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THE DESERTED VILLAGE OF LOW BUSTON, NORTHUMBERLAND: A STUDY IN SOIL PHOSPHATE ANALYSIS

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INTRODUCTION

SOIL PHOSPHATE has been used in numerous published studies, particularly in work from Scandinavia, as a means of locating former settlement sites, ploughed out and completely destroyed, and lying beneath present arable or pasture land. This phosphate derives from the urine and faeces of man and animals together with other organic refuse and forms insoluble complexes with other soil minerals. High intensities are indicative of the presence of former habitations. The technique has been little-used in this country and the exercise described below was designed to examine the variations in soil phosphate intensity to be found below the visible earthworks of a small deserted village, at present under pasture. Sampling was carried out at three levels within the soil with the object of testing whether the 30 cms depth favoured by Scandinavian scholars was indeed the most useful, recognizing of course that the 15 cms level would normally be destroyed upon a ploughed site. The conclusions reached indicate that significant intensities of phosphate do indeed appear at each of the three levels and lead to the suggestion that this type of mapping should be normally undertaken as a preliminary to excavation.

The work was carried out at Easter 1976 by the students of the Alnwick I field party from the Geography Department at Durham University and we would like to pay tribute to their enthusiasm, good humour and tenacity in coping with survey techniques amid wind, snow-flurries and near-zero temperatures.

THE SITE: EARTHWORKS AND DOCUMENTARY EVIDENCE

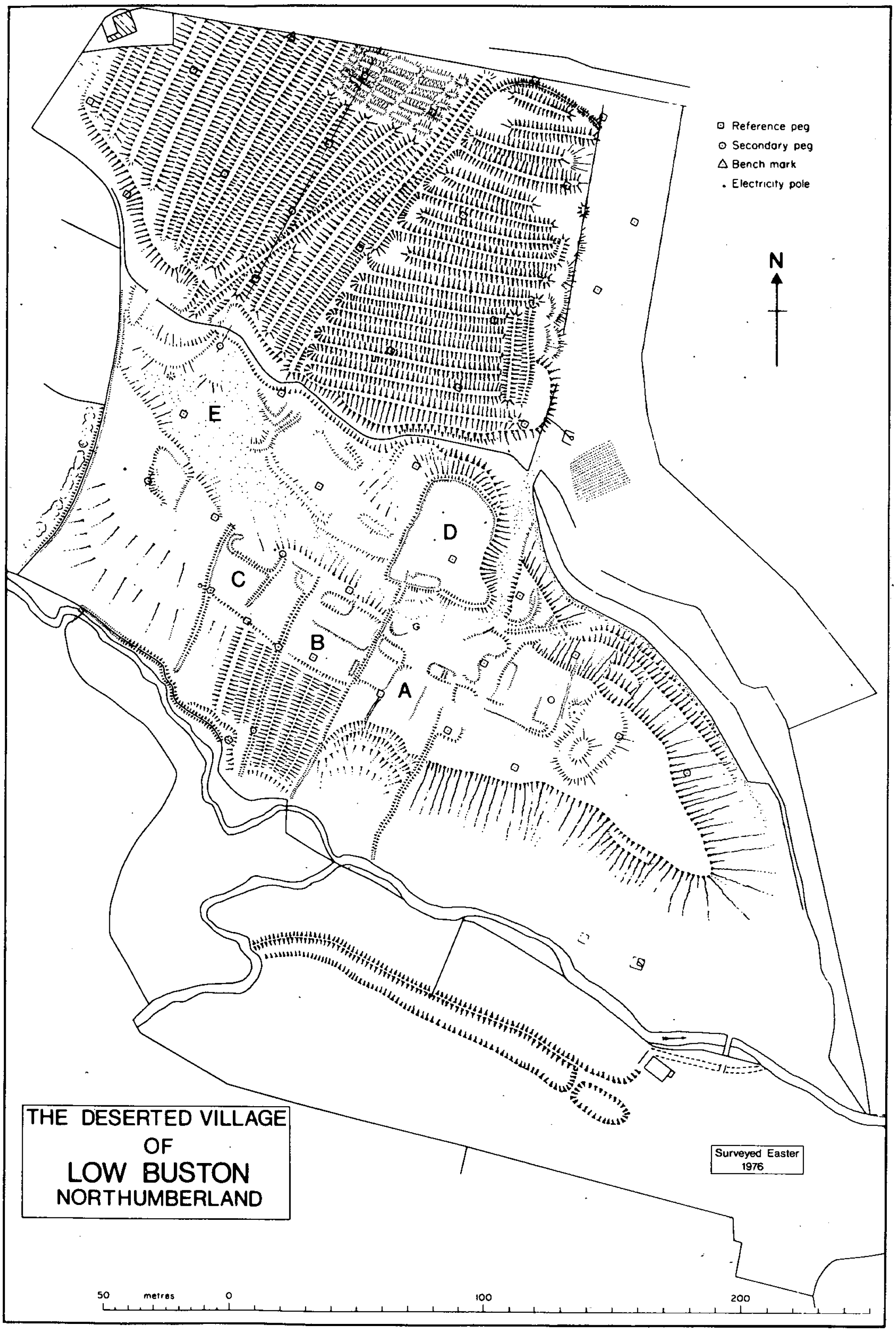
The deserted village site of Low Buston (NU 224074) is clear enough to be marked on all scales of Ordnance Survey map except the former one-inch and the current 1:50.000 series. It occupies a field some 8·8 hectares (19·50 acres) in area (fig. 1), but the village earthworks only cover approximately 3·25 hectares (8 acres), the remainder being given over to ridge and furrow ploughing (now grassed over), steep slopes and wet bottom land. To the south are the extensive remains of a water-mill. The village occupied a flat-topped spur, capped by freely draining fluvio-glacial gravels, which at this point overlie boulder-clays. The northern boundary of the settlement is a stream, beginning as little more than a boggy depression by the western boundary of the field (adjacent to the grounds of the hall) but rapidly becoming deeply incised as it progresses to the east, so that the sharp spur between it and the more important valley to the south can quite reasonably be seen as a site with defensive qualities.

It is probable that the village once extended further to the west and the present eastern boundary of the hall grounds, a ha-ha, sharply separates the earthworks from the landscaped garden, but it must be admitted that, for reasons to be suggested below, there are no unambiguous traces of any earthwork demonstrably cut by the ha-ha boundary. The surviving earthworks, however, fall into four well-marked categories:

Group I, comprising four tofts (A–D); on the southern side of the settlement the toft boundaries comprise well-defined low mounds and run from the ridge crest down to the stream. At their heads, the northern ends, rectangular hollows and raised platforms indicate the presence of former buildings and possibly crew-yards, sunken areas, where cattle were once penned and where the systematic removal of manure has eroded a hollow. Toft A embraces the steep declivity of a former meander (it must be remembered that the active erosion of this landscape by melt-water in immediate post-Glacial times would have been appreciably greater than that continuing at present), but tofts C and B reveal traces of ridges and furrows. This is significant in that these have been tailored to fit the tofts and it is clear that in this case the tofts have not been developed over existing field ridges, an explanation more usually advanced. Toft C indeed contains a clear division between ridged arable and non-ridged lands. Toft D on the north side of the village is less regular in shape, being adapted to the contours of the ridge-crest.

Group II comprises the remaining earthworks visible within the settlement, and are less clear-cut than those of Group I; there are hints of an enclosure blocking the eastern end of the village, but towards the house these earthworks become no more than vague swells and hollows, grading imperceptibly with the features of Group III.

Group III consists of the former roadway and a possible green. The road enters the village via a hollow-way half-way along the north side, to the east of toft D, turns sharply to the west and becomes the village street, eventually merging with a large flat area, free of earthworks at the western end of the surviving remains, possibly to be interpreted as a green. There are slight hints that the roadway may have continued further west, parallel to the stream. In the centre of the village this roadway appears to have been virtually blocked by a continuation of the boundary bank between tofts A and B, a curious feature, showing no signs of being a late addition, and conceivably being a device for penning cattle within the green, but demanding of course a cattle-proof fence along the south side, and possibly one along



Reference peg
Secondary peg
Bench mark
Electricity pole
N
E
D
C
B
A
THE DESERTED VILLAGE OF LOW BUSTON NORTHUMBERLAND
Surveyed Easter 1976
50
metres
0
100
200

Fig. 1.

the headland of the surviving ridge and furrow on the north side of the stream.

Group IV comprises the ridge and furrow ploughing, the main furlong running south-west to north-east, cut by the roadway, and visible as splendid soil marks in the adjacent field. A series of shorter ridges, butts, run east to west. Two particularly odd features occur: a discordant ridge cuts diagonally across the main furlong, having the appearance of an access ridge, but it fails to pass accordantly, as one might have expected, round the northern end of the butts to join the line of the present road. Second, a series of irregular bumps reveal where some perverse ploughman seems to have tried to plough at right angles across the existing ridges of the main furlong.

This superficial examination of the site hints at two periods of visible earthworks, those of Group II being the earliest, those of Group I being later, although at no point is clear-cut discordant superimposition visible, except possibly at the south-western corner of toft D, where the toft boundary appears to lie over, and extend beyond, the former northern edge of the roadway. This interpretation of the site must, however, be treated with some caution as it is possible that the western end of the surviving earthworks has been robbed of material when the landscape garden behind the ha-ha was levelled, indeed this may be a partial explanation of the "green".

The documentary evidence for the village is conveniently summarized in the *History of Northumberland*: the earliest unambiguous reference to Low Buston is in 1296, when a Lay Subsidy roll distinguishes between *Botlesdon Superior* and *Botlesdon Inferior*, having respectively ten and eleven taxpayers. By 1538 Low Buston could muster no less than 31 able-bodied men, as compared with twelve men from High Buston and 24 from the large village of Shilbottle, somewhat to the north. During the sixteenth and seventeenth centuries a family called Forster appear to have been engrossing or accumulating farms, and by 1702 this family were holding "a capital messuage commonly called the Stane-house (*i.e.* stone house) and seven farms", these latter being fiscal rather than tenurial units. Final depopulation of the village seems to have taken place between 1778 and 1818 when Charles Francis Forster emparked the grounds of the great house and extended the building. When sold in 1818 the estate comprised some 196 hectares (490 acres) of land.

Depopulation as a by-product of engrossing was common in Northumberland and the northern portion of the county contains many former villages, well-tenanted as late as the seventeenth century but reduced to two farms by the mid-nineteenth. Such developments opened the way for the creation of the regular fields and great farmeries (drawn from the idealized plans published in contemporary textbooks) which are now such dominant features of the landscape.

The Method

a. *Topographic Survey*

A grid was constructed over the entire area being surveyed, using as an orientated base line a convenient line of electricity posts. The grid was set out using an Autoset level and wooden pegs were driven into the ground at 30 m intervals along the two base lines and at 60 m elsewhere. Detailed mapping was carried out using plane tables, ranging poles and 30 m chains. A gridded base map was fixed to the tables so that the measurements and recorded detail could be entered directly onto the map. This allowed errors to be detected and corrected as the mapping progressed. Each grid point was accurately levelled into Ordnance datum using an Autoset level, and the data was used to draw up the contour map (fig. 2a).

b. *Phosphate Survey*

On-site analysis of soil phosphate was carried out using the test developed by Grundlach (1961) and simplified by Schwarz (1967). The even more simplified version developed by McCawley and McKerrell (1971) proved impracticable in this case due to the need for rather prolonged storage of chemicals prior to use. The Schwarz method measures phosphorus content by the intensity of the blue coloured phosphorus complex formed by addition of acidified ammonium molybdate and a 0·5 solution of ascorbic acid to a small (0·1–0·5 g) soil sample placed in the centre of a filter paper. Although this method is quick and very easy to carry out in the field it does have a number of drawbacks. Firstly, the chemicals have a limited life, particularly the acidified ammonium molybdate solution, although storage of this in the dark and at low temperatures will preserve it for up to ten days. Secondly, the rate of reaction is related to temperature and in the cold conditions experienced during this investigation full colour development took upwards of five minutes. Finally, the method as described by Schwarz employs an entirely descriptive measure of soil phosphate concentration on a scale of 0–4. In this study the method was modified by developing in the laboratory a number of standard phosphate solutions and from these preparing a colour chart for 50, 100, 150, 200, 300, 400, and 500 parts per million (ppm) concentrations of phosphate. The colour developed in the field could then be directly compared with these standard colours and hence a more accurate assessment of phosphorus concentration could be made.

The field sampling was carried out by small groups using a 2·5 cm diameter screw auger to collect samples from each 30 m grid point at depths of 15, 30 and 45 cms. These were chosen following a survey of the Scandinavian literature which indicated 30 cm to be the most frequently employed sampling depth. The 15 and 45 cm depths were added simply to permit a comparison of results, although the 15 cm depth could in certain circumstances be influenced by the use of phosphate fertilizer. As the survey


58·00
57·00
56·00
55·00
54·00
53·00
52·00
51·00
50·00
49·00
53·00
52·00
51·00
Reference peg
Secondary peg
Bench mark
Electricity pole
LOW BUSTON: Nb.
SITE CONTOURS
IN METRES
50
metres
0
100
200

Fig. 2a.

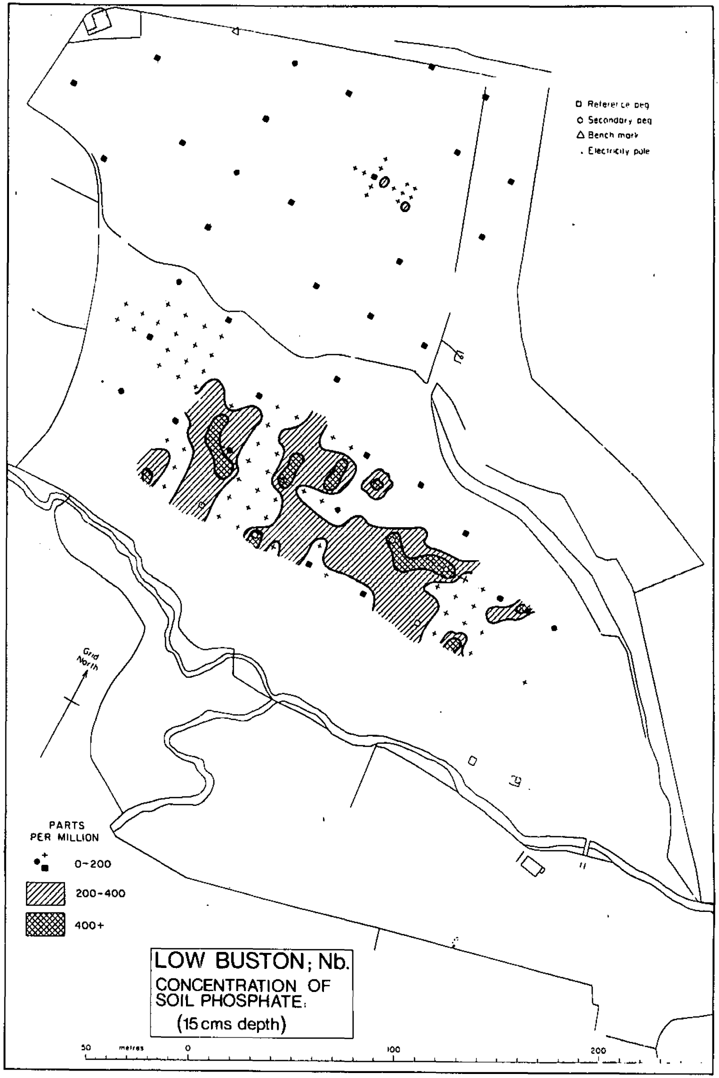

Reference peg
Secondary peg
Bench mark
Electricity pole
Grid North
PARTS
PER MILLION
0–200
200–400
400+
LOW BUSTON; Nb.
CONCENTRATION OF
SOIL PHOSPHATE:
(15 cms depth)
50
metres
0
100
200

Fig. 2b.

progressed sampling frequency was increased to 10 m intervals over the area of the deserted village and at any point where phosphate concentrations of 100 ppm or greater were recorded.

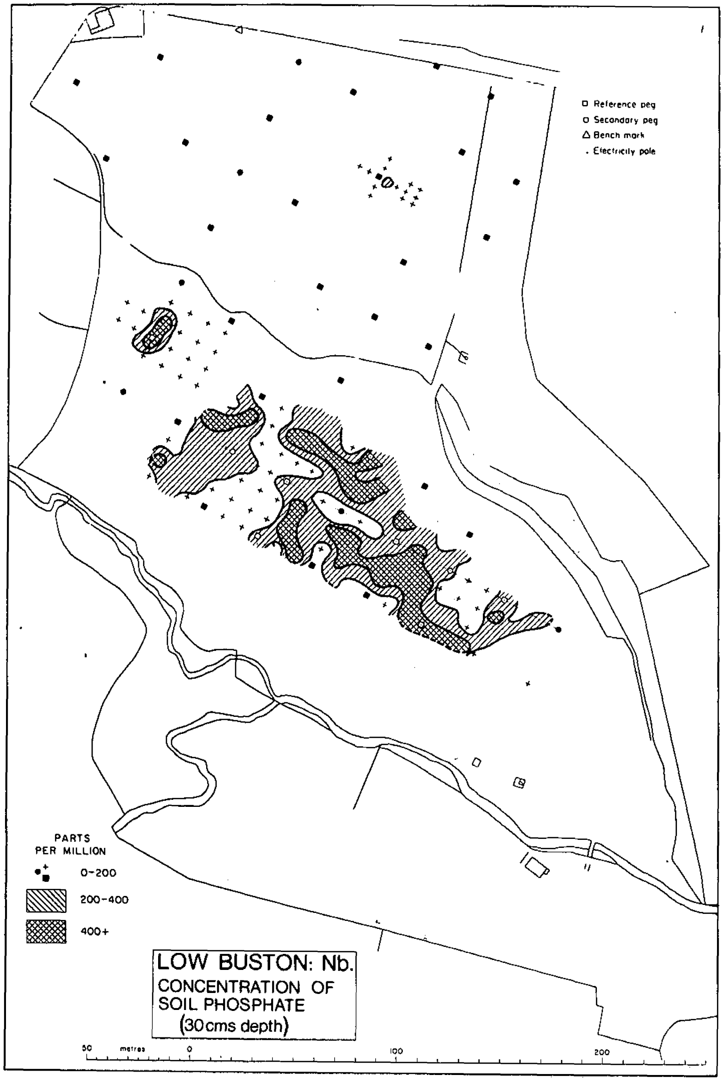
The results of the survey for each of the three sampling depths were plotted on separate maps (fig. 2b and figs. 3a and b) and contours of phosphate concentration were constructed. The value of 200 ppm was taken to be the lowest value of any significance, this being similar to most of the values obtained by McCawley and McKerrell (1971) in their studies using this method.

Discussion and Conclusions

All three maps demonstrate the presence of a sharp gradient between the phosphate intensities found beneath the former arable fields and those beneath the village area, indeed this is sharper in practice than the maps indicate because the normal readings for the field samples are 50 ppm or lower. A comparison of figures 2a–b and 3a–b will indicate that while our survey is not entirely complete a sufficiently large area was covered to permit conclusions. It will be noted that the readings at the 15 cm level are more complete than those for the 30 cm level, and those of the 30 cm level more complete than those for the 45 cm level. This is because a second visit to the site to attempt to close some of the phosphate contours took place at the end of the 1976 drought and the soil auger simply would not penetrate the soil. Considering each map in turn:

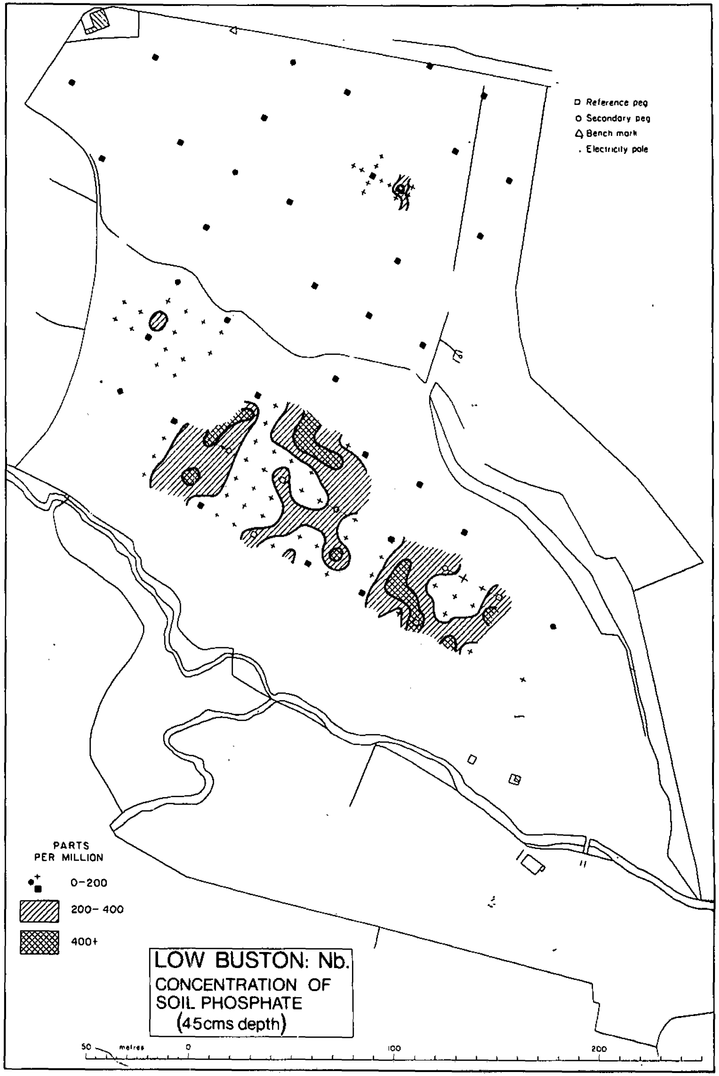
30 cm. The 30 cm level will be examined first; the highest concentrations (400+ ppm) are clearly located close to the houses, but not necessarily within them, and the settlement as a whole is characterized by readings above 200 ppm. High levels do not appear in the roadway, pointing perhaps to regular scouring to remove manure. The distribution of the highest concentrations extend beyond the limits of tofts A–D suggesting that the earthworks of Group II may indeed represent an older level of occupation. This is particularly notable at the eastern end of the village, but isolated areas of high concentration appear at the western end, suggesting that landscaping may not have removed all occupation levels. Significantly it is at this western end where the 15 cm level, comprising perhaps re-spread top-soil, reveals no concentrations above 100 ppm. Two further points may be noted, the area of low readings extended across the village at the western end of toft B, and the high concentration in one small location amid the northern ridges of the butt furlong.

15 cm. The 15 cm level demonstrates essential continuity with the 30 cm level, but there are slight changes in the location and extent of the high values. The roadway sustains low levels, but the isolated high in the butt furlong persists.



Reference peg
Secondary peg
Bench mark
Electricity pole
PARTS PER MILLION
0-200
200-400
400+
LOW BUSTON: Nb.
CONCENTRATION OF SOIL PHOSPHATE
(30cms depth)
50
metres
0
100
200

Fig. 3a.



Reference peg
Secondary peg
Bench mark
Electricity pole
PARTS PER MILLION
0-200
200- 400
400+
LOW BUSTON: Nb.
CONCENTRATION OF SOIL PHOSPHATE
(45cms depth)
50
metres
0
100
200

Fig. 3b.

45 cm. At this level the concentrations within the limits of tofts A–D are reduced in area, but the presence of intensities in excess of 400 ppm at the eastern end of the earthworks is confirmed and reinforced. It will be noted that the band of low values running across the centre of the village appears at both this and the 15 cm level but at this level the island of high readings adjacent to the "green" at the western end of the village is drastically reduced in area, to be expected if the suggestion that the surface layers have been stripped off is indeed true. Thus, at this end of the village the present 30 cm level could represent the original 45 cm level. The isolated concentration in the butt furlong persists, and is indeed most extensive at the 45 cm level.

Clearly, to explain this distribution one must excavate and test the relationship between phosphate concentrations and buried structures, houses, byres, stockyards and cattle yards (crew yards). The isolated concentration in the field to the north of the village may indeed only represent a burial of animal remains (following cattle murrain?) but the extent, involving an area at least eight metres by eight metres, could make this archaeologically interesting. Two general conclusions emerge: the 30 cm level does indeed provide a useful picture of variations in phosphate intensity but it is clear that the 45 cm level and where possible the 15 cm are worth examination if an intensive rather than a rapid survey is involved. Even within the context of the limitations and practical difficulties present during this pilot investigation the readings show sufficient variation for errors in colour-matching between field sample and laboratory-prepared colour card not to affect the result greatly, and we are convinced that our untrained student field surveyors, while working more slowly than a trained team, took adequate care with the work. Secondly, there are clear archaeological implications here: we would suggest that a soil phosphate map should be a normal preliminary to excavation. The evidence, concealed within the soil profiles, is of course destroyed during the process of examination by destruction. We would suggest that the initial sampling could be closely tied to the establishment and insertion of site reference pegs, the auger hole being used eventually for peg insertion, so as to cause minimum damage to sub-surface stratigraphy. The careful study of soil profiles over archaeological sites has implications for both the archaeologist and the pedologist.

Future Work

We are planning to extend these studies into a shrunken village and at Easter 1977 commenced work at Edlingham, Northumberland, to begin to assess the impact of continuous occupation upon soil phosphate levels and hope eventually to move in two directions, into villages which have survived as functioning settlements and into settlements entirely destroyed by agricultural activity. We believe that a knowledge of a variety of sites, with varied histories, and varied complementary sources, is essential for evaluating the more scanty evidence of totally destroyed villages.

ACKNOWLEDGEMENTS

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