series where thin silt overlies peat.

Everton, Gringley and Misterton Carrs are dominated by fine loamy over fine sandy humic-alluvial gley soils of the Everton series with subsidiary peat soils and Gilberdyke (7) and Downholland series. Around the margins, patchy thin lake marls associated with subsoils of variable derivation and texture result in a complex pattern of calcareous gley soils. (Reeve and Thomasson)

Western Midlands

Hereford and Worcester

Sheets SO 85/95 (Worcester/Upton Snodsbury). Some 45 km² were mapped in detail and a legend prepared. A further 16 representative profiles have been described and sampled. (Palmer)

Staffordshire

Sheets SK 00 and 10 (Lichfield). Some 45 km² have been mapped in detail and a provisional legend prepared showing 32 soil series.

On the thick Devensian glacial deposits covering most of the South Staffordshire Coalfield north and west of Walsall, Aldridge and Brownhills, typical stagnogley soils of the Clifton and Salop series (8), and the argillic stagnohumic gley soils of the Lea and Oaklands series (9) predominate. The drift is often moderately stony so stony phases of the Lea and Clifton series have been distinguished. Ground-water gley soils of the Quorndon and Blackwood series (8) in glaciofluvial gravels occur along the main lines of late Devensian drainage, while thin, as yet undifferentiated alluvial soils, normally over gravels within 1 m depth, flank streams draining south from Walsall Wood, Pelsall and Fishley.

The Devensian drifts thin to the east ending against the high Bunter Pebble Beds ridge that runs south from Brownhills through Aldridge. This ridge is capped by stony reddish sandy over loamy material which could be reworked Wolstonian till, and here stagnogleyic brown sands of the Rudge series are mapped. The eastern slopes of the ridge are extensively covered with sandy stony superficial drift giving the stony phase of

https://doi.org/10.23637/ERADOC-1-134

the Newport (8) series. In places, mainly towards the foot of the slopes, late and post-glacial erosion has cut into the solid sandstone below and typical brown sands of the Bridgnorth (10) series occur. North of Shire Oak, the ridge is lower and thin Devensian till covers the Pebble Beds giving Clifton and Salwick (8) soils.

The broad vale east of the Pebble Beds is floored by soft Bunter and Keuper sandstones giving typical brown earths of the Bromsgrove (10) series and typical brown sands of the Bridgnorth series or, more commonly, soils of the Wick (10) and Newport series where thin superficial drift occurs. There are a few thin isolated patches of till, with Clifton and Salwick soils. The Black Brook and its tributaries drain much of this relatively low ground and west of Weeford, the narrow alluvial strips along the streams are flanked by glaciofluvial gravels giving ground-water gley soils of the Quorndon and Isleham (6) series. An associated organic soil in basin peat has been correlated tentatively with the Adventurers' (6) series.

The outcrop of Bunter Pebble Beds in the east, capped in places by the Hopwas Breccia, forms high, deeply dissected ground free from glacial drift. The conglomeratic and brecciated rocks are only weakly consolidated however, and are deeply weathered to give stony phase soils of the Wick or Newport series. In Weeford Park sandy stony typical humo-ferric podzols have been mapped under coniferous woodland. Further east, red Upper Coal Measures marls and sandstones of the Hamstead Beds give soils of the Shifnal (11), Lilleshall (11), Dodmoor (11) and Bentley series recently introduced in the Nuneaton district. The Hamstead Beds are faulted against the Keuper Marl which forms lower ground sloping gently eastwards to the Thame. The outcrop has been deeply dissected by the Bourne Brook and smaller streams, but interfluves are covered by thin stony drift which is possibly reworked Wolstonian till, giving stony, typical stagnogley soils of the Clifton series. Upper slopes and brows carry Whimple and Worcester soils (10), whereas typical stagnogley soils of the Brockhurst (10) series are mainly on lower slopes. In the narrow valleys, gleyic brown earths of the Arrow (8) series or fine loamy typical cambic gley soils of the Grendon series occur, but broader vales are often floored by fine loamy over clayey drift in which soils resembling the Salop series are developed. (Hollis)

Sheets SK 02/12 (Abbot's Bromley/Draycott in the Clay). Some 50 km² have been mapped on SK 02 and 5 km² on adjacent SK 01 and 11. The legend has been finalised and 16 representative profile pits sampled for analysis.

Outcrops of Keuper Marl around Blithbury give Worcester and Whimple soils with occasional patches of Brockhurst soils in basins. On the interfluve between the Ashbrook and the Blythe, Chalky Boulder Clay carries Ragdale (4) and occasionally Beccles (6) soils.

To the west and south of Abbot's Bromley, there are large spreads of glacial and glaciofluvial sands and gravels in which mainly Wick and Arrow soils are developed, with a few profiles of Quorndon series in depressions. A stony phase of the Wick series, containing >15% stones, has also been mapped. Around Bagots Bromley, there are fine loamy gleyic brown earths of the Hopsford (12) series. In wetter hollows and on the low terrace of the Blythe in Blithfield fine loamy non-calcareous gley soils of the Grendon series have been mapped.

In the south-west the Trent has cut a narrow valley across the Bunter Pebble Beds which gives stony Newport, Wick and Bromsgrove soils. When weathered, the Bunter Pebble Beds are almost indistinguishable from glacial deposits. The Forestry Commission have planted Corsican pine, Scots pine and Lodgepole pine on Cannock Chase and in places profiles of Crannymoor (10) series and a coarse loamy humus-iron podzol have developed under the acid litter of these trees.

https://doi.org/10.23637/ERADOC-1-134

The first and second terraces of the Trent between Great Haywood and Colton give mainly Wick soils and along the Moreton Brook there is brownish or greyish, fine loamy or clayey river alluvium, over gravel or in a few places organic deposits.

On the highest land in Chartley Park, loamy argillic stagnohumic gley soils of the Lea series are found flanked by Clifton soils, often with moderately stony subsurface horizons. The Park rises to over 150 m O.D. and it has not been intensively farmed until recently; hence the survival of humose topsoils. The drift deposits of the Park contain many large boulders, which have been dragged into piles at the edges of the fields during land clearance. About three-quarters of the boulders are of Lake District origin, the most common types being Ennerdale granophyre and rocks of the Barrowdale Volcanic Series. (Jones)

Warwickshire

Sheet SP 25 and 35 (Stratford-upon-Avon East). The soils so far recognised have been mostly identified earlier in the nearby Leamington Spa district and around Alcester (13). Those on the Keuper outcrop are mostly Worcester and Spetchley (10) series with some rendzinas on the very steep marl slopes cut by the Avon. Where thin drift covers the country rocks Whimple and Brockhurst soils are found. The Lower Lias has Evesham (4) and Denchworth (6) soils, and some Podimore (2) profiles have been recognised where thin loamy drift covers the calcareous clays.

Pleistocene deposits are widespread and cover large tracts. The older drift, mainly till, caps the higher ground and here Salop, Flint (8) and Rufford (9) soils are found. At Christmas Hill, Bishop's Itchington Chalky Boulder Clay of eastern provenance containing chalk fragments has Ragdale series, and Salop profiles nearby have brown horizons over reddish till. The newer (Devensian) drift consists mainly of gravelly terrace deposits along the course of the Avon, and Wick and Arrow soils are the main series. At Wellesbourne, Wick soils rest on calcareous gravels and occur widely near Charlecote and Hampton Lucy. Small patches of fine loamy cambic gley soils tentatively correlated with the Grendon series and similar gleyic argillic brown earths on low terraces have been recognised. The origin of the clay in these profiles is unclear, but it could be the product of mixing the terrace gravels with the Keuper Marl beneath.

Grey alluvium, from Jurassic rocks gives mainly Fladbury (4) series but on the levee of the Avon there are gleyic brown alluvial soils of the Wyre (11) series. Small patches of calcareous alluvial gley soils of the Thames (13) series occur along some of the small tributary streams near the Jurassic outcrop.

Some 20 km² have been surveyed in detail and 25 profiles sampled representing most of the series present. (Whitfield)

Sheet SP 27 and 37 (Coventry). A reconnaissance survey was made and 35 km² were mapped in detail. A provisional legend has been compiled with 28 series and profile pits representing 18 have been sampled.

The district is covered mainly by Wolstonian and Devensian drift over Trias and Upper Coal Measures. The Pleistocene deposits include glaciofluvial sands and gravels and clayey tills. The former support Wick, Arrow and Quorndon soils and where the drift thins over Keuper Marl, Dunnington Heath (4) soils occur. Salop and Rufford soils are widespread on the clay tills and small patches of Flint and Clifton soils have been found. On steeper eroded slopes, soils of the Crewe (8) series and an unnamed typical (stagnogleyic) argillic pelosol have been mapped. Small patches of Chalky Boulder Clay have Ragdale soils. In the parishes of Wroxall, Baddesley Clinton, Balsall and Honiley, clay till possibly of Anglian age above 120 m O.D. has Salop soils, small patches of Dunsmore (12) series and an unnamed, probably paleo-argillic, soil.

https://doi.org/10.23637/ERADOC-1-134

The Upper Coal Measures comprise red marls, sandstones and thin breccias and are mostly drift free giving Dodmoor, Gatacre, Lilleshall, Shifnal and Bentley series. Keuper Marl occurs in the east and west and has Wimple and Brockhurst soils. Small patches of Worcester series occur on eroded slopes particularly in the south-east around Princethorpe and small patches of Spetchley soils were also recognised in depressions. In the parishes of Wroxall and Balsall, bands of grey/green marl associated with the Arden Sandstone give unnamed argillic brown earths and typical (argillic) stagnogley soils. The Arden Sandstone which is best represented in the south-east gives Inkberrow and Clive soils (13).

The main drainage of the district is by the rivers Avon, Sowe and Blythe which have formed broad shallow valleys flanked by gravelly terraces with mainly Wick and Arrow soils. The alluvium supports mainly Fladbury soils with Stixwould (6) and Compton (8) series along the minor tributaries. The soil pattern is often complicated along the minor water courses which have only thin alluvium over red and grey/green Keuper Marl. (Beard)

Sheet SP 29 and 39 (Nuneaton). The *Record*, which is being prepared for publication, includes a short section on the physical properties of selected soils. Regression analysis using the Rothamsted computer shows that much of the variance in available water and retained water capacity is explained by differences in organic matter content. (Whitfield and Beard)

South-east England

Essex

Sheet TL 71 (Little Waltham). *Record* and map were prepared. (Allen and Sturdy)

Sheet TL 83 (Halstead). Reconnaissance has proceeded. An undulating plateau is dissected by the two large valleys of the Colne and Stour flowing south-east across the north-east and south-west of the district. There are twenty geological formations, the most extensive being boulder clays mantling the plateau and glacial sands and gravels on valley sides. The valleys are cut in Lower London Tertiaries, and locally reach the Chalk in several places. Soils in the boulder clay include calcareous and argillic pelosols (Hanslope (4) and Faulkbourne series) and stagnogleyic paleo-argillic brown earths (Hornbeam). Glacial gravels on upper valley sides have paleo-argillic brown earths (Terling series) with argillic brown earths and gleyic brown sands on mid-slopes. Wide stretches of alluvium occur in the Colne and Stour valleys while colluvial deposits are extensive in smaller tributary valleys. Cultivation of moderately and strongly sloping land has led to erosion of topsoil which has exposed subsoils at breaks of slopes. (Allen)

Oxfordshire

Sheet SP 30 (Witney South). The *Record* is complete. (Jarvis and Hazelden).

Sheet SP 60 (Tiddington). The remaining 10 km² have been mapped and a legend constructed. (Hazelden)

Surrey

Sheets SU 95/TQ 05 (Pirbright/Woking). The district comprises land north-east and north-west of Guildford in west Surrey, and was chosen to characterise soils in parent materials from Upper London Tertiary deposits and associated drifts.

Land use is varied. The north-western half is chiefly a patchwork of heaths, woodland

https://doi.org/10.23637/ERADOC-1-134 *pp 9*

and grassland, contrasting with mixed agriculture elsewhere. Urban land covers about 30 km² at present, and small market gardens thrive around Woking.

The two principal uplands are on porous rock. Clandon Downs along the south-eastern border, are on Upper Chalk and rise to about 200 m O.D.; Barton Sand capped by Plateau Gravel forms a dissected ridge about 50 m high along the western edge of the district. The Wey and its tributaries dominate the central lowland, the latter on Bracklesham and Bagshot Beds and London Clay. Extensive river terrace deposits flank the Wey's broad floodplain which crosses the district from south to north.

Bagshot and Bracklesham Beds are alternating loamy and clayey strata, with occasional stony seams. These alternations are particularly frequent in the Bracklesham Beds, which also include much glauconite; soils therefore vary in complex patterns over short distances. Parent materials are locally sandy, stony and chalky.

Reconnaissance of soils in Tertiary strata and the main drift deposits was completed, and about 15 km² surveyed in detail. (Fordham)

South-west England

Cornwall

Sheet SW 61, 62, 71 and 72 (Lizard). The remaining 90 km² were mapped. Representative profile pits were dug and sampled on serpentine, granite-gneiss, gabbro and the schists. Particular attention has been paid to soils in loessial deposits and to the relative importance of ultrabasic rocks in the granite-gneiss rock complex. (Staines)

Devon

Sheet SS 74/75 (Lynton). The remaining 30 km² have been mapped and profiles sampled. (Harrod and Hogan)

Sheet SX 68 and 78 (Moretonhampstead). This comprises the district around Fernworthy and the enclosed agricultural land around Moretonhampstead to the east. The latter is almost entirely on granite and is dominated by brown podzolic soils of the Moretonhampstead (14) series with ground-water gley soils of the Laployd (14) series on flat receiving ground. Farmland is interspersed with much woodland on steep valley sides. Commons occupy many hilltops where the land is often rocky and bouldery. (Harrod and Hogan)

Gloucestershire

Sheet SO 61 (Cinderford). The remaining 50 km² has been completed, 33 km² over strata of Devonian Age. Sandy loams of the Ross and Sellack series (15) occupy some 10 km², followed by smaller areas of Bromyard (10), Eardiston (15), Middleton (16) and Castleton (11) series. An unnamed ranker and typical brown earth make up 3 km² whilst smaller compound units occupy 4 km². Soils over Carboniferous Limestone and associated strata are extremely variable, Crwbin (17) series being one of the more widespread. (Colborne)

Sheet SO 72 (Newent). The remaining 30 km² were completed to include some adjacent land; 20 profiles were described. (Cope)

Wales

Clwyd

Sheet SJ17 (Holywell). The *Record* and soil and land use capability maps have been edited and are in press. (Thompson)

https://doi.org/10.23637/ERADOC-1-134 *pp 10*

Sheet SJ 24 (Llangollen). A further 40 km² were mapped, leaving only the moorland of Ruabon Mountain unsurveyed. Samples from B horizons have been taken to determine the extent of brown podzolic soils and, as an extension of the study in the Holywell district, surface soils were sampled for heavy metal analysis by the Agricultural Development and Advisory Service (ADAS). (Lea)

Sheet SJ 35 (Wrexham). The map is published and the *Record* is in press. (Lea and Thompson)

Dyfed

Sheet SN 24 (Llechryd). A further nine profiles were described and sampled and the final legend compiled. The pelo-stagnogley soils in Irish Sea drift have been correlated with the Hallsworth series. (Bradley)

Sheet SN 50 (Llanelli North). Outstanding representative profiles were sampled. (Clayden with P. Ashworth, vacation worker)

Sheet SN 62 (Llandeilo). The soil and land use capability maps were completed and the *Record* submitted. (P. S. Wright)

Sheet SN 72 (Llangadog). A further 60 km² were mapped, and 20 representative profiles described and sampled. (P. S. Wright)

Pembrokeshire. The legend for the 1:50 000 map was compiled, and map and publication edited. (Rudeforth)

Powys

Sheet SJ 21 (Arddleen). A further 40 km² were mapped and 38 profiles described and sampled. The map embraces the interfluve of the Severn and Vyrnwy just west of their confluence south of Oswestry, and is floored mainly by Lower Palaeozoic sandstones and siltstones with a complex of igneous rocks forming the high ground of the Breiddens in the south-east. Interest centres on the extent of the soil catena currently defined as fine loamy or fine silty typical of mid-Wales, as against the more silty soils described in Shropshire (16). Mapping so far suggests that the former predominates despite the relatively coarse nature of the local rocks. The morphology of many alluvial gley soils indicate that many have slowly permeable subsoil horizons. (Thompson)

Basic research

Minor element studies

Cardiganshire. The results of a study of trace elements in soils in south Ceredigion have been summarised, and a paper prepared. (Bradley)

Carmarthenshire. In co-operation with ADAS an investigation has begun into the Cu, Co, Mo and Se levels of soils in the Llangadog district (Sheet SN 72). Sampling of soil and herbage at points of a grid is nearly completed. (P. S. Wright with Mr. R. Dight, ADAS)

Pembrokeshire. Maps were produced showing the distribution of trace elements throughout west and central Pembrokeshire. (Rudeforth, with Wilkins, Soils and Plant Nutrition Department)

https://doi.org/10.23637/ERADOC-1-134 *pp 11*

Soil chemistry

In co-operation with ADAS, the relationship between phosphate sorption capacity and levels of amorphous forms of Fe and Al is being examined in samples from points on a grid in the Llangadog district (Sheet SN 72). (Loveland and P. S. Wright, with Mr. R. Dight, ADAS)

Upper Greensand soils

The study of these rather fertile soils and of the weathering of glauconite was continued. X-ray diffraction, electron probe analysis and Mössbauer spectroscopy were used to examine whether grains of different colour and morphology differ consistently in composition. Grain colour and major element composition are not related. Magnetically separated glauconite grains and aggregates described in last year's *Report* were shown to consist largely of mica-smectite. The mica-smectite in the grains contained 20% expansible layers and the aggregates 60%.

In an attempt to explain mappable colour differences between the Urchfont, Pewsey and Puckshipton soils, organic carbon and free iron contents were determined in six size fractions from the horizons of each soil but they differed little in amounts of these two components. The most likely explanation for the colour differences comes from a study of thin sections. The Pewsey soil had organic/iron stained clay on the surfaces of grains and voids in the upper horizons whereas in the other two the clay was in intergranular aggregates. The upper horizons in the brown Pewsey soils are thought to be colluvial material derived in part from Urchfont upper horizons. (Loveland)

Clayey soils

Regression equations to calculate shrinkage potential from clay content, bulk density, organic carbon and cation exchange capacity (CEC) explained about 85% of the variation in the shrinkage of samples from 20 clayey soil profiles. (Bullock, Hall and Reeve)

Brown podzolic soils

Clay fractions from 32 podzolic B horizons were further separated into $<0{\cdot}2$ μm and $0{\cdot}2$–2 μm fractions and examined by X-ray diffraction and transmission electron microscopy. The clays from all the horizons contained the tubular mineral halloysite, mostly in the $<0{\cdot}2$ μm fraction, and this identification was confirmed by a broad 7Å peak in diffraction patterns which did not collapse on heating to 335 °C. In clay from a soil on dolerite, "blocky" structures resembling cylindrical halloysite were also observed. This is the first time halloysite has been recognised in podzolic soils of England and Wales, though it has been found in Scottish soils by Wilson and Tait (18) who attributed its formation to a previous warmer climatic period. (Loveland)

Paleosols

Samples were taken from profiles in paleo-argillic stagnogley soils (Oak and Essendon series), stagnogleyic paleo-argillic brown earths (Hornbeam series), and argillic pelosols (Faulkbourne series) to study soil development on Chalky Boulder Clay in Essex. Analyses of particle-size distribution, micromorphology and clay mineralogy were made.

Granulometry and mineralogy show that none of the profiles is developed solely from Chalky Boulder Clay. Devensian loess has been added to all, and some horizons in the Essendon soil are derived in part from non-glacial sediments. There is a clear weathering trend in those parts of the profiles developed from the boulder clay, and contents of more weatherable minerals decrease upwards to the junction with the loess. In the loess

https://doi.org/10.23637/ERADOC-1-134 pp 12

there are more weatherable minerals than in horizons immediately below, indicating that the boulder clay weathered mainly before the loess was deposited, and that since then, weathering has been less severe. In addition the earlier soil formation involved decalcification, much clay illuviation, gleying and the segregation of red haematite. Paleoargillic horizons, particularly well developed in the Oak and Essendon profiles, were probably formed in a climate warmer than at present, either during the Ipswichian or the Hoxnian interglacials. (Allen, Bullock and Sturdy, with Catt and Greenfield, Soils and Plant Nutrition Department)

Coverloam and Sand

The general distribution of sandy Coverloam in central and west Norfolk and throughout Suffolk is being plotted and 75 flat crest sites have been sampled. The aims are to clarify the boundary with the loess in south Suffolk and to reveal particle-size distribution trends within the sandy Coverloam region. Examination of the local distribution of sandy Coverloam within 10 × 10 m grids has continued in Suffolk, in collaboration with ADAS drainage work. (Corbett)

Methodological research

Particle-size and chemical analyses

Potassium pyrophosphate (19) has been shown to be more suitable for selective extraction of iron-organic complexes from soils which contain amorphous or poorly ordered crystalline iron oxides than either aqueous acetylacetone (20) or acid ammonium oxalate (21). Seven samples of iron oxyhydroxides characterised by crystallinity and surface area (monolayer water content) were extracted with each reagent. Solubilities in acetylacetone and acid oxalate depended on surface area, being 30% Fe or more in 40h for non-crystalline oxides. Solubility in pyrophosphate was 2% Fe or less in 40h even when surface area was 300 $m^2 g^{-1}$. (Bascomb and Thanigasalam)

Analyses of samples from 1469 profiles examined by the Survey between 1950 and 1973 have been summarised. Certain analytical measurements have been generally related to field assessments of degree of gleying and parent material and it is concluded that sampling on a random or grid pattern would allow statistically better inferences to be made about areas of land that can be made when samples are taken to typify soil classes. (Bascomb, with Todd, Statistics Department)

Micromorphometry

The minimum number of Kubiena tin samples and thin sections needed to characterise the pore space accurately in clayey soil was determined. Eight such samples were taken from the Bt horizon of a Worcester soil and eight from the Btg horizon of a Spetchley soil and three horizontally oriented thin sections were made from each sample. Each thin section was divided into nine "frames" and the voids in each frame measured by image analysis.

An hierarchical analysis of variance was used to estimate the variance components of each sample at tin, section and frame levels, and showed that at least one thin section should be made from each of six or more tin samples to characterise accurately the pores in the fine textured horizons studied. (Murphy, with Banfield, Statistics Department)

Soil classification

Principles for series differentiation were tested by preparing lists of soil series appropriate for individual subgroups of the classification. The need for some amendments was

https://doi.org/10.23637/ERADOC-1-134

revealed and revisions are in preparation. (Clayden, Avery, Carroll, Robson and Hodgson)

Automated cartography

Progress on mapping data from the sample survey of the Ivybridge area (14), has been halted temporarily while equipment is being replaced at the Edinburgh Regional Computing Centre. A technical monograph has been prepared reporting the results obtained so far. (Webster)

Data management

In collaboration with Oxford University, data from soil surveys in Oxfordshire have been assembled. The Natural Environment Research Council (NERC) program, G-EXEC, has been obtained and is being implemented by C. M. Lessells (Computer Department) to handle the data. (Webster)

The information contained in the punched feature card system at Lincoln has been transferred to the Rothamsted computer. Programs for data retrieval were written and arrangements made for customers to use the system on-line or by post in a similar manner to the DECODE program. (Heaven, with C. M. Lessells, Computer Department)

Spatial analysis

Spatial dependence in soil has been measured along two transects in Oxfordshire where observations had been made at 10 m and 20 m intervals. The results were applied in two methods for optimally locating soil boundaries. One method optimises locally and finds all sharp boundaries even though they separate similar types of soil. The other optimizes globally and finds all large differences whether the boundaries are sharp or gradual.

Experiments have been made to fit spline functions to soil data, both down profiles and along transects. For profiles cubic splines that fit exactly at the data points seem most successful. Data from transects are better approximated using cubic splines fitted by least squares. A program has been obtained from the National Physical Laboratory for fitting splines to data distributed over areas. (Webster)

Remote sensing

Air photo interpretation. A map of landscapes in lowland Cumbria was compiled from air photos. (Evans)

Crop patterns. Rates of germination and tillering as well as height and yield were again monitored throughout the growing season, in four fields in which soil patterns show due to differences in growth of cereals.

Growth patterns on Sheet TF00E/10W (Barnack) showed much less well than in 1976. (Evans)

Soil erosion. A map is being compiled of fields in East Anglia known to have eroded in the past few years, especially in the wet winter and spring of 1977. Landform, soil, land use and rainfall are being studied as factors in erosion. (Evans)

Applications research

Land use capability map

A national land use capability map at 1:1 000 000 was completed. It will be published

https://doi.org/10.23637/ERADOC-1-134

in the format of the national soil map at this scale. (Mackney and Soil Survey and ADAS Staff)

Demonstration farms project: Countryside Commission

Soil maps and land capability information have been provided for farms in Powys, Northumberland, Worcestershire, and Mid-Glamorgan. A detailed soil survey of 200 ha was completed in Mid-Glamorgan, whilst for the remainder existing surveys were used or reconnaissance maps made. (Soil Survey Staff)

Soil suitability for direct drilling

This year the national survey has been much reduced in size and only a few sites have been visited. A provisional classification of soils for sequential direct drilling of combinable crops in the United Kingdom has been made, and a map at 1:2 000 000 compiled. (Mackney and Soil Survey Staff)

Underdrainage treatment maps

An underdrainage treatment map at the scale of 1:25 000 was produced at small cost for a district in Kent. The cartographic work was undertaken at Rothamsted and involved two days' work. Similar maps could be produced for a wide range of uses. (Fordham, Green and Mackney, with Messrs. J. McCunnall and D. J. Robins, ADAS Drainage Service)

Land classification

A working group has been formed to discuss the possible integration of the Ministry of Agriculture, Fisheries and Food (MAFF) Agricultural Land Classification and the Soil Survey's Land Capability Classification. (Mackney, with Messrs. R. W. Swain, D. Hewgill and J. F. B. Tew, ADAS)

Soils and land drainage

A project, started in 1974 with ADAS drainage service to monitor soil water regimes in drained and undrained nearby fields on major soil series, is continuing. Results for the drainage years 1974–75 and 1975–76 are now available. The latter was a very dry winter in the east with negligible waterlogging at many places. The total site/years now recorded is around 430 and the results generally confirm the earlier study. (Mackney, Thomasson and Regional Staff)

At the request of the Meteorological Office, tables of the areal proportions of High (>180 mm), Medium (180–110 mm) and Low (<110 mm) soil available water were estimated for the whole of England and Wales using a 20×20 km grid. This information is needed for a new hydro-meteorological model to estimate soil moisture deficits and the return to field capacity on a weekly basis. (Thomasson and Regional Staff)

Soils and corrosion

In co-operation with the East Midland Gas Board, a classification of soil aggressiveness to iron pipes was evolved, and maps at 1:50 000 scale drawn to improve identification of problem areas and allocate priorities for replacement of older distribution systems. (Furness, Heaven, Reeve, Robson and Thomasson)

Supporting work

Particle-size and chemical analyses

Over 1550 samples from 365 profiles studied in current mapping and research were

https://doi.org/10.23637/ERADOC-1-134

analysed in the Headquarters laboratory using methods given in *Soil Survey Technical Monograph* No. 6. (Bascomb and Thanigasalam)

The results are now stored on punched cards and given to surveyors as computer printouts using the LABTAB program. (Webster and Bascomb)

Sixty samples taken from profiles on the Stratford-upon-Avon (SP 25 and 35) and Coventry (SP 27 and 37) sheets were analysed in the Wellesbourne laboratory. (Beard)

Soil strength

A tensile tester has been adapted for use as a penetrometer and has proved more satisfactory than a full-cone penetrometer when used on wet soils. (Whitfield)

Micromorphology

Six hundred and twenty thin sections were made and described to aid characterisation and classification of the soils in current mapping. A further 210 sections were made for supporting research projects, mainly concerning paleosols and the measurement and characterisation of soil pores. (Bullock, Murphy and Biswell)

Mineralogical analyses

The mineralogical composition of the $<2\ \mu m$ fraction from 227 samples, most from current mapping areas, was determined by X-ray diffraction and non-exchangeable potassium and cation exchange capacity measurements. Some were analysed to determine the clay mineralogy of the major clayey soil parent materials in England and Wales. (Bullock, Loveland and Kavanagh)

Heavy mineral investigation of soils and drifts in Cumbria and Cheshire was continued. (Kilgour)

Soil water regimes

Neutron probe measurements made at Lincolnshire sites monitored from spring 1974 to spring 1975 have been analysed, and measured and predicted soil moisture deficits compared. The three sites near to Draycott in the Clay (Staffs) were studied for a further year and three new sites on limestone were set up at Kirton-in-Lindsey (Lincs.). (Hall, Heaven and Jones)

Water levels were again recorded in glaciofluvial sands in the area of the projected Selby Coalfield. (Furness)

The water content distributions of Wick soils under grass and potatoes at the National Vegetable Research Station have been compared. (Whitfield)

The water release characteristics of samples from five profiles in the Stratford-upon-Avon and Coventry districts have been measured. (Beard)

Soil water retention

Water retention properties were determined for 730 core samples from 83 profiles. Samples were received from all seven regions this year. (Hall, V. F. Wright and Mansey)

Special surveys

A soil map of the Newcastle University Experimental Farm at Cockle Park was made at a scale of 1:2500. (Allison, Hartnup and R. A. Jarvis)

Parts of eight farms were surveyed in detail and sampled for an ADAS Working Party studying problems associated with copper deficiency in cattle in North Yorkshire, (Carroll and Bendelow)

https://doi.org/10.23637/ERADOC-1-134

A report on the Northumberland Hill Farm Project soil map was prepared at the request of ADAS, and a land use capability map compiled. (Carroll and Bendelow)

A soil map for the Countryside Commission's demonstration farms near Bishampton, Worcestershire was supplied to the Commission. (Palmer)

A survey of some 80 km² of the floodplains of the Thames, Cherwell and Evenlode was made for the Thames Water Authority. The floodplain area was delineated from aerial photographs and then sampled to determine the percentages of the various soil types and land use capability classes present within each of the floodplains. (Hazelden, M. G. Jarvis and Evans)

A soil map was made of the Surrey Agricultural College Farm at Merrist Wood, Worplesdon. (Fordham)

A soil map, land capability map and report on the Porkellis area of Cornwall was prepared for the Botany Department University of Liverpool. (Staines)

An investigation of the use of soil surveys in engineering and land planning was started supported by a Science Research Council CASE studentship in co-operation with Oxfordshire County Council. A detailed soil map has been made of the Didcot area and the monitoring of bench mark sites commenced. (M. G. Jarvis and Johnson)

A survey was made of about 1·25 km² of land around the Llysdinam Field Centre of the University of Wales Institute of Science and Technology near Newbridge-on-Wye. (Clayden)

At the request of ADAS and the West Glamorgan Planning Officer a soil map and report was prepared of some 4 km² in the Cockett valley, Swansea. (Clayden)

Soil and land capability maps were prepared for the Countryside Commission at Tynllan Farm, Castle Careinion, near Welshpool, Powys, and Cwmrisca, Tondu, near Bridgend, Mid-Glamorgan. (Clayden, Lea and Thompson)

A soil map was prepared for ADAS of 5 km² in the Llanedeyrn district north of Cardiff. (Clayden and P. S. Wright)

The soil map of 4 km² farmed by Llysfasi College of Agriculture in the Vale of Clwyd was completed. (Lea)

At the request of ADAS, a survey was made of Rhysnant Farm, for a modernisation programme. (Thompson)

Selected areas of hill land in mid-Wales were assessed for soil uniformity and suitability for new experimental plots for the Welsh Plant Breeding Station. (Rudeforth with Dr. A. H. Charles, Welsh Plant Breeding Station)

Other work

Characterisation of peats by fibre content has been extended to the Somerset Moors. Samples were obtained from transects on three moors from Sedgemoor series soils. Fibre content will be related to hydraulic conductivity and other properties relevant to land use in this area. (Findlay, with Woodbridge—vacation worker)

An oval, peat-filled depression 1000 m by 750 m in Farcet Fen, Cambridgeshire, has been recognised from aerial photographs as probably being thermokarstic and related to similar depressions in Conington Fen and near Thorney, and is being studied. (Burton)

The geology of Fen deposits near Benwick, Cambridgeshire was reported on for Lavenham Fen Farms Ltd. (Seale)

The Geological Survey was further helped with the publication of the Geological Map of the Ely district based on the Soil Survey map of the area on 3rd Edition O.S. 178 (Ely). (Seale)

Work was begun with the Ministry of Agriculture, Fisheries and Food on a feasibility study concerning the reclamation of 70 ha in the Humber estuary. (S. J. King)

https://doi.org/10.23637/ERADOC-1-134

An improved classification of ease of cultivation of soils in the Western Midlands was developed. (Jones)

A land capability map of parts of the Lizard peninsula was compiled for the Nature Conservancy Council. (Staines)

A land capability map and brief report on the soils of Horton Common, Dorset were supplied to the Nature Conservancy Council. (Findlay)

A paper on soil suitability for intensive winter playing fields has been prepared. (Palmer)

Study of the compaction and erosion of the soil surface on footpaths in the Peak District National Park has shown the value of soil properties in planning routes for new footpaths. Management cost is high for drainage and surfacing if heavily-used footpaths are on unfavourable soils such as pelo-stagnogley or peat soils. (George)

About 22 km of section were examined along a gas pipeline in Cambridgeshire between Pondersbridge to Newton in the Fenland. The trench was generally 3 m deep, and in places up to 8 m deep. South and west of the road between Murrow and Guyhirn a sequence was found of Upper Peat/Fen Clay with creeks/Lower Peat/Gravels, clayey or silty drift or Oxford Clay. North and east of the road the sequence changes abruptly; solid or drift deposits under Fenland deposits were not seen and an undulating peat band below clayey deposits appeared. The peat lies generally within 0·5–1·5 m of the surface between Murrow and Leverington Common but from here to the Sea Bank at Newton, it is between 1·5–3·0 m deep and is thicker. (Evans)

Profiles were examined along a gas pipeline in Powys. (Thompson)

Sections of a trench opened by the Gas Board were studied in the Fens near Ramsey and in uplands near Wood Walton. (Seale)

Advice and assistance was given to many governmental and private organisations, and to individuals.

Publications

Following publication of the *Ivybridge Record* (SX65) a small-scale publicity exercise was carried out. Letters were sent to 68 farmers in the survey area explaining the nature and content of the publication. Twenty-two orders were subsequently received for the *Record* and maps. The local press were also circulated. Editors were invited to borrow a copy (one did) or use a prepared summary of about 200 words. At least one paper printed the summary verbatim. It is planned to contact all those who purchased the publication to ascertain views on the usefulness of the *Record* and maps and to obtain comments and criticism on *Record* content and format and on map use and interpretation. (Hogan and Harrod)

A publicity leaflet entitled *The Soil Survey* was prepared for distribution by Survey Staff. (Thomson)

During the year four outline and ten coloured soil and land capability maps were published as part of the standard 1:25 000 series. Soil maps of the Counties of Cheshire and South and West Yorkshire at a scale of 1:250 000 have appeared. Thirty-one maps are being prepared for publication.

An exhibition of Soil Survey maps was presented at the British Cartographic Society's symposium at Durham in September. (Thomson)

Six *Records*, four *Technical Monographs* and the last *Memoir* have appeared during the year.

Twelve *Records*, one *Special Survey* and three *Bulletins* are being published.

Staff

D. J. Eldridge resigned and Mrs. J. R. Price was appointed in his place.

https://doi.org/10.23637/ERADOC-1-134

R. Hartnup transferred to Trawsgoed from Harrogate and R. I. Bradley moved to the Harrogate Office.

Mr. J. R. S. Menk, a visiting worker from Brazil, has joined the Survey for 3 years.

A new subcentre for surveys in Hampshire, Surrey and Sussex was opened at the Forest Research Centre, Alice Holt, Hampshire to which M. G. Jarvis and S. J. Fordham have been transferred.

R. Webster attended a work shop on 'Soil Resource Inventories' at Cornell University, Ithaca, U.S.A. and a symposium on 'Factual Data Banks in Agriculture', Luxembourg.

D. Mackney visited Washington and Ithaca for two weeks for discussions with the Soil Conservation Service and Professor G. W. Olson.

J. M. Hodgson visited Bologna at the invitation of the Ministry of Agriculture of the Regione Emilia-Romagna, Italy to take part in an open seminar on soil survey methods and give advice to a closed working party on the proposed development of soil survey in the region.

P. Bullock attended the 5th International Working Meeting of Soil Micromorphology in Granada, Spain, May 22–29th.

P. J. Loveland attended the 3rd Meeting of European Clay Groups in Oslo, Norway. June 2nd–5th and gave a paper.

B. Clayden was a part-leader of the excursion in Wales and the Cheshire-Shropshire lowlands of the 10th Congress of the International Union for Quaternary Research.

C. C. Rudeforth was awarded the PhD degree of London University for his Thesis on 'A quantitative approach to soil survey in Wales'.

R. I. Bradley submitted a MSc Thesis to the University of Wales entitled 'Trace elements in soils in south Ceredigion with special reference to the role of parent material'.

An internal conference to consider soil survey applications and upland surveys was organised, 20–22 December, at Sutton Bonington. Thirteen of the papers presented are being prepared for publication as a *Technical Monograph*. (M. G. Jarvis and Mackney)

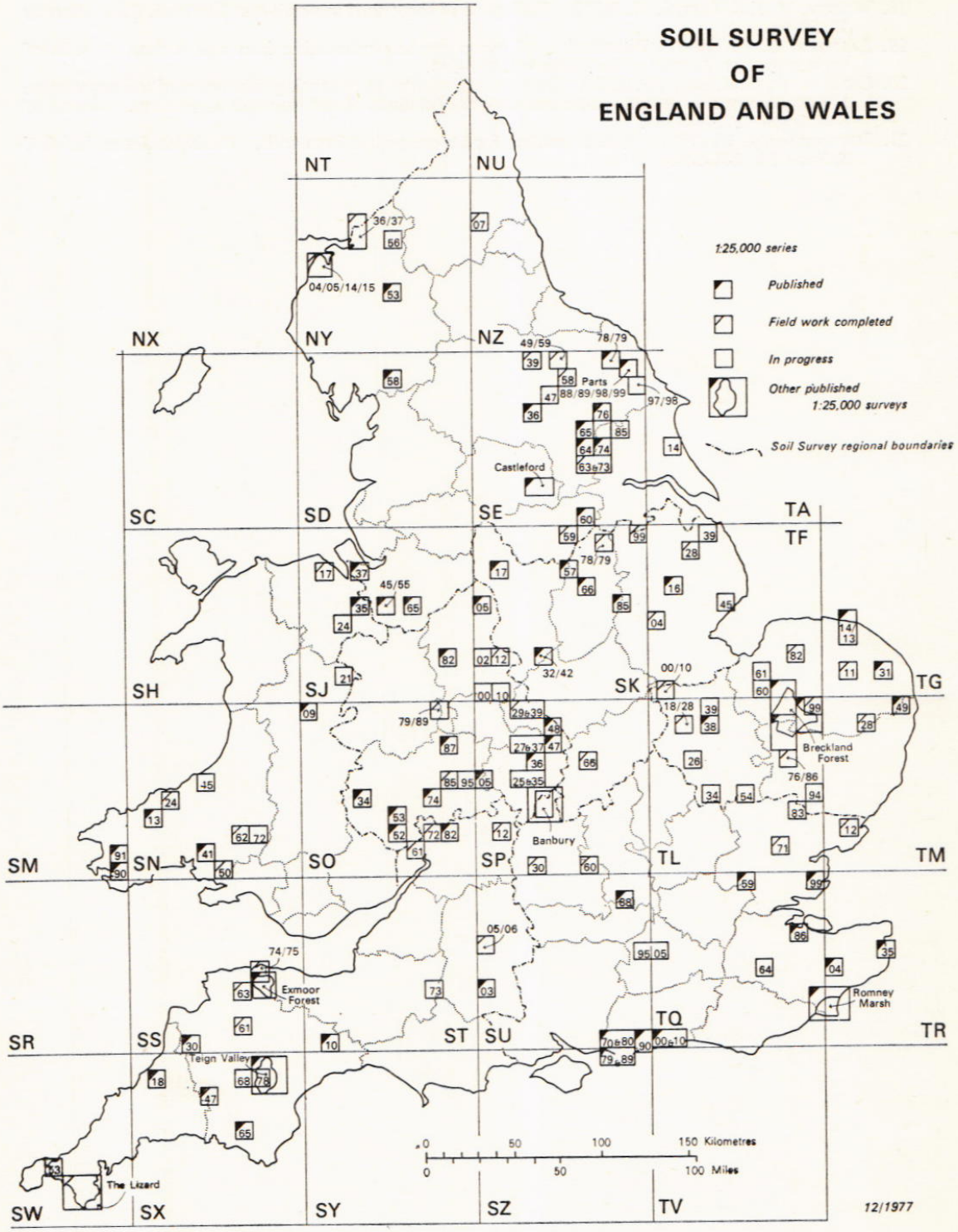
References cited in Report

1. Hartnup, R. (1977) Soils in South Yorkshire I: Sheet SK 59 (Maltby). *Soil Survey Record* No. 42.
2. Bendelow, V. C. & Carroll, D. M. (1976) Soils in North Yorkshire III: Parts of Sheets SE 79, 88, 89, 98, 99 (Pickering Moor and Troutsdale). *Soil Survey Record* No. 35.
3. Corbett, W. M. & Tatler, W. (1974) Soils in Norfolk II: Sheets TG 13/14 (Barningham/Sheringham). *Soil Survey Record* No. 21.
4. Thomasson, A. J. (1971) Soils of the Melton Mowbray district. *Memoir of the Soil Survey of Great Britain.*
5. Fordham, S. J. & Green, R. D. (1973) Soils in Kent II: Sheet TR 35 (Deal). *Soil Survey Record* No. 15.
6. Robson, J. D., George, H. & Heaven, F. W. (1974) Soils in Lincolnshire I: Sheet TF 16 (Woodhall Spa). *Soil Survey Record* No. 22.
7. Matthews, B. (1971) Soils in Yorkshire I: Sheet SE 65 (York East). *Soil Survey Record* No. 6.
8. Jones, R. J. A. (1975) Soils in Staffordshire II: Sheet SJ 82 (Eccleshall). *Soil Survey Record* No. 31.
9. Hall, B. R. & Folland, C. J. (1967) Soils of the south-west Lancashire coastal plain. *Memoir of the Soil Survey of Great Britain.*
10. Hollis, J. M. & Hodgson, J. M. (1974) Soils in Worcestershire I: Sheet SO 87 (Kidderminster). *Soil Survey Record* No. 18.
11. Mackney, D. & Burnham, C. P. The soils of the west Midlands. *Bulletin of the Soil Survey of Great Britain.*
12. Whitfield, W. A. D. & Beard, G. R. (1977) Soils in Warwickshire III: Sheets SP 47/48 (Rugby West/Wolvey). *Soil Survey Record* No. 45.
13. Whitfield, W. A. D. & Beard, G. R. (1975) Soils in Warwickshire II: Sheet SP 05 (Alcester). *Soil Survey Record* No. 25.
14. Harrod, T. R., Hogan, D. V. & Staines, S. J. (1976) Soils in Devon II: Sheet SX 65 (Ivybridge). *Soil Survey Record* No. 39.
15. Whitfield, W. A. D. (1971) Soils in Herefordshire: Sheet SO 82 (Ross-on-Wye West). *Soil Survey Record* No. 3.
16. Mackney, D. & Burnham, C. P. (1966) The soils of the Church Stretton district of Shropshire. *Memoir of the Soil Survey of Great Britain.*

https://doi.org/10.23637/ERADOC-1-134

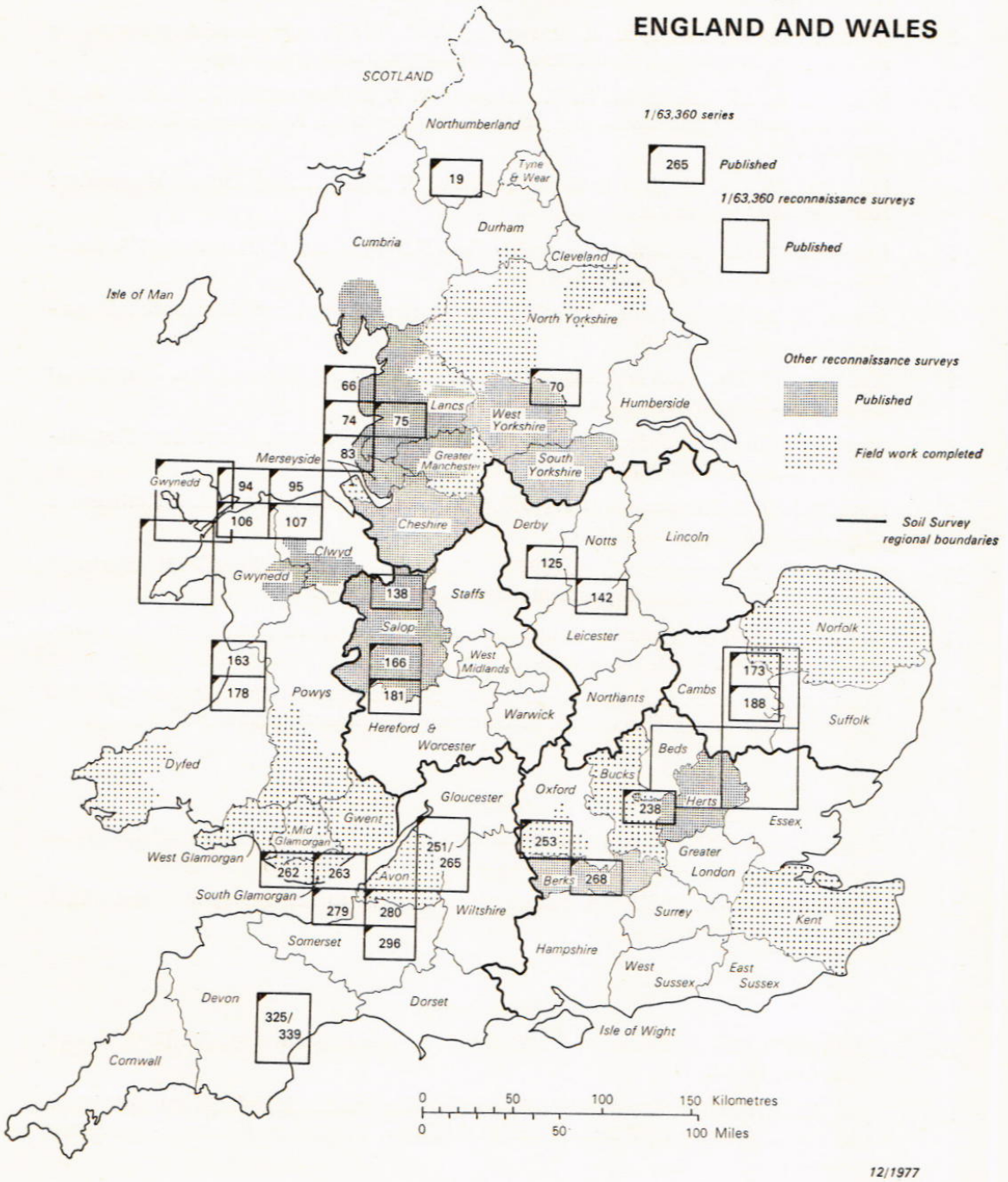
17. CLAYDEN, B. & EVANS, G. D. (1974) Soils in Dyfed I: Sheet SN 41 (Llangendeirne). *Soil Survey Record* No. 20.
18. WILSON, M. J. & TAIT, J. M. (1977) Halloysite in some soils in north-east Scotland. *Clay Minerals* **12,** 59–66.
19. BASCOMB, C. L. (1968) Distribution of pyrophosphate-extractable iron and carbon in soils of various groups. *Journal of Soil Science* **1,** 251–268.
20. GIOVANNINI, G. & SEQUI, P. (1976) Iron and aluminium as cementing substances of soil aggregates. I. Acetylacetone in benzene as an extractant of fractions of soil iron and aluminium. *Journal of Soil Science* **27,** 140–147.
21. SCHWERTMANN, U. (1973) Use of oxalate for Fe extraction from soils. *Canadian Journal of Soil Science* **53,** 244–246.

https://doi.org/10.23637/ERADOC-1-134



https://doi.org/10.23637/ERADOC-1-134

SOIL SURVEY OF ENGLAND AND WALES



https://doi.org/10.23637/ERADOC-1-134 *pp 22*

Publications

Books

1 Avery, B. W. & Bullock, P. (1977) *Mineralogy of clayey soils in relation to soil classification*. Harpenden: Rothamsted Experimental Station, viii, 64 pp.

2 Carroll, D. M., Evans, R. & Bendelow, V. C. (1977) *Air photo-interpretation for soil mapping*. Harpenden: Rothamsted Experimental Station, vi, 85 pp.

3 Hall, D. G. M., Reeve, M. J., Thomasson, A. J. & Wright, V. F. (1977) *Water retention, porosity and density of field soils*. Harpenden: Rothamsted Experimental Station, viii, 74 pp.

4 Hartnup, R. (1977) *Soils in South Yorkshire I: Sheet SK*59 (*Maltby*). Harpenden: Rothamsted Experimental Station, viii, 160 pp.

5 Hogan, D. V. (1977) *Soils in Devon III: Sheet SX*47 (*Tavistock*). Harpenden: Rothamsted Experimental Station, viii, 130 pp.

6 Jarvis, R. A. (1977) *Soils of the Hexham district*. Harpenden: Rothamsted Experimental Station, viii, 72 pp.

7 King, S. J. (1977) *Soils in Cheshire III: Sheet SJ*45*E*/55*W* (*Burwardsley*). Harpenden: Rothamsted Experimental Station, viii, 156 pp.

8 Matthews, B. (1977) *Soils in Cumbria I: Sheet NY*53 (*Penrith*). Harpenden: Rothamsted Experimental Station, viii, 158 pp.

9 Robson, J. D. & Thomasson, A. J. (1977) *Soil water regimes*. Harpenden: Rothamsted Experimental Station, viii, 57 pp.

10 Tatler, W. & Corbett, W. M. (1977) *Soils in Norfolk III: Sheet TG*31 (*Horning*). Harpenden: Rothamsted Experimental Station, viii, 117 pp.

11 Webster, R. (1977) *Quantitative and numerical methods in soil classification and survey*. Oxford University Press, viii, 269 pp.

12 Whitfield, W. A. D. & Beard, G. R. (1977) *Soils in Warwickshire III: Sheets SP*47/48 (*Rugby West*/*Wolvey*). Harpenden: Rothamsted Experimental Station, viii, 124 pp.

Theses

13 Bradley, R. I. (1977) Trace elements in soils in south Ceredigion with special reference to the role of parent material. M.Sc. Thesis, University of Wales.

14 Rudeforth, C. C. (1977) A quantitative approach to soil survey in Wales. Ph.D. Thesis, University of London.

General Papers

15 Clayden, B. (1977) Paleosols. In: *Studies in the Welsh Quaternary*. Ed. D. Q. Bowen. *Cambria* **4**, 84–97.

16 Cope, D. W. (1977) Silty drift in soils on the Wiltshire Chalk Upland. In: *Field Handbook Easter Meeting 1977 Bristol*. Ed. K. Crabtree. Quaternary Research Association, pp. 49–54.

17 Evans, R. & Carroll, D. M. (1976) Remote sensing for small scale soil mapping in England and Wales. In: *Land use studies by remote sensing*. Ed. W. G. Collins & J. L. van Genderen. Remote Sensing Society, pp. 89–122.

https://doi.org/10.23637/ERADOC-1-134

18 FINDLAY, D. C. (1977) Bourne (Avon): A temporary section in gravelly Head. In: *Field Handbook Easter Meeting 1977 Bristol*. Ed. K. Crabtree, Quaternary Research Association, pp. 21–25.

19 HARTNUP, R. (1976) Soil survey as a tool for planners. *Welsh Soils Discussion Group Report* No. 17, 135–147.

20 JARVIS, M. G. (1976) Soil survey interpretation and use. *Welsh Soils Discussion Group Report* No. 17, 97–119.

21 MURPHY, C. P. & BULLOCK, P. (1977) Quantifying soil microstructure. *Laboratory News* No. 134, 81.

22 WEBSTER, R. (1976) The nature of soil variation. *Classification Society Bulletin*, **3**, No. 4, 43–55.

23 WEBSTER, R. (1977) Soil survey: its quality and effectiveness. In: *Soil resource inventories, Agronomy Mimeo*. No. 77–23, Cornell University, pp. 59–70.

RESEARCH PAPERS

24 AVERY, B. W., CLAYDEN, B. & (RAGG, J. M.) (1977) Identification of podzolic soils (Spodosols) in Upland Britain. *Soil Science* **123**, 306–318.

25 BASCOMB, C. L., BANFIELD, C. F. & BURTON, R. G. O. (1977) Characterisation of peaty materials from organic soils (Histosols) in England and Wales. *Geoderma* **19**, 131–147.

26 CORBETT, W. M. (1977) Distribution of loess in northeast Norfolk. *Bulletin of the Geological Society of Norfolk*, No. 29, 3–22.

27 CORBETT, W. M. & HODGE, C. A. H. (1976) Distribution and lithology of drift behind Sheringham, Norfolk. *Bulletin of the Geological Society of Norfolk*, No. 28, 3–27.

28 (Corcoran, P.), JARVIS, M. G., MACKNEY, D. & (STEVENS, K. W.) (1977) Soil corrosivity in south Oxfordshire. *Journal of Soil Science* **28**, 473–484.

29 EVANS, R. (1977) Overgrazing and soil erosion on hill pastures with particular reference to the Peak District. *Journal of the British Grassland Society*, **32**, 65–76.

30 EVANS, R. & JONES, R. J. A. (1977) Crop marks and soils at two archaeological sites in Britain. *Journal of Archaeological Science* **4**, 63–76.

31 (HAMMOND, N. D. C., ASPINALL, A., FEATHER, S.), HAZELDEN, J., (GAYARD, T. & AGNELL, S.) (1977) Maya jade: source, location and analysis. In: *Exchange systems in prehistory*. Ed. J. E. Ericson & T. K. Earle. New York: Academic Press, pp. 35–67.

32 HOLLIS, J. M., JONES, R. J. A. & PALMER, R. C. (1977) The effects of organic matter and particle size on the water retention properties of some soils in the west Midlands of England. *Geoderma* **17**, 235–238.

33 MATTHEWS, B. (1977) Clay-with-flints on the Yorkshire and Lincolnshire Wolds. *Proceedings of the Yorkshire Geological Society* **41**, 231–239.

34 MURPHY, C. P., BULLOCK, P. & BISWELL, K. J. (1977) The measurement and characterisation of voids in soil thin sections by image analysis. Part II. Applications. *Journal of Soil Science* **28**, 509–518.

35 MURPHY, C. P., BULLOCK, P. & TURNER, R. H. (1977) The measurement and characterisation of voids in soil thin sections by image analysis. Part I. Principles and techniques. *Journal of Soil Science* **28**, 498–508.

36 REEVE, M. J. (1976) The use of soil water retention studies in agriculture and hydrology. *Welsh Soils Discussion Group Report* No. 17, 15–28.

https://doi.org/10.23637/ERADOC-1-134

37 STURDY, R. G. & ELDRIDGE, D. J. (1976) Cereal yields in loamy and sandy soils in East Anglia. *Welsh Soils Discussion Group Report* No. 17, 55–84.

38 WEBSTER, R. (1977) Canonical correlation in pedology: how useful? *Journal of Soil Science* **28,** 196–221.

39 WEBSTER, R. (1977) Spectral analysis of gilgai soil. *Australian Journal of Soil Research* **15,** 191–204.

40 WEBSTER, R., HODGE, C. A. H., DRAYCOTT, A. P. & DURRANT, M. J. (1977) The effect of soil type and related factors on sugar beet yield. *Journal of Agricultural Science, Cambridge* **88,** 455–469.

MAPS

41 ALLISON, J. W., BENDELOW, V. C., BRIGGS, D. J., CARROLL, D. M., HARTNUP, R. & JARVIS, R. A. (1977) Soil map of South and West Yorkshire 1:250 000. Southampton: Ordnance Survey.

42 BEARD, G. R. & WHITFIELD, W. A. D. (1977) Soil map, 1:25 000 Sheet SP47 (Rugby West). Southampton: Ordnance Survey.

43 FURNESS, R. R. & KING, S. J. (1977) Soil map of Cheshire 1:250 000. Southampton: Ordnance Survey.

44 HARROD, T. R. (1977) Soil map, 1:25 000 Sheet SS 30 (Holsworthy). Southampton: Ordnance Survey.

45 HARROD, T. R. (1977) Land use capability map, 1:25 000 Sheet SS 30 (Holsworthy). Southampton: Ordnance Survey.

46 HARTNUP, R., BRIGGS, D. J. & ALLISON, J. W. (1977) Soil map, 1:25 000 Sheet SK 59 (Maltby). Southampton: Ordnance Survey.

47 HARTNUP, R., BRIGGS, D. J. & ALLISON, J. W. (1977) Land use capability map, 1:25 000 Sheet SK 59 (Maltby). Southampton: Ordnance Survey.

48 HOGAN, D. V. (1977) Soil map, 1:25 000 Sheet SX 47 (Tavistock). Southampton: Ordnance Survey.

49 HOGAN, D. V. (1977) Land use capability map, 1:25 000 Sheet SX 47 (Tavistock). Southampton: Ordnance Survey.

50 LEA, J. W. & THOMPSON, T. R. E. (1977) Soil map, 1:25 000 Sheet SJ 35 (Wrexham). Southampton: Ordnance Survey.

51 MACKNEY, D. & THOMASSON, A. J. (1977) Winter rain acceptance potential map (England & Wales) 1:1 000 000. Southampton: Ordnance Survey.

52 MACKNEY, D. (WESTERN, S., LAW, R. D., HOLMES, D. A., VIRGO, K. J., DE VOS, J. H. & WHITE, L. P.) (1976) Land use capability map, 1:25 000 Sheet SU 88 (Marlow). Southampton: Ordnance Survey.

53 MATTHEWS, B. & KILGOUR, I. N. L. (1977) Soil map, 1:25 000 Sheet NY 53 (Penrith). Southampton: Ordnance Survey.

54 MATTHEWS, B. & (LE GRICE, S.) (1977) Land use capability map, 1:25 000 Sheet NY 53 (Penrith). Southampton: Ordnance Survey.

55 TATLER, W. (1977) Soil map, 1:25 000 Sheet TG 31 (Horning). Southampton: Ordnance Survey.

56 TATLER, W. & CORBETT, W. M. (1977) Land use capability map, 1:25 000 Sheet TG 31 (Horning). Southampton: Ordnance Survey.

57 WHITFIELD, W. A. D. & BEARD, G. R. (1977) Soil map, 1:25 000 Sheet SP 48 (Wolvey). Southampton: Ordnance Survey.

https://doi.org/10.23637/ERADOC-1-134