Cultural landscape, computers and characterisation:
GIS-based Historic Landscape Characterisation as a tool for archaeological resource management in England

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Abstract: A programme of Historic Landscape Characterisation (HLC) using GIS is being carried out in England. HLC creates a rapid, broad-brush overview of the historic dimension – the time-depth – of the landscape for Sites and Monuments Records. The method is archaeological in its perspective, but aims to understand the archaeological and historical component of the present-day landscape. It is a method that is explicitly subjective and interpretative. This paper introduces some of the ideas behind the method, particularly its ability to deliver a wide range of practical applications, spatial planning and archaeological resource management. A summary of the method is given, with particular reference to the linked issues of defining the polygons that lie at the basis of the approach, and selecting the attributes that define their character. The likely impact of emerging new digital map-bases is also discussed.

Key Words: Cultural landscape, Historic landscape characterisation, GIS, Subjectivity, Spatial planning, Sites and Monuments Records, Archaeological resource management, Conservation

Background

Historic Landscape Characterisation ('HLC') is a national English programme of broad-based county-scale archaeological assessments of the present landscape - ie a programme of reading material culture (Fairclough et al 1999; Fairclough (ed) 1999). HLC brings together in one place, from an archaeologist's perspective, what we already know or can interpret about the historic landscape to facilitate the sustainable management of change through. It uses GIS to establish areas (polygons) defined by shared attributes based on the historic character and time-depth of the landscape. This provides a computer-based tool for sophisticated analysis and interrogation, without being wholly driven by technology or data-collation. It rests upon interpretation and perception, initially expert-led but hopefully to become more democratic. A number of examples of maps derived from HLC GIS are included in this paper, although they are inevitably highly simplified versions of what is feasible when using the HLC work on its GIS (figs 1 – 4). The programme is approaching its half-way stage and could be completed in 5-8 years (fig 5). Thirteen HLCs are both complete and have prepared method statements (Aldred 2001, Bannister 2001, Barnatt 1999, Barnatt et al 2000, Bramhill and Munby 2001, Ede 2001, Ford 1999, Herring 1998, Hoyle 1999, Lambrick and Bramhill 1999, Miller 1997, White 2001).

Each project covers a county or similar area, and is commissioned by English Heritage from local government archaeological services as part of their Sites and Monuments Records. SMRs in England provide the fundamental structure of archaeological resource management. They are maintained by every county council, sometimes in partnership with "unitary" authorities (ie mainly urban areas of single-tier local government). The functions of every SMR include spatial planning, development control, public and professional information provision, providing material for research, facilitating the active collection and curation of information about archaeological sites and their condition, landscape management, the quality control of developer-funded rescue excavations, and agri-environmental policies.

The location of the projects in SMRs is important, because HLC, although it has important research benefit, is designed first and foremost to support conservation and archaeological resource management, and to ensure that the cultural landscape is taken fully into account in decision-making. HLC is a conservation-led technique, an example of 'applied archaeology'. It is starting to fill a major gap in the archaeological resource management system in England. Similar gaps are being filled in other European countries (eg Netherlands State Government 1999 and Hallewas forthcoming; Heritage Council 2001, Danish Forest and Nature Agency 2001 and Stoumann forthcoming). As far as England is concerned, over the past three decades, the ARM system has successfully developed more or less effective ways of dealing with archaeological sites and their deposits, notably PPG16 and its related procedures (Department of the Environment 1990, Fairclough 1999(b)). It has been rather less successful, however, explaining and managing the significance of the whole landscape.

"Whole landscape" in this context means not just the ensemble of sites and monuments in an area, nor just their settings. It mainly refers to the areas between sites and most importantly of all to the fabric of the landscape itself, its fields, hedges or walls, its roads and settlement patterns, its woodlands and heath, its land cover generally. Many of these features of the landscape have not always been

traditionally considered to be an archaeologist's concern, but they comprise a major part of the material remains of the landscape, and as such they invite an archaeological reading. The scale of the task of understanding the whole landscape, however, requires archaeologists to learn how to use generalised interpretations - how to work with area rather than point data, and with predominant character as well as specific detail. These different approaches have led to GIS and their related data structures, which is the main subject of this paper (one of a trilogy delivered at conferences in the spring of 2001 – Fairclough forthcoming (b), (c)).

Adopting a way of thinking that allows us to engage with the historic environment at landscape scale has also required an expansion of perception about what archaeology is and what archaeologists do, for instance:

-   Recognising that significance, meaning and information about the past does not only lie within stratigraphic deposits on "sites", but throughout the landscape within all manner of structures and patterns;

-   accepting that the very recent past is as much a part of landscape's historic continuum as the distant past, perhaps more so in certain ways;

-   recognising that understanding the present day landscape as an archaeological artefact, unravelling its layers and components, is as much 'archaeology' as is trying to reconstruct the shape of past environments

-   understanding that landscape exists for us only in the present-day, a subjective construct that uses thousands of years of environmental modification as building blocks but filtered through archaeological analysis, interpretation and perception;

-   adopting new approaches to scale and generalisation using area not point data, so as to rise above unique details of places to identify significant similarities and differences;

-   developing a greater acceptance that subjectivity has value and is not necessarily something to be avoided. Landscape is first and foremost a matter of perception, an emotional or intellectual construct.

HLC, finally, is not the same as landscape archaeology. The two approaches are of course related, but landscape archaeology attempts first to understand or to reconstruct past landscapes, not study the present. More often than not, despite contrary claims, it has sites rather than areas as its starting point, and normally it seeks objective rather than subjective understanding.

Non-archaeological ways of appreciating landscape character are in some ways closer in objective to HLC than is landscape archaeology. Ecologists or landscape architects for example share with HLC a concern to amalgamate landscape and its manifold attributes (historical, archaeological, biodiversity, amenity, aesthetics, association,

folklore, and memory) into our own contemporary social and cultural constructions of what landscape means for people. This is notably the case for agencies like English Heritage that are primarily concerned with conservation and resource management.

The most elegant, straightforward and simple definition of landscape currently available is that of the new European Landscape Convention (Council of Europe 2000). This evolved from earlier documents (Council of Europe 1995) in parallel with the evolution of the HLC method. Its definition and objectives therefore fit HLC very closely. The Convention defines landscape as:

"an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors".

The Convention applies this definition to all parts of a country's territory. It includes urban as well as rural areas, everyday as well as exceptional landscapes, and degraded as well as well-preserved places. The definition, like HLC, emphasises change (action/interaction), people (human factors) and perception (cultural perspectives); in practice it defines 'cultural landscape', a near-synonym for historic landscape.

HLC (and the Convention) defines landscape in a way that differentiates it from "environment", partly because of its subjectivity, but mainly by an emphasis on the intervention of human consciousness and imagination in creating landscape. The creation of landscape is a human and cultural act in two ways. First, the components of landscape are created throughout the past (until yesterday), arising from the series of decisions and actions that have modified the environment, and created its material culture. Second, in today's present-time, people create from landscape from their environment as an intellectual, social or emotional construct. Archaeologists create a particular type of construct in which the issues that loom largest historical process are the remains of the past, the role of people rather than environment, the prevalence of change and the critical significance of longer-term chronology.

HLC seeks to capture all this. Almost from its inception, it has used GIS to do this. The area-based rather then record-led character of GIS has proved to be very suitable for the unusual mixture of objectivity and subjectivity that is landscape, being able to encompass concrete material things and vaguer ideas, scientific data and human perspective. It can also take into account the provisionality of any view of landscape that is caused by landscape's dynamism and the fast -changing character of perception and understanding. That is what this paper is mainly about: using computers to capture perception and understanding rather than fact and record, and doing so in ways that allow interrogation, dissemination, analysis, updating and integration with other landscape data-sets. In short, HLC is an application-led technique, and this paper therefore also tries to give an overview of the range of uses to which HLC is being put.

The paper also offers a superficial guide to the diversity of method used so far within HLC since the first, non-GIS, project in 1994 in Cornwall. One of the methods – that which is evolving for the six counties of the East of England region (East Anglia) - is described by Lynn Dyson-Bruce in

some detail in a separate paper elsewhere in these proceedings. Until now, the method has been deemed to be experimental and still developing, and the invention and use of new methods has been encouraged. This has also allowed the method to develop a diversity that reflects landscape variation within England, and allows HLC to operate effectively within the many different institutional structures, spatial planning policies and computer data systems that exist across the range of England's local authorities. Local ownership and integration have so far been deemed to be more important than national consistency. At a European level, such methodological diversity may become even more important. Adoption of HLC in Scotland and Ireland has already led to significant modification of methods and aims to meet national requirements (Bruce et al 1999, Macinnes forthcoming, Cooney et al 2000, ERM/ERA 2000). A further layer of modification is being developed for its use in SW Sweden in Scania (pers comm Jenny Nord-Paulsson), as part of the EU Culture 200 project European Pathways to the Cultural Landscape, which involves ten countries in twelve linked projects. Informal assessment suggests that countries such as Portugal would require even greater adjustment of the methodology to work in different landscape types, whilst still retaining the core philosophy of HLC.

During 2001, however, English Heritage will commission a review of the English methodology. This will establish the extent of the common core of philosophy, method and structure that underlies all the separate projects, and identify the optimum techniques that have been developed.

Historic Landscape Characterisation

Ideas

Some of the precepts that underlie the idea of Historic Landscape Characterisation have already been mentioned. In summary they are that:

- "landscape" exists everywhere (and is important locally as well as nationally); but it only exists in the here and now (earlier versions of what we now call landscape did exist, and can be studied, but for contemporary purposes they are past environments not landscape) (Fairclough et al 9-16, Countryside Commission 1996).

- landscape, and landscape character, is a matter of perception more than fact (Fairclough 1998). Although the idea of landscape is often, particularly for archaeologists, made up from physical objects such as buildings hedges, walls, farms, woodland, or sites, it is only when these are viewed through perception, memory, imagination and ideas that they come together to be "landscape" rather than environment. Landscape is therefore best regarded as a matter of interpretation and perception, as an idea rather than a thing. Inevitably, therefore, there are as many landscapes as there are people to perceive them - landscape has multiple meanings and diverse values, and GIS is a useful medium for giving space to this diversity;

- landscape is defined by the interaction through time of people and their environment, and primary place in explaining and understanding historic landscape character is given to the actions in the past of people not to the ahistorical dictates of nature (Fairclough 1994). Environmental determinants exist, of course, but what interests HLC, and archaeologists generally, is the human impact on landscape, and landscape's cultural and social dimensions; these might be more nuanced, and perhaps more superficial, but they are more interesting;

- landscape is produced by process and change in the past. Its most important attribute is change, and it remains today essentially dynamic and transient. HLC data structure and GIS systems must therefore be able to deal with ephemerality, palimpsest and incompleteness. Recognition of the role of change - sometimes described by the shorthand of 'living landscape' - should be one of the foundations of sustainable conservation and sustainable development.

Character

Historic landscape character is constructed from several aspects of the archaeological and historic environment. Most central is the broad pattern of the landscape itself displayed in the diversity of attributes such as landuse, landcover, features, settlement patterns, the shapes of fields, all viewed as archaeological patterns. To understand these patterns it is necessary to look at the historic reasons for them, and at the historic processes that created the landscape's character. Relevant to HLC are attributes such as the distribution of arable, grazing, or woodlands (the patterning of woodland for example, demonstrably a manufactured not a natural pattern as it is restricted to parish edges and steep valleys), or the patterning and variety of settlement and field boundaries (the character of fields forms the backbone of the work and the main opportunity for further research). More localised features might contribute, too, such as the pattern of modified water courses, altered soils, the hedges and walls, quarries and mines, or roads, tracks, canals. Major historic processes – agriculture, quarrying, settlement - are kept at the forefront in other ways, too, as is the balance between them which has changed through time. Most GIS polygons in HLC record interpretations of previous land-uses as well as current, and thus the transition between them: ie time depth.

Archaeological sites and buildings are not mapped individually or even as distributions but can be used interactively with the area-based generalised view that HLC produces. This helps to understand site distributions and enables new types of area data to be generated from site data, a process which seems to have been largely impossible until now. A "fingerprint" of an area's archaeological character can be drawn, indicating - the type of sites that might be expected there, or which might be expected to survive given later landscape change, or the combination of different types of sites (or predicted sites) that make up the area's identity.

A less tangible aspect of HLC is territoriality, space across the landscape (Fairclough 1999(a)). Communities have always needed access to a mixture of resources, from crop-

land, grazing land, water resources (eg fishing) and woodland resources. This range requires many different topographical settings. Land-use territories therefore crossed the grain of the landscape, whether at parish or township scale where parishes cover several land-use zones, or at sub-regional level. There could also be temporal solutions (seasonal transhumance, for example) and solutions by trade and exchange, which also in different ways have affected the landscape's appearance. The English Heritage Rural Settlement Atlas provides an understanding of some of these cultural territories (Roberts and Wrathmell 2000), but HLC maps give us more local opportunities to see these patterns.

Finally, there is a largely unexplored area: the intangible associations of landscape and of public perception, and the personal and collective views of "real" people whether residents in an area or , visitors to it. People appreciate and value their historic landscape in so many different ways. It can be used as primary evidence for the past or to understand the current character of a place. For many people 'landscape' carries with it a host of varied associations (such as literary, mythological etc) and it is of course a source of aesthetic appreciation, meeting a basic love of 'nature' and ecology. It contains memory, both personal and social or collective; and it generates a sense of belonging (and perhaps of alienation).

Landscape in this sense varies from person to person, and from time to time, and encompasses stories, associations, memories or myths as well as history and archaeology. Capturing these ideas is a large area for future work, and HLC has so far not been able to engage much with the difficult issues it raises. Work is underway in Wales, however (eg Gwyn forthcoming), and we will experiment in England with using HLC as a baseline for public perception work, as part of the Bowland/Lune project, the English part of European Pathways to the Cultural Landscape, the EU Culture 2000 project mentioned above.

Methods

The HLC technique is not complicated. It simply assumes that the land can be divided into areas (GIS polygons) which are defined by some degree of shared character using a range of attributes or aspects. The resulting map is neither topographical nor directly reflective of physical reality, but is an interpretation of landscape character and history captured and presented as a patchwork of differentiated areas that together cover the whole map. One of the most important sources is the modern 1:10,000 or 1:25,000 map, showing field boundaries, buildings, and all land parcels. These maps are supported by up to date vertical air photos, other data-sets on habitats or woodland, and to some extent historic map.

The method works best when it is applied to large areas, by generalisation or summary, so that very broad patterns can be identified that rise above the detail of each place's unique differences. One of its characteristics is speed, to produce rapid overviews as close to a single "snapshot" as possible, by synthesising existing information. It is therefore almost wholly desk-based. Breadth – indeed comprehensiveness – rather than depth (and thus selectivity) is the aim, but of course HLC offers a new interpretation as a springboard for later, more detailed, analysis or research.

The definition of areas of land (polygons) with shared characteristics is key to HLC. This makes GIS almost essential for HLC work, although the primacy of defined areas was central to HLC even before use of GIS was adopted (Herring 1998, 1999). Intuitively defined to reflect historic landscape character (see below), the polygon is a container for all the structured data that creates the HLC.

Attributes

To produce the characterisation, all areas of the modern landscape, by interpreting maps and air photographs, are attributed to a range of 'historic landscape types'. This is sometimes a very direct process, using a prepared finite list of historic landscape types - see tables 1 and 2 (Lambrick 1999, Wills 1999, Bramhill and Munby 2001, Bannister 2001). These early types of lists, or classifications, were relatively short - 18 simplified types ('zones') in Cornwall, c80 at its most detailed in Hampshire. More recent projects have tended to record the individual attributes (indicators or "proxies") that subsequently allow high-level interpretation and analysis and the ability for different purposes for a polygon to be attributed to more than one landscape type - see table 3 (eg Aldred 2001, Ede forthcoming). The earlier approach (using a fixed number of categories or historic landscape types) has the advantage of clarity and ease, but limits interpretation to one attribute, embeds time-depth in a single view, and is difficult to simplify or re-work. The later approach is more time-consuming and difficult but it is more flexible, enabling a much wider range of analysis and levels of presentation. It also creates a very much larger, potentially infinite, number of separate types: Lancashire at its simplest (its 'Broad Types' map) has c80 types, for example, the same as Hampshire's most detailed set, but many more can be created by analysis of attributes and subdivision.

There is high degree of generalisation within HLC, so that it is the predominant aspects of the historic character of each area that is defined, rather than the detail of every distinct place. The GIS polygons against which attributes are recorded vary in size and shape in relation to the scale and grain of the landscape itself. Character is not usually defined for every land parcel or field, but for groups of land parcels. Attributes attached to a polygon, for example, might include for enclosed land, the straightness or sinuosity of boundaries, the size of fields, the existence of dog-legs indicative of removed boundaries, the morphological signs of enclosed strip fields, or the pattern of cumulative assart from woodland. In unenclosed (eg upland moors) character might be defined in terms of differences such as the existence of earlier abandoned phases of settlement or enclosure, or by the patterns of surviving prehistoric burial and ritual sites, or by industrial activity, or relationship to settlement. The likely earlier form of landscape character can also be included within polygon attributes, to allow change through time to be understood, for example whether 18th century fields were enclosed from common or common grazing, whether forestry had previously been upland moor, or what was there before urban expansion. Information is also recorded on data sources, and on the strength of confidence of interpretation.

Sites or areas of archaeology and remains are not plotted as point data, or as realistic representations. Such information

exists elsewhere (eg in Sites and Monuments Records) and can be used later against the base-map that HLC provides. It is this that distinguishes HLC from other approaches to studying archaeological landscape - it does not aim to plot the components of the landscape but to map a generalised depiction of its overall historic landscape character.

TOIDs and the DNF

One technical advance that is likely to change the way HLC is carried out in England will be the issue in November 2001 of a new digital map by the Ordnance Survey, the UK's national mapping agency. This map, the Digital National Framework (DNF), converts all Ordnance Survey 'Land-line' mapping - detailed cadastral and topographic mapping captured at 1:2,500 resolution – into a seamless national dataset containing 400million individually defined and geo-referenced features, each uniquely identified (Ordnance Survey 2001).

DNF is an intelligent digital map designed especially for GIS and database use. Features defined can include points, lines and boundary lines but also areas and polygons. Each feature, including polygons, has its own unique 16-digit reference – a TOID (TOpographic IDentifier) – which in the case of area data is related to fully closed polygons. This dataset (to be issued in gml format) will therefore includes for the first time fully active pre-defined polygons for every land parcel (gardens, houses, fields, walls etc.) in the country, each capable of having additional structured data attached to it.

The full range of ways in which TOIDs will change HLC work is not yet known. The onerous, time-consuming and difficult task of digitising the boundaries of HLC polygons will largely cease, and HLC practitioners are already anticipating liberation from the exasperating business of digitising newly-defined polygons. Until now, only polygons in existing datasets (eg county datasets of, for example, mineral extraction or woodland) could be imported automatically into HLC, and even these often required modification. Every other polygon in a county's HLC map has of necessity been created anew, by 'drawing' over scanned maps or by on-screen digitising. With TOIDs, single features or groups (ie OS parcels) can be labelled as polygons to contain relevant new HLC data as described above. This will be a valuable time saving that will release more effort for the interpretation and analysis, rather than description, of historic landscape character that is the real heart of HLC. There will be a gain in precision, and much of the DNF's in-built TOID-related attribute datasets will also be useful. TOID technology will also facilitate analysis and research once HLC is complete.

The initial DNF release will not include all necessary inferred data, however. Invisible boundaries (such as that between a car-park and a road, for example, or, more significantly for HLC, the closure of fields across farm gates and other breaks in boundary) will not always be included at first. Nor at first will there be an hierarchical data structure, so that associating features into complexes – even obvious ones such as houses into a village – will not always be simple. Nor will subjective decisions be incorporated – for

example, when to decide, as HLC frequently does, that detailed differences such as a single building in the corner of a field, or a small patch of woodland in fields should be submerged into a wider whole in the interests of generalisation. The availability of TOIDs will make mapped data easier to manipulate in many ways, but for HLC at least there will still need to be a large degree of further interpretation.

DNF data will be themed, however, so that, for example, features deemed to be buildings (most, not all buildings, not structures, nor their associated roads) can be displayed separately. The other eight themes, apart from Buildings, includes Water (rivers, tide lines, canals), Administrative Boundaries, and Roads/Tracks, and Land (all features that describe surface cover apart from buildings and communication routes), all useful supports for the mechanics of creating HLC.

Whilst TOIDs will streamline the technical methodology of HLC, the most interesting – and difficult – question about DNF and TOIDs is whether it should, can or will change the innate structure of HLC. Some practitioners point out that the high-level local resolution of TOIDs will allow each and every land parcel to be attributed to different HLC types or to contain a distinctive set of Historic Landscape attributes that would allow such very detailed classification. The question (putting aside the difficult practicalities, such as how TOID features can be grouped and linked to the absence of hierarchy and inferred data) is whether this is desirable or necessary. This is a theoretical not a technical issue. Detailed "recording" is not the objective of HLC, which aims for interpretation not description. The single most valuable innovation of both the first HLC projects (Cornwall without any GIS or computing; Avon with minimum, autocad-type, computer use; Peak Park with its detailed use of historic maps) and the very latest (eg Lancashire, Hertfordshire, Somerset, Herefordshire) is the ability to capture generalisation and overview. Whilst recognising that ultimately every place, every field and every land parcel has its distinctive historic landscape character when viewed closely enough and in enough detail, the real gain of HLC was to discover a way to rise above particularity. The aim is to define larger-scale differences and similarities, and to understand generic and overarching patterns, as part of the main objective mentioned earlier of creating the first ever strategic framework for decision-making that affects the wider landscape. In other words, HLC seeks to capture interpretation, meaning and subjectivity rather than to depict any real world. The ability that the DNF will give to work at a very detailed level may be an obstacle to these wider overviews.

The morphological, interpretative and stratigraphic techniques that underpin HLC require a much wider focus than individual land parcels. HLC makes assumptions about land parcels (in England, especially fields), largely on the basis of their attachment to broader patterns. It is the wider group to which a field belongs (sometimes up to several kilometres across) that allows the field's origin, purpose and history to be considered. Beyond that, it is the relationship of that group to adjacent and surrounding groups that begins to create a stratigraphy of landscape. Reduction to individual fields at too early a stage is a hindrance to this broader view

(it might be desirable at later stages to isolate variations and exceptions, but the whole picture needs first to be defined). HLC polygons if they are to do their job of interpreting the landscape (and not simply recording in a different format the data from other historic maps) need to be larger than land parcels. Polygons based on a single land-parcel could admittedly be amalgamated later into larger polygons on the basis of their attributes and by other means of analysis, but this would detach analysis from observation and interpretation. The process of interpretation is so central to the philosophy of HLC that it needs to be carried out at the time of creating the GIS.

HLC is concerned with generalisation to achieve a wider view - hence the county-wide scope of each project, the insistence on the ability to produce simplified, general maps whatever more detailed data exists, the emphasis on interpretation and recording. HLC is also essentially subjective; GIS has been used to capture subjectivity and the new technique of TOIDs can contribute to this if used within that spirit. If, however, seen as a way to capture increasingly detailed objective data, it will produce merely a data-led landscape description, a database where the really interesting work of analysis, research and, most of all, understanding remains undone. The risk is also that it will describe environment, but not create landscape. HLC may therefore need to resist parts of the seductive offer that DNF and its TOIDs make of being able to capture the distinctiveness of every land parcel. When placed into a broader framework, the DNF should be capable of serving a larger purpose; but first this necessitates capturing the similarities of large groups of land parcels, defined intuitively as a polygon that may not exist in conventional terms.

Defining Polygons

How large the HLC polygons "should" be, and how they are defined, is a flexible matter, and polygon size will be variable. The basis of HLC is the presentation of a multiplicity of interpretation, ideas and theories about landscape's historic dimension as generalised areas, not as any type of real-space depiction. An HLC map is a chorophet, not a topographic map. It depicts areas characterised by some general common features, in the same way as map showing political areas (such as countries) or settlement zones (such as Roberts and Wrathmell 2000) although using a wide range of variable attributes. There are therefore two critical factors: the choice of attributes that define common character, and the choice of a level of resolution that determines the size of polygons.

The first of these critical issues - choosing the factors and attributes - is discussed elsewhere. Here the issue of polygon size is discussed, the definition of polygons within which to capture generalised, summarising data. This data (in some combination) must differentiate the polygon from its neighbours. Polygons should not therefore be devised mechanically: they should not be km-sq data collection units, nor administrative areas, even if historic), nor past settlement territories such as townships. Rather, HLC polygons need to arise out of observation and interpretation of the present-day landscape. They are defined intuitively and subjectively, but from a controlled observation of an explicit and transparent set of indicators. In this they are a little like the excavation contexts or excavation units that are defined by what makes each distinctive. In practice, HLC polygons are usually less reductive than contexts, allowing a polygons to contain a degree of heterogeneity in detail whilst maintaining a higher level, broad-brush homogeneity that allows each polygon to be described in different terms to others. Nonetheless the parallel holds, insofar as polygon boundaries are drawn around an area that at landscape scale can be seen to share, irrespective of size, key and core attributes of landscape character.

The size and shape of polygons varies because of the grain and diversity of the landscape itself, notwithstanding the obvious ability to merge polygons to create more simplified maps. In certain types of landscape each polygon might cover large areas, for instance of moorland, or 20th century intensively-farmed cereal fields ("prairie" fields). Such large polygons may include diversity of various types, such as the presence or absence of earthworks remains in disused fields, prehistoric or medieval, in moorland, and if these distinctions are required to have an area dimension the large polygon will need to be subdivided. Whether the lower level is activated however will depend on the use to which the HLC is being put.

Conversely, many landscape types will lead to much smaller polygons – functional types such as 20th century military sites (eg airfields, if they still dominate landscape character at county resolution) or industrial areas whether used or abandoned. Another trend towards smaller polygons is caused by the great diversity of field patterns, for example within the hedged landscapes of western England. These field patterns are often capable of being classified morphologically in numerous ways to represent known or assumed origins (eg, piecemeal enclosures from woodland (assarts), or long established in-field patterns, or the remnants of strip-divided fields, whether or not midland-type ("classic") open field patterns), and this tends to produce smaller polygons.

That these variations in the size of polygons reflect the grain of the landscape can be seen within individual counties, but also at regional and national level. There are areas of the country's landscape – the Hampshire chalklands, the East Anglian clay plateau - where landscape character is drawn at a very broad scale, in large homogenous tracts in significant contradiction to the diverse and detailed maps resulting from HLC in western areas such a Somerset. In part of course this is a matter of human perspectives (an inescapable part of landscape character) or the state of knowledge. For example, the field patterns of East Anglia have been little studied except through historic maps and in localised areas. In large parts of the Suffolk HLC, therefore, while polygons were drawn relatively small the distinctions between them are minor or non-existent. Given the limited extent of work that had been carried out before the HLC began (a follow-up research project is approaching completion picking up where HLC leaves off), fields were subdivided into only three types on the basis of regularity of shape, sinuosity of boundaries, size of fields. The more detailed EH-funded work now underway in East Anglia on historic fields will allow these large blocks of land to be sub-divided.

The same difficulty with knowing how to subdivide this region's landscape is visible in the Countryside Agency's national landscape character classification. This is designed to be a more detailed successor to the Countryside Character Map (Countryside Commission 1998, Countryside Agency 1999). The latter divided England into 159 Character Areas; the new emerging more detailed approach subdivides this through a set of 75 landscape types into over 2,100 (including urban areas). In East Anglia, however, the detailed map identifies only 14 types, and divides the whole region into only 40 mainly-large areas, compared to 9 original Character Areas. In the more diverse, perhaps essentially older and least changed, western parts of the country, in contrast, the effects of subdividing 159 Character Areas into 2,100 areas has been much more marked. The increase in detail is thus not spread evenly across the country, but reflects landscape character and appreciation of it. East Anglia has a relatively homogenous appearance, and to capture its subtle character requires a greater attention to detail to pick up the more minor differences in knowledge and perception. The thresholds of defining difference need to be lower in such areas. Furthermore, the indicators being used by the Countryside Agency for landscape character – the mixed pattern of agriculture, topographic indicators like slope and relief, or field boundaries – cause certain types of landscape, notably those valued by a picturesque aesthetic, to be privileged in contrast to others. Having said that, the sub-province and local regions in the Settlement Atlas are also larger in East Anglia than most other regions.

The grain of HLC – the extent to which difference is mapped, how far into detail to go, how far to summarise - needs to be established to meet user-needs. In Herefordshire (the western English midlands), the HLC polygons are drawn large because, as a county where landscape character derives from well-preserved, little changed but under-studied ancient field-patterns, the first priority is for a high level initial overview. Existing and future research at more local and detailed level can be fitted into the overview later. In Hertfordshire (Eastern England), in contrast, the landscape is more fragmented with a more diverse character, with large numbers of large urban centres, a great deal of ornamental parkland, significant post-medieval, indeed late 20th century, landscape change. This required the HLC to use a more detailed characterisation of the fewer surviving areas of earlier fields. Because of this, and because it also builds on the achievement of Suffolk, Hertfordshire HLC uses much smaller polygons, in order to capture otherwise largely invisible (and indeed until now overlooked) distinctions and survivals.

Applications

Throughout the HLC process, its very practical end-uses and applications are always borne in mind, and this has strongly influenced the way GIS is used. Being so strongly GIS-based has in itself aided HLC's adoption within various very practical activities, notably spatial planning and landscape management, because it is simple to provide large amounts of sophisticated data either on line across organisations, via CD or (in the very near future) on web pages. On-line access is particularly useful as it allows HLC to form part of much more extensive data-sets, incorporating SMR data, Urban surveys, and non-archaeological, eg land-use, data, so that integrated interrogation is feasible.

Some of the many applications that HLC is designed for, and is being used for, have been discussed elsewhere (eg Johnson 1999, Herring 1998, Fairclough (ed) 1999, pp67 -122; forthcoming (b) and (c)) but it is true to say that users of HLC are still discovering its full potential.

All in all, therefore, HLC is an application of increasingly sophisticated and sophisticated computing technology. It is aimed, not only at analysis and learning, but at broad social issues such as democratic involvement, social inclusion and participation on the one hand, and sustainable development on the other. Both of these are key themes of many current EU and Council of Europe statements of policy. The aim is nothing less than to learn to pass on a landscape to our successors that we understand and which carries in it adequate remains of its history.

Most important, because it is the foundation for almost all other applications, is that HLC enhances SMRs. It does this most simply by adding another layer of interpretation, and by bringing into the SMR new information on a wide range of semi-natural landscape components, notably historically-managed woodland, hedges, ponds and modified watercourses. These reflect the impact of people on the landscape just as much in their way as buildings or earthworks, but they have largely been overlooked. HLC also enhances the SMR more fundamentally by providing a new base map that can integrate the rest of the SMR. The type of encoded data within an HLC map is different, and for some purposes perhaps superior, to that within a standard topographic map. It does not geo-locate individual features but instead provides some explanation, through the effects of landscape change and loss through time, of the pattern of survival and condition of archaeological population. It can explain why earthwork burial mounds existed, and why they still survive in some landscape types, but not in others, for example (see Johnson 1999 for other examples). HLC provides an 'intelligent' rather than a descriptive matrix for SMR data.

HLC also offers another step towards effective site prediction. Relating HLC to recorded sites in SMRs, and thus isolating some of the reasons for survival and visibility (always remembering the effect of the vagaries of archaeological research), can identify gaps in knowledge as opposed to gaps in real distributions. It can produce "fingerprints" of an area's (or historic landscape type's) most likely predicted archaeological assemblage, based on inference and assumptions about its earlier character and later loss and change.

From such analysis it is a short step to establishing new research agendas, or conservation and management strategies. HLC for example can identify rare or typical landscape types, those that are best preserved, or most intact for a single date, or those that demonstrate a sequence of more than one period. It thus aids the very first stage of conservation, that of defining significance. Within this process, HLC can also provide a strong context for protective designation – the selection of "special" buildings that the English conservation system uses to protect a sample of

monuments and buildings.

The second major group of applications concerns the use of HLC in spatial planning (Fairclough forthcoming (b)). At a generalised level, HLC can be converted straightforwardly into strategic or local forward plans, or non-land use landscape management strategies (eg Lancashire County Council 2001, New Forest District Council 2000), identifying the types of development that most fit each area's landscape character, for example. At a higher level, HLC will be able to provide a strategic contribution to wider European planning, such as the two inter-regional planning overviews that have recently been produced (Norvision 2000, NWMA Spatial Planning Group 2001). To do this effectively, HLC has also been designed to be easily laid alongside other ways of assessing landscape character that are based on non historical criteria such as scenic beauty or ecology, so as to create an integrated perspective (Fairclough 1995, Countryside Agency forthcoming).

At a more local and tactical level, HLC can be used within development control to assess the impact of individual development proposals, and to inform decisions on mitigating the effects of development. It can be used to guide the design of new buildings and settlement so that they reflect deeply embedded landscape character, thereby benefiting from the contribution that the past can make to the future.

In a similar vein, HLC can contribute to more proactive landscape management. In England, for example, the environmental strand of the EU Common Agricultural Policy consists of a series of agri-environmental grant schemes (to which c£1.6bn is dedicated over the next six years) designed to pay farmers for producing environmental and social benefits including the preservation of archaeological sites. The principal scheme for landscape is Countryside Stewardship and HLC is becoming one of the mechanisms by which the government Rural Development Agency is targeting its grants to maximise their value to the historic environment.

On the regulatory front, HLC has greatly strengthened the operation of the Hedgerow Protection regulation, designed to prevent the destruction of the most important hedges. Before HLC, the main criteria for identifying special hedges was ecological (number of species, biodiversity) and the only historic criteria were partial indicators such as parish boundaries and whether the hedge appeared on early maps. HLC enables individual hedges to be placed in context, and their date, origin and history to be evaluated as part of the wider pattern. At the same time, rates of loss over the last century can be easily measured, and issues such as rarity can be demonstrated. In Hertfordshire, for example, we now have an overall view of the differential distribution and survival of medieval or earlier fields across the whole county.

In addition to all this, the HLC maps form a benchmark for measuring future change, whether positive or negative. Change can take place in the landscape itself, and more interestingly, in our perception and understanding of it. It is the intention, exploiting the flexibility and sophistication of GIS, to keep HLCs up to date, but the first HLCs (and periodic updates) will be archived to become reference points for comparison of change across time. Such information on the rate and direction of change is extremely hard to collect others (Darvill and Fulton 1998), and this may become a major benefit of HLC. It is also possible to use HLC to measure past recent change - identifying the degree of change in area character between the picture shown by HLC and HLC derived from historic maps, for example.

Finally, HLC seems to offer an opportunity to escape a little from the expert-led interpretation of landscape towards a more democratic and wide-ranging ownership, of the kind insisted upon by the European Landscape Convention (Council of Europe 2000, Lambrick 1999, Johnson 1999, English Heritage 1997). Landscape itself is an easier and more accessible concept for most people; almost automatically it is a sort of shared common language. Maps too are relatively easy to use as vehicles of both explanation and interpretation. One of the next stages of the HLC project is to start seeking public responses to expertly-created HLC, and more importantly to ask the public for their views on what makes an area historically significant. We hope that such a process will emerge from the Culture 2000 European Pathways to Cultural Landscape project. Public criteria may well be very different to archaeologists' views, perhaps relying more on literary association, mythology, political or religious connotations, and on the more everyday details of landscape (perhaps relatively modern) that create sense of place and local identity. Adding them to more specialist archaeological interpretations will not only deepen our understanding of landscape and its social value, but will also start to create stronger support for conservation of the cultural landscape, for the sustainable management of change in the landscape, and for more practical and active management strategies.

Acknowledgements

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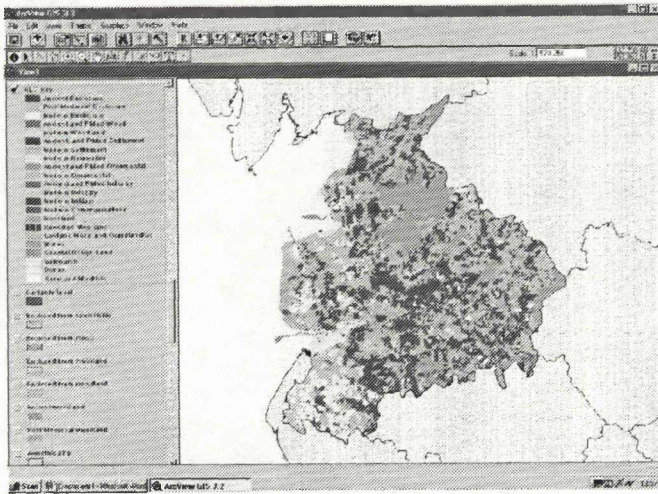
Figures

Figure 1. Lancashire (after Ede 2001): Broad HLC types
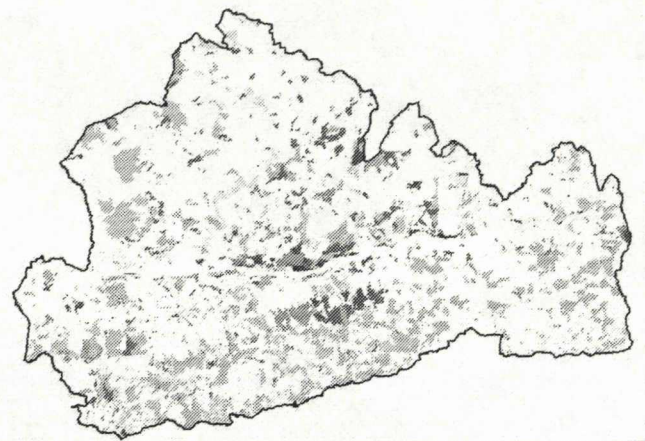
Figure 3B: Surrey HLC (after Bannister 2001): areas of predominantly pre-1810 historic landscape character
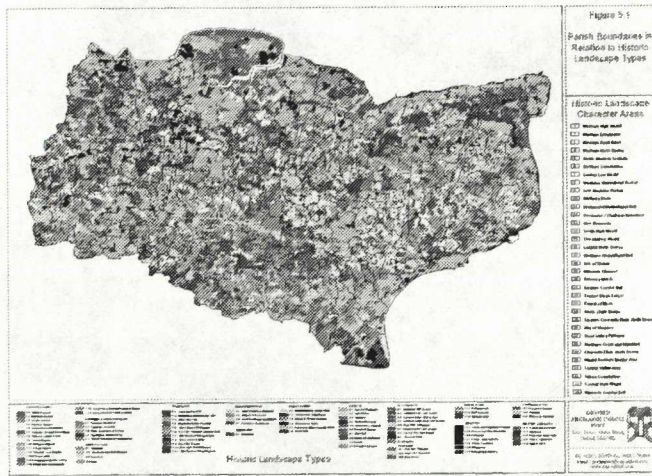
Figure 2. Kent (after Bramhill and Munby 2001): all HLC types, with parish boundaries superimposed
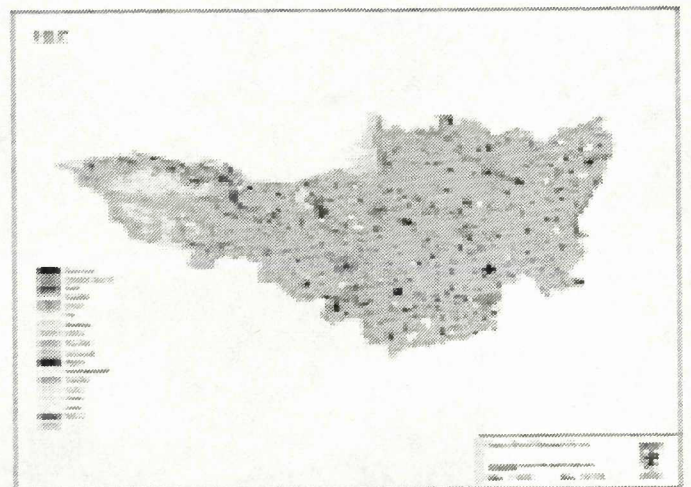
Figure 4a: Somerset HLC – all basic types, with enclosed land amalgamated as single type (after Aldred 2001)
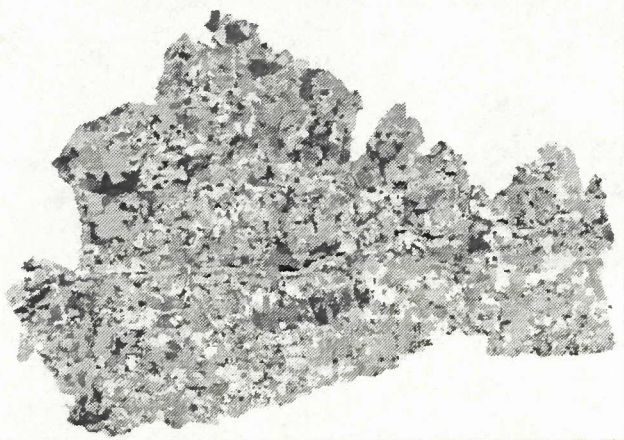
Figure 3A: Surrey HLC (after Bannister 2001): all HLC types (simplified)

Figure 4b: Somerset HLC – subdivision of enclosed land types (after Aldred 2001)

Figure 4c: Somerset HLC – model of previous landscape (time depth) (after Aldred 2001)

Figure 5. Map showing progress with the English Heritage programme of HLC (drawn by Vince Griffin).

Tables

Table 1: CORNWALL : Historic Landscape Character Zones

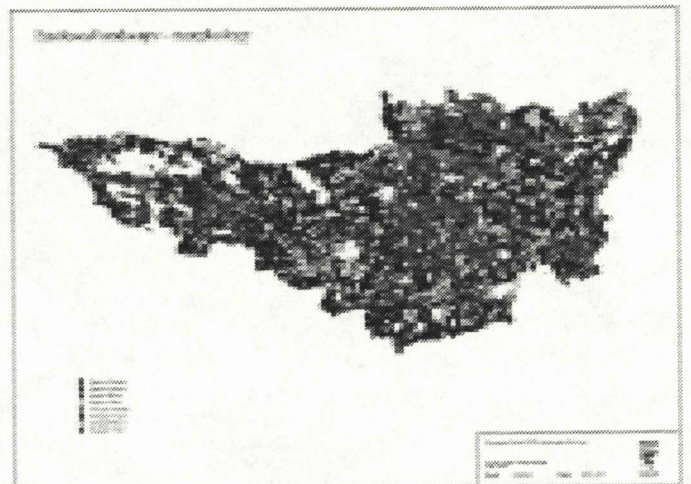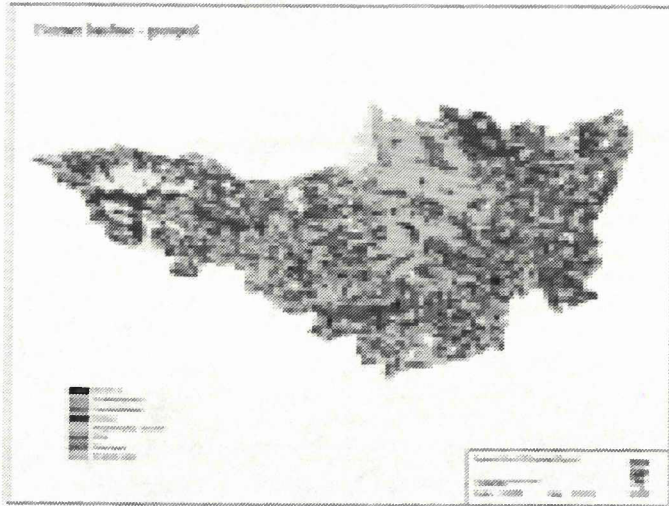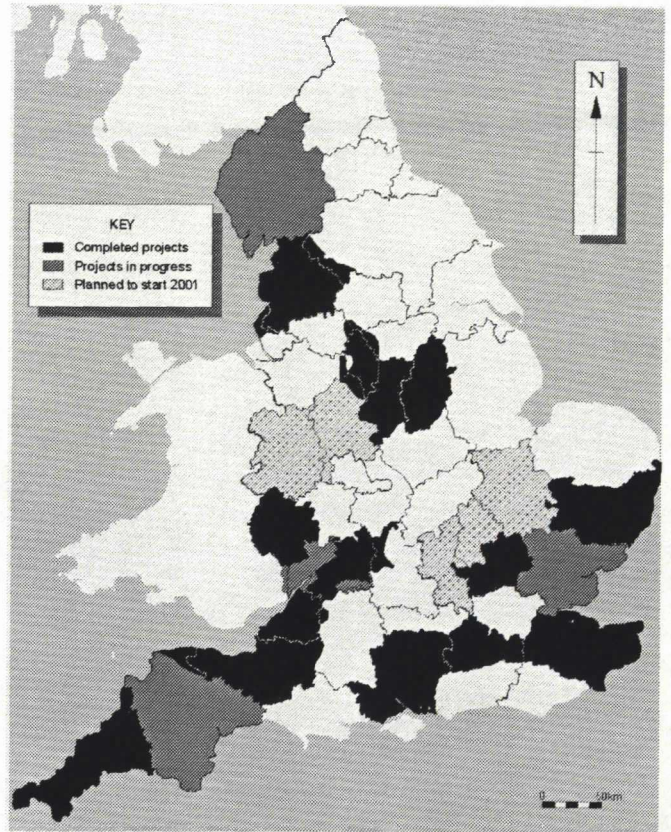| CORNWALL HISTORIC LANDSCAPE CHARACTER ZONES		
Zones (or simplified 'super-types')	**% area of Cornwall**	**Comments**
Anciently Enclosed Land	57.47	Amalgamation of the types Prehistoric Enclosures and Medieval Enclosures.
Upland Rough Ground	4.03	A subdivision of the type Rough Ground
Coastal Rough Ground	1.27	A subdivision of Rough Ground
Dunes	0.39	A topographical subdivision of Rough Ground
Recently Enclosed Land	17.44	Amalgamation of Post-medieval Enclosures and Modern Enclosures.
Anciently Enclosed Land extensively altered in the 18th and 19th centuries	0.58	Interpretation of elements of Prehistoric, Medieval and Post-medieval Enclosures.
Anciently Enclosed Land extensively altered in the 20th century	4.03	Modern Enclosures which are adaptations of Prehistoric and Medieval Enclosures.
Navigable Rivers and Creeks	1.22	Topographically derived zone using OS maps as source
Steep-sided Valleys	4.48	Topographic zone using OS maps as principal source.
Predominantly industrial	1.61	Amalgamation of Industrial (active) and Industrial (relict)
Urban development	3.83	Amalgamation of Settlements, historic and modern
Ornamental	1.32	Simple derivation from Ornamental type.
Recreation	0.34	Simple derivation from Recreational type.
Military	0.66	Subdivision of Military type, including airfields.
Upland Woods	1.13	Subdivision of Plantation and Scrub Woodland
Reservoirs	0.2	Simple derivation from Water, artificial.
Inter-tidal zone		

Table 2 : Historic Landscape Types used in the Hampshire HLC project (after Lambrick 1999)

HAMPSHIRE HISTORIC LANDSCAPE TYPES	
Categories	**Types**
1 Field Patterns	1.1 Small irregular assarts intermixed with woodland
	1.2 Medium irregular assarts and copses with wavy boundaries
	1.3 Large Irregular assarts with wavy or mixed boundaries
	1.4 Regular assarts with straight boundaries
	1.5 Enclosed strips and furlongs
	1.6 Regular form with wavy boundaries (?late med to17th/18thcentury enclosures)
	1.7 Irregular straight boundaries
	1.8 Regular "ladder" fields (long wavy boundaries subdivided by straight cross divisions)
	1.9 Small regular fields with straight boundaries (parliamentary type enclosure)
	1.10 Medium regular fields with straight boundaries (parliamentary type enclosure)
	1.11 Large regular fields with straight boundaries (parliamentary type enclosure)
	1.12 Variable size, regular fields with straight boundaries (parliamentary type enclosure)
	1.13 Not Used
	1.14 Prairie" fields (19th cent enclosure with extensive boundary loss)
	1.15 Fields predominantly bounded by tracks, roads, other rights of way
	1.16 Small rectilinear fields with wavy boundaries
2 Commons	2.1 Common heathland
	2.2 Common downland
	2.3 Other commons and greens
	2.4 Wooded over commons
3 Horticulture	3.1 Orchards
	3.2 Not Used
	3.3 Nurseries with glass houses
4 Woodland	4.1 Assarted pre-1810 woodland
	4.2 Replanted assarted pre-1810 woodland

HAMPSHIRE HISTORIC LANDSCAPE TYPES	
Categories	**Types**
	4.3 Other pre-1810 woodland
	4.4 Replanted other pre-1810 woodland
	4.5 19th century plantations (general)
	4.6 pre-1810 hangers (scarp & steep valley-side woodland)
	4.7 Post 1810 hangers
	4.8 Pre 1810 heathland enclosed woodland
	4.9 19th century heathland plantations
	4.10 Pre 1810 wood pasture
	4.11 19th century wood pasture
5 Heathland	5.1 Unenclosed heath and scrub
	5.2 Enclosed heath and scrub
	5.3 Purlieus and other enclosed heathland pastures
6 Downland	6.1 Downland
7 Valley Floor, water man't	7.1 Miscellaneous valley bottom paddocks and pastures
	7.2 Valley floor woodlands
	7.3 Marsh and rough grazing
	7.4 Water meadows
	7.5 Unimproved hay meadows or pasture
	7.6 Watercress beds
	7.7 Fishpond, hatchery complexes, natural ponds and lakes
	7.8 Watermills, mill ponds and leats
8 Coastal	8.1 Coastal wetlands
	8.2 Salt marsh
	8.3 Salterns
	8.4 Reclaimed land
	8.5 Harbours and marinas
	8.6 Shingle and dunes
	8.7 Mud flats
9 Settlements	9.1 Scattered settlement with paddocks 1800 extent

HAMPSHIRE HISTORIC LANDSCAPE TYPES	
Categories	**Types**
	9.2 Scattered settlement with paddocks (post 1800 extent)
	9.3 Common edge settlement
	9.4 Common edge settlement (post 1800 extent)
	9.5 Not Used
	9.6 Post 1810 settlement (general)
	9.7 Village/hamlet 1810 extent
	9.8 Not Used
	9.9 Town & city 1810 extent
	9.10 Town & city post 1810 extent
	9.11 Caravan sites
10 Parkland & Designed	10.1 Pre-1810 parkland
	10.2 19th century and later parkland
	10.3 Deer parks
11 Recreation	11.1 Racecourses
	11.2 Golf Courses
	11.3 Major sports fields and complexes
12 Extractive & Industry	12.1 Active and disused chalk quarries
	12.2 Active and disused gravel workings
	12.3 Industrial complexes and factories
	12.4 Modern large scale industry (power stations; oil terminals etc)
	12.5 Reservoirs and water treatment
	12.6 Dockyards
13 Inland Communications	13.1 Station and sidings complexes
	13.2 Canal basin complexes
	13.3 Airfields
	13.4 Motorway service areas
14 Military and Defence	14.1 Prehistoric and Roman (eg hillforts, roman forts)
	14.2 Medieval (motte and baileys, ring works)
	14.3 Post medieval (1500-1830)
	14.4 19th century (1830-1914)
	14.5 20th century (1914-)

Table 3: Summary of data structure attached to polygons in Lancashire HLC (after Ede 2001)

1. Pattern Recognition:
- Habitat-based (woodland, moorland, saltmarsh etc.)
- Built (settlement, industrial, communications etc.)
- Enclosure of land

Code	Wavy edged enclosures	Code	Coastal rough land
E1	Small irregular	RL1	Dunes
E2	Other irregular	RL2	Saltmarsh
E12	Regular	RL3	Sand
	Straight edged irregular enclosures	RL4	Mudflats, shingle etc
E3	Small	RL11	Coastal rough ground
E4	Medium		**Heath/Moor incl. blanket peat etc**
E5	Large	RL5	Unenclosed
	Straight edged regular enclosures	RL6	Very large enclosures
E6	Small	RL7	Enclosed
E7	Medium	RL7A	Reverted fields since 1840s (assumed habitat change)
E8	Large		**Other unimproved land**
	Long, thin (3x long as wide) enclosures	RL9	moss - lowland, big enough areas
E9	Straight edge	RL10	grass/scrub etc, big enough areas
E10	Wavy edge		**Inactive industrial**
E13	Distinguishing features are: running at right angles to slope and paths and tracks running along edges. Some cross boundaries and loss of boundaries.	I1	Quarry
E13S	=<100m wide overall pattern	I2	Mine
E13L	=>100m wide overall pattern	I3	Other
	Clear Grid Layout		**Active industrial**
E15	Small	I5	Quarry
E16	Medium	I6	Mine
E17	Large	I7	Industrial estates
	Nurseries	I8	Other 'works'
E11	Small enclosures mainly with glasshouses	I9	Power generation
		I10	Docks
	Woodland	I11	Textile mill
WD1	Wavy edged		**Settlement**
WD2	Straight edged	S1	Settlement
	Recreation		**Ornamental**
R1	Golf course	O1	Ornamental landscape/parkland
R2	Caravan park		**Military**
R3	Playing fields/sports grounds/amenity land when marked as such on maps, and as amenity land on Phase I and large enough area or as Op on rlanduse coverage	M1	Active military
R4	Racecourse	M2	Inactive military but still present as an influence in present day landscape
R5	Holiday camp		
	Communication		**Water**
C1	Rail	W1	Inter-tidal water
C2	Canal		**Fresh water**
C3	Motorway		Man-made
C4	Other large road	W2	Reservoir
C5	Airport/Airfield	W3	mill pool
C6	Telecommunication station	W4	flooded quarry
C7	Toll roads now not large main roads only if info easily available	W7	lake/pond
	Parliamentary Enclosures (PE)		**Natural**
PE	Enclosed by Parliamentary Enclosure	W5	Lake
anc	Shown as anciently enclosed land on PE docs	W6	River

Other attributes recorded against polygons:

- Size of field or other enclosure: Small = less than about 2-3 ha
                                        Medium = (2-3) - about 16 ha
                                        Large = over 16 ha

- **Change and condition**
- **A** - altered 1840-1990 but some features remaining
- **Z** -altered a lot
- **M** - variety of patterns visible on 1st edn now altered a lot
- **W**-water boundary

- For settlement and urban:
- **MH** - mills and housing
- **R** - residential
- **MC** - municipal centre, shops

- Topography of WD coded polygons: **Y** if on steep slope (only for WD codes)

2.   **Historical maps**, eg 1st Edition OS maps (mid-19th century), to sub-divide the areas into pre- and post- mid 19th century.

3.   **Subjective interpretation**: additional codings for

- **dating**   **1** - prehist-RB
                2 - pre 1600
                3- 1600-1st ed
                4 - post 1st ed
                5 - no date indicated
                6 - mid 18th /early 19th c
                7 - pre 1st edn.

- **identification of processes** of landscape development. interpretation of dating was applied to each polygon eg-

fossil strips	Enclosed from:
old deer park	open field
old parkland	Woodland
single farm	lowland moss
rabbit warren	Moorland
meadow grazing	the sea
Ornamental woods associated with park	by Parliamentary Enclosure

confidence level of interpretation, applied to **dating** and **process**, for each polygon.