



Understanding England's Landscapes: An Aerial Survey Approach To A National Mapping Programme For England

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Abstract

The purpose of this paper is to present the challenges and problems we face at a national level in utilising the existing aerial photographic resource and the roles that computer applications play in maximising the potential for aerial survey. This includes the collections of aerial photographs, approaches to mapping, interpretation, as well as the presentation and dissemination of results.

1 Introduction

Aerial photography for archaeology is a cyclical process. The process involves taking aerial photographs, curating and making them accessible in libraries as well as interpreting them for mapping projects. Ultimately their use can lead to a better understanding of past human behaviour as well as assisting in the development of preservation strategies. The purpose of this paper is to present a brief résumé of the RCHME's National Mapping Programme which began as a cropmark classification project in 1988 (Edis *et al* 1989) and broadened its scope to include all archaeological features seen on aerial photographs (Bewley 1995).

The National Mapping Programme is now at a cross-roads in terms of new technologies and new approaches to record dissemination and creation within the National Monuments Record (NMR). The methodology which has developed since 1988 has to be evaluated in the light of these developments and in particular in the use of computer applications, especially new software development and GIS.

2 The background

Aerial photography for archaeology is approaching its ninetieth birthday, and archaeological aerial photographs have been accumulating in a number of libraries throughout England. The two major sources, National Monuments Record (NMR), the public archive of the RCHME, and the Cambridge University Committee for Aerial Photography's library hold over 900,000 photographs taken for archaeological purposes (Bewley 1993). Each year more aerial reconnaissance takes place adding new information to this enormous resource (Featherstone *et al* 1995, Featherstone 1994; Griffith 1990). See also Figure 1.

The majority of the twentieth century has been one of data gathering (i.e. reconnaissance surveys and taking photographs). The exception in the early years was the work of OGS Crawford (Crawford 1924, 1929 and 1955) whose approach was to use aerial photographs as a means of creating maps which depicted an archaeological site or landscape, with an interpretation of its meaning. This approach was further developed by the RCHME (RCHME

1960) and by others (Bewley 1984a and b, Palmer 1984, Whimster 1989) in the early 1980s.



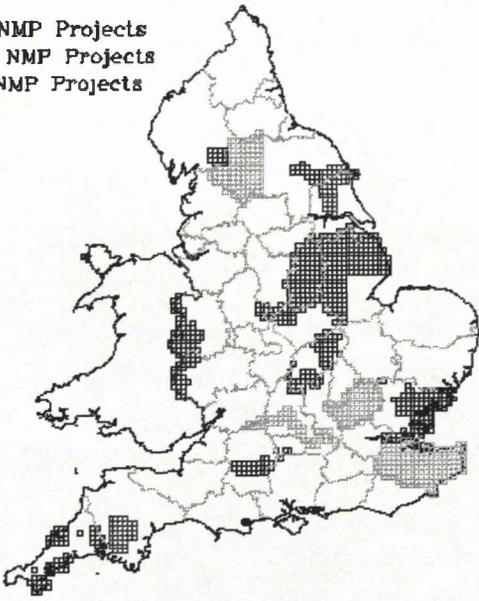
Figure 1 Distribution of aerial photographs in England 1996.

With the creation and development of both the National Monument Record and regionally-based Sites and Monument Records in the last twenty years, the need for mapped information became fundamentally important. The significance of the mapped information was also realised by the national body responsible for the statutory protection of archaeological sites in England, English Heritage (EH). During the late 1980s EH's Monument Protection Programme (MPP) was established to increase the number of protected sites within England (Fairclough 1996). Research projects working on the classification of archaeological sites seen on aerial photographs (especially cropmarks and soilmarks) had begun in the 1980s (Bewley 1984a and b, Whimster 1989). Classification was taken further in a project designed specifically to solve the problem of describing sites in a systematic way, for use in the MPP when the MORPH and MORPH2 computerised

recording systems were developed (Edis *et al* 1989, Bewley 1995). Four pilot projects were jointly funded by the RCHME and English Heritage (Hertfordshire, Kent, Thames Valley and Yorkshire Dales) see Figure 2.

NATIONAL MAPPING PROGRAMME

- Full NMP Projects
- Pilot NMP Projects
- Pre NMP Projects



To September 30th 1997

Figure 2 NMP progress.

Since then all NMP projects, which includes those mapping projects which preceded the pilots but had similar aims, e.g. the Yorkshire Wolds (Stoertz 1997) and Dartmoor, as well as new projects, have mapped 1187 maps. This represents 22% of the total of 5,444 maps at 1:10,000 scale. During 1995 an internal review of NMP was completed and with the changes to the organisation of the RCHME it was an appropriate period to evaluate possible new approaches to the methodology of NMP.

3 Current position and future directions

The evaluation falls into three areas: methodology of mapping, approaches to recording, and analysis of results.

3.1 Methodology of mapping

The approach to date has been a mixture of manual transcription onto translucent film overlays and computer-aided rectification using the AERIAL 4.2 programme (Haigh 1991). The one exception to this has been the project, funded by the RCHME and run by Northamptonshire Heritage, to map Northamptonshire using digital methods. This project is still ongoing and has been a research and development opportunity to examine the feasibility of working in a totally digital environment. So far the products have been highly successful and digital maps are used every day for planning purposes on the local GIS network using Mapinfo. The digital plot files from AERIAL are enhanced using Adobe Photoshop package and can then be linked to the MORPH2 records and cross-referenced to the SMR.

Within the RCHME there is a commitment to move to digital mapping, and trials using digital Ordnance Survey

(OS) maps have begun (late 1997). For one project, to map the archaeological sites in the Avebury World Heritage Site area, the OS have supplied digital maps (Bewley *et al* 1996). The AERIAL program will still be used (including the newer versions 4.3 and 5.0) as will AutoCad 14 for preparing the final digital plans. The move to digital mapping for all the NMP projects (which are based in two RCHME locations, Swindon and York, as well as in the other two external locations, in the Cornwall Archaeological Unit and Essex County Council; the Northamptonshire Heritage project has already been mentioned) will take a number of years. The resources required are not yet available to purchase the required hardware and software and the training of staff in the new methodologies, which has now begun, is also a considerable commitment of time.

3.2 Approaches to recording

Since the early pilot projects began and with subsequent developments in the requirements at a national level, the current recording system, MORPH2, has to be replaced. The basic approach and philosophy behind the recording system, as published (Edis *et al* 1989) will not change. The need for morphological descriptions of sites whose date or function are unknown is an agreed, fundamental principle, though it is more likely to be useful for prehistoric, Roman and Romano-British periods than later ones. There are four morphological tables on the international database - one for Enclosures, Linear Features, Linear Systems and Macula, (see Edis *et al* 1989). For the Yorkshire Dales project, which was the first to use MORPH2 and included the systematic recording of earthworks and stoneworks as well as cropmarks, an input screen to include industrial sites on a presence-absence basis was devised (Horne and MacLeod 1994). MORPH2 is a suite of programs that manage a number of related databases providing a closely structured method of describing archaeological features. The database conforms to the dBase3 standard, the programs are run using FOXR (the runtime version of FoxPro) and the indexes are of the FoxPro type.

The need for a recording system which produces a database which can be analysed within the project areas, or by combining project areas is also fundamentally important. However, the development of the MONARCH system for the National Monument Record and the requirement for all new archaeological sites recorded by the survey staff to be input to MONARCH meant that a more streamlined flow of information was necessary. The transfer of data from MORPH2 to MONARCH is too costly in time and a replacement was necessary. The review of NMP and the requirements of a national monument recording system, currently MONARCH, has allowed for some of the anomalies and problems of using MORPH2 to be ironed out.

A proposal for a new recording system has been drawn up and is currently being evaluated in terms of its feasibility and costs. The approach has been to allow the core fields, required by MONARCH, to be input as an opening screen and then to allow further, more detailed morphological recording to take place, if necessary, on subsequent screens. The current system of recording (MORPH2) uses PCs, and transfer its data, via a tag loader to the MONARCH system.

MONARCH is a three-tier client server application which comprises an Oracle 7.3 database on a SUN SPARC server. Part of the evaluation will be to consider the best approach in terms of hardware for rapid input, easy analysis facilities and rapid transfer of records to the national monument recording system.

3.3 Analysis of results

The National Mapping Programme is not just about creating maps and records. Its approach has been to aid understanding landscapes using one particular strand of evidence, aerial photographs. The databases created (MORPH2 using FoxPro) are amenable to analysis in many ways (Fenner and Dyer 1994, Horne and MacLeod 1994) but the main focus is to examine the possibility of creating new classes of sites. Known site types (e.g. henges, Roman Forts etc.) can be easily classified but the numerous enclosures of various sizes and shapes, which are discovered in large quantities in all NMP projects (e.g. 3,318 in the Thames Valley, 1,394 in SPTA, 5,233 in Lincolnshire, 4,525 in the Yorkshire Dales) can be broken down by size and shape and then are available for further research (Bewley 1994).

However this approach does not provide an understanding of the archaeological sites in a landscape context which is

important if the association of sites and site types is to be appreciated. The future approach has to include the use of GIS to allow for analyses on spatial variables such as soil and locational preferences. One of the fundamental questions relating to the use of information derived from aerial photographs is whether it is representative of past human behaviour or is a reflection of our own abilities to discover sites. The analytical capabilities of GIS will allow these questions to be answered more efficiently (Bewley 1994).

4 Conclusion

As the national body of survey and record the RCHME not only has to adopt and adapt to new developments but also to decide when is the best time to do it. An analogy is the way in which a river, following an oxbow will cut through the neck of the oxbow and re-create a straight line of flow. If technology is the river where are we on the oxbow? Over the past five years we have been going with the flow, turning the bend of the oxbow but the time is now right to join the mainsteam and accept the developments in technology and implement the new approaches to digital mapping, recording and GIS analytical tools which are available to us.

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