Section D: Non-Invasive Surveys

D.1: Vegetation Survey

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Introduction

A botanical survey of the Hagg Cottages site was carried out, before the archaeological excavation started. The purpose of the survey was three-fold. Firstly it is important to record all the plants that grow there before any dig, and to preserve any rare or unusual species from a viewpoint of natural history conservation. Secondly, the survey recorded any plants there that related to the occupation of the site, such as domesticated or ruderal species, that might prove useful to the archaeologists in interpreting their dig. And thirdly, the botanical map will be precisely correlated with the final archaeological map in the hope of identifying useful indicator species that might in the future be useful for archaeologists in detecting, for example, hidden foundations.

Circumscription of the survey

The total area surveyed comprised approximately 4000 m^2, more-or-less in SJ853774 and was divided into a grid of fifty 10 m squares (6H8 with two outliers). The site is surrounded by pasture fields to the east and south, by semi-natural woodland to the north, and by a grassy public path to the north-west; the "Sandhills proper" (i.e. the open land left after the removal of the hills of mine spoil) lie to the south-west corner.

The vegetation survey and mapping started in March 2003, as soon as the surveying grid had been laid by the archaeological surveyors. It needed to finish by May when the archaeologists moved in for the dig. This restricted time meant that many plants were still emerging as the survey finished, and it is clear that from later observations that the extent of many species was much greater than evidenced by the survey. Species excluded include: *Angelica sylvestris* (in 20/30, by main path away from cottages, and *Carex ovalis* (in 10/30, on main path away from cottages).

Vegetation map

The map was built from 459 numbered components, either as individual tree locations (one number often including many distinctly plotted individuals), or as contoured zones of single species or species mixtures. There were also several larger unnumbered but defined contoured areas. These were measured to the nearest centimetre using the grid, plotted on site to the nearest 10 cm on graph paper, and then computerised as a bitmap. Many widespread and scattered species, such as the mosses *Kindbergia praelonga* and *Brachythecium rutabulum*, were not considered to be mappable, The 459+ original components were then rationalised to 54 vectorised categories to enable an interpretable overview and GIS analysis. From this, 14 layers (including the fence, paths, cottage walls, well, and grid) were selected to be presented in Figure D.1. There was no evidence of any direct associations between particular plants and for example the cottage foundations (but see *Indicators of habitation*, below), and no analysis was carried out. However, a number of observations are worth recording.

Initial findings

The Hagg Cottages site was occupied until the 1960s, and forty years on the vegetation is still reverting to woodland, with the present survey providing a snapshot

in time. No unusual species was found on the site, so minimal ecological damage was thought to be caused by the dig. As the result of the plant species list analysis, the site is characterised as a complex semi-natural woodland with an admixture of naturalised garden species with the following broad grouping of plant species (Bunce *et al.*, 1999) forming associations characteristic of:

1. neutral/acidic woodland patches – open woodland on mildly acidic soils. Often with Sycamore (*Acer pseudoplatanus*) as the canopy species. Ground cover vegetation consists of *Pteridium aquilinum*, *Chamerion angustifolium*, *Rubus fruticosus* agg.
2. Oak/Birch woodland has variable soil conditions and represented at the site by *Quercus* sp., *Betula* sp., *Sorbus aucuparia*, *Pteridium aquilinum*, *Primula vulgaris.*
3. Woodland on heavy soils – *Dryopteris dilatata, Hyacinthoides non-scripta*, *Oxalis acetosella*, *Ranunculus ficaria*.
4. Wooded stream sites and waterlogged soils – *Salix* sp., *Betula* sp., *Juncus effusus, Epilobium hirsutum*, *Digitalis purpurea*, *Oxalis acetosella*, *Solanum dulcamara*.
5. Fertile hedges/crop boundaries – canopy consists almost entirely of *Crataegus monogyna, Prunus domestica* with understory *Sambucus nigra.* Ground cover: *Urtica dioica*, *Rubus fruticosus* agg., *Galium aparine*, *Hypericum perforatum*, *Cirsium arvense*.

Seventy percent of the species recorded at the site (see Appendix D.1), including a group of coloniser species such as the willow *Salix cinerea*, birches *Betula* spp., Ash *Fraxinus excelsior*, Sycamore *Acer pseudoplatanus*, the bramble *Rubus tuberculatus* and the helleborine *Epipactis helleborine*, represent forest and hedgerow species and show that neighbouring woodland rather then the surrounding field acts as a source for vegetation formation on this site. The only species of orchid widely recorded at the site, *Epipactis helleborine,* according to Carey and Dines (2002), is usually found in secondary woodland and also may invade urban habitats, particularly abandoned gardens. It is almost ubiquitous in the surrounding disturbed woodland, but is overlooked because of its greenish flowers.

Indicators of habitation

Many of the plant species provide insights to the past. Changes in distribution and structure of components of vegetation occur over time manifesting themselves in a dynamic nature of vegetation. Some of these changes are due to intrinsic properties of the plants forming a vegetative cover, others are due to environmental and historical factors. Analysis of vegetation, therefore, does not only allow assessment of current ecological properties of the site in obvious and easily measurable manner, but also provides important insights into its past. Damsons (*Prunus domestica*), raspberries (*Rubus idaeus*), daffodils (*Narcissus* cv), roses (*Rosa* cv) and primroses (*Primula vulgaris*) are evident indicators of domestic planting on the site, and the native bluebells (*Hyacinthoides non-scripta*) may also have been imported or encouraged. Nettles (*Urtica dioica*) are also an indicator of occupation.

Some mosses such as the Palm-tree Moss (*Plagiomnium undulatum*) may indicate buried foundations. Watson (1971) says “On occasion a moss will have an interesting ‘story to tell’, as in the case of [*Plagio*]*mnium undulatum*, the presence of which (Hoermann, *in litt.*) led to the discovery of a lost village in a forest in Austria. This

moss had selected the locally enriched ground where the former village had existed before its total destruction during the Thirty Years' War".

According to PW Richards (*pers. comm.*) a field course in the mid 20th century was surveying vegetation in the forest, and a student mapped *P. undulatum* in straight lines at right-angles to each other. The student was chastised because nature doesn't work that way, but of course he was right and had mapped the foundations of the lost village. The date of the raising of the village would have been about 1620. In reasonably poor acid soil, mortar in foundations provides a little lime, and also human activity against walls may also provide other nutrient enrichment.

P. undulatum has picked out foundations elsewhere in the Sandhills area (remains of uninhabited mining buildings at around SJ85277748), but not for the Hagg Cottages. The moss is however particularly abundant in the whole Hagg Cottages area, compared with nearby areas, and this probably indicates an overall enrichment caused by gardening, middens, etc., within which the foundations would not be particularly favoured.

Restoration of site

Consideration could now be much better given to how the site should be restored, either to its recent condition, or maybe kept as a more open habitat. In practice, one year on, the site is rapidly healing to its former state: bluebells had been dug up and stored in a cellar during the dig, and then replanted, and were flowering again the next spring. The brambles (*Rubus* spp.) that had been mowed from the area in front of the cottages, are already reclaiming their area, but in the meantime Common Ragwort (*Senecio jacobaea*) has taken advantage of the clearing with a spectacular flowering.

The disturbance of soil for the dig itself has resulted in a flush of several ruderal species previously unreported from the site. These include mosses, and flowering plant species from long-dormant buried seeds germinating, for example the little Marsh Cudweed *Gnaphalium uliginosum*. But particularly noticeable (July 2004) is the pretty yellow Musk *Mimulus moschatus*, which would have been grown as a cottage garden plant. These will be overgrown and vanish until the next dig. In effect the site has already restored itself, and any further human intervention would need to be taken on its own merit.

D.2: Topographic Survey

By Malcolm Bailey and Graham Mottershead

A topographic survey was conducted on site in May 2003. This was done using the site grid and a total station theodolite. The aim of this survey was to map any features which appeared at ground level which might aid in located the cottages, associated out-buildings and possible middens. The results (Figure D.2) indicated the general slope of the site running East to West and the banks running along the eastern and southern fence lines. The topographic survey also clearly indicated the well next to the Stanley cottage and a marked depression in this area which it was supposed could be caused by the collapse of the cellar in this structure. Besides the contemporary tracks over the site, no other features were picked up by this survey.

D.3: Electro-Resistivity Survey

By Malcolm Bailey and Graham Mottershead

In June 2003 both resistivity and magnetometry surveys were carried out during the project using a resistivity meter and a fluxgate gradiometer both built by electronic engineering department of UMIST. Both were attached to a data-logger with geophysical logging software. The data collected in the field was processed using interpolation software. The entire site was covered by both these surveys and a reading was taken every metre within the site grid.

The electro-resistivity survey produced some interesting results (Figure D.3). Because of the dense coverage of vegetation over the site it was presumed that the results of this survey would be limited, and that tree roots would obscure any features. However this was not the case and some clear readings were obtained. This included the area where the Stanley cottage was situated where four large anomalies appear. These comprises an irregular patch of interference with two linear anomalies to its north and curving anomaly at the very edge of the area. These probably represent the Stanley cottage and suggest that rubble was spread across the area after demolition. The anomalies to the north and east of the cottage remains may also be middens associated with the cottage eroding out of the bank. A linear anomaly running north-east to south-west across the eastern side of the area and then turning south-east is likely to be a pipe and is probably related to another linear anomaly running east to west in the northern side of the area, although they do not correspond with any of the known services on site which appear in the plans of the area.

It was interesting to note that Hagg Lane was not picked up by this survey. Also the electro-resistivity survey was unable to pick up any distinct features to indicate the remains of the southern cottage, although the area where it was likely to be situated appeared as a rectangular patch of hard-pact soil. Excavation revealed the reason for this when it was discovered that there was no rubble demolition layer for this cottage as most of the structural remains had been removed. Also a hard packed yellow clay had been spread across the site after the demolition of the site which seems to have obscured the resistivity readings.

D.4: Magnetometry Survey

By Malcolm Bailey and Graham Mottershead

Although much of the area was masked by geoferrous litter, probably as a result of the demolition of the cottages, it was possible to pick up a number of anomalies from the magnetometry survey (Figure D.3). One of these corresponded with one of the three anomalies to the north west of the cottages. The remains of the Stanley cottage and midden eroding out of the bank were once again clearly definable. The linear anomaly which ran between the cottages was also picked up by the magnetometry survey adding weight to the supposition that it is a metal pipe. Any clear evidence of the remains of the southern cottage and Hagg lane were also lacking in the magnetometry survey**.** A group of features represented by irregular anomalous areas on the resistivity plot and several magnetic spikes on the magnetometry plot may represent below ground remains, such as middens, but their nature is unclear and it is possible they result from general geoferrous litter.