Archeologia e Calcolatori
9, 1998, 81-126

GIS APPLICATIONS IN AUSTRALIAN AND NEW ZEALAND ARCHAEOLOGY – A REVIEW

1. Background

Australia and New Zealand have many innovative GIS programs, particularly in the environmental sciences. This perhaps reflects the high level of personal computer ownership (some statistics place us second in the world after the USA) and a high level of public concern with the environment. Australians, in particular, like to think of themselves as rugged outdoors people in a huge and empty land, even if we are one of the most urbanised societies on earth and our outdoor activities often extend no further than weekend BBQs in the back yard. Despite our small population (<25M), Australian and New Zealand contributions to GIS lists are highly visible, and GIS applications are commonplace in emergency service management, environmental monitoring, mining exploration, commerce and even sporting events – competitors in the Sydney to Hobart ocean yacht race have been tracked for years with GPS and desktop mapping software.

The Federal government set up an environmental information agency (ERIN – Earth Resources Information Network, now Environment Australia) in 1990. The agency broke new ground with active monitoring of environmental resources and flood events (a major environmental hazard on the western slopes of the eastern divide) using continental-scale satellite data. Its main rôle is to coordinate information from other government departments and it maintains a metadata repository describing available spatial datasets at all levels from continental to local (Environment Australia Online http: // www.environment.gov.au). One of the contributing agencies is the Australian Heritage Commission, which maintains the Register of the National Estate (including nominated natural and cultural heritage sites).

2. GIS applications in Australian and New Zealand archaeology

Against this backdrop of widespread GIS activity and widespread availability of PCs, I want to look at the effects of GIS technology in Australian and New Zealand archaeology. My first impressions, when asked to write this article, were of a paucity of archaeological GIS applications in the two countries, and a concentration of activity in three university centres – Auckland, Latrobe and Sydney.

My initial impressions have been somewhat modified on closer inspec-

tion. What is clear, however, is that few people in Australian and New Zealand archaeology have made GIS their primary business and that much GIS work remains unpublished or is alluded to only in the 'grey' literature – either because it falls in the administrative domain, where publication is not highly rated, or because it is sideline work or work of students who have not yet got into the publication habit. These tendencies are perhaps reinforced by the limited opportunities for conference presentation and publication arising from our spatial isolation (and consequent high travel costs, particularly acting against younger researchers who are those most likely to be involved in innovative GIS work) and the rugged-fieldworker stereotype we tend to promote, which devalues lab-intensive methodological studies in favour of field projects and 'real' data.

2.1 *Administrative / CRM applications*

GIS, particularly used as database management and mapping tools, have become a ubiquitous part of many Cultural Resource Management projects, and Australia and New Zealand are no exceptions in this regard. Many of the projects are fairly small scale in terms of funding and personnel, reflecting the lack of any administrative structure capable of directing substantial funds to research-oriented archaeology or system development. Australian projects tend to be directly funded to solve specific development-related problems, viz. clearing the way for construction, rather than with a broader view of the resource. Consequently, most CRM work is carried out by loose conglomerations of private consultants, coalescing briefly for a project and then going their separate ways.

These conglomerates do not have the time, nor the budget surplus, to do more than utilise available tools towards a specific short-term end, so GIS has little rôle beyond use as a simple mapping tool. Concerted efforts to use GIS in a more proactive rôle have been left to the government organisations responsible for managing cultural resources, while methodological developments and research applications have been mainly in the domain of university departments.

2.2 *Administrative applications*

New Zealand got off to an early start on computerisation of archaeological site records, with the NZRAS system (Challis 1978). As with many pioneering efforts, the lead was a liability, developed in the mainframe era and creating an inertia to change. The introduction of GIS to New Zealand archaeology has therefore been left to the academic and consulting communities.

Australia has separate 'relics' or heritage legislation for each state, re-

sulting in separate Aboriginal site registers for each state, as well as separate historic site registers and shipwreck registers. The registers are maintained by a variety of different agencies. For Aboriginal sites, for example, the register is maintained by the State's main museum in two states (WA & NT); by the National Parks & Wildlife Service in three (Tas, NSW, ACT); by the Department of the Environment in one (Qld); and by Aboriginal Affairs in two (Vic, SA). The only nationwide register is the Register of the National Estate, maintained by the Australian Heritage Commission, which includes natural environment sites in addition to historic and Aboriginal sites.

2.3 Site register mapping

The first attempts to integrate a mapping capability into a site register occurred in NSW in 1985, with the development of GMS (Johnson 1987) as part of the Minark DBMS (Johnson 1984, 1989) then in use by the Aboriginal site registers of NSW and Victoria. As Aboriginal Site Registrar for NSW from 1988 – 1991, I pulled the plug on GMS, because it was obvious that commercial systems (particularly MapInfo) had overtaken it. However, the presence of a home-grown raster GIS system (ERMS, Environmental Resource Management System) within the organisation meant that we were never allowed to move to a mainstream desktop mapping system, so NSW is still in 1997 without a credible means of doing even basic Aboriginal site distribution mapping.

Despite the lack of a standard mapping system, the NSW NPWS and private consultants funded by NPWS, the Murray-Darling Basin Commission and the Australian Heritage Commission, have carried out a number of GIS-based CRM applications in NSW since 1988: attempts were made to characterise and digitise the boundaries of the more than 2000 archaeological surveys and reports in the register; a project was developed to encapsulate expert knowledge on site locations in western NSW, using a GIS (ERMS) to map landform categories identified as being associated with particular site patterning (Johnson, Turner 1993); a limited sample field survey project was carried out to test the results of this exercise (Webb 1993; Johnson *et al.* 1993); a small heritage study of Kosciusko National Park used GIS to analyse and present field survey results on a topographic base (Johnson 1992); and GIS was used to map Aboriginal burial sites (in NSW and adjoining states) for heritage management and interpretation to Aboriginal communities (Hope, Littleton 1995). In retrospect these efforts have not come together into any very coherent GIS solution to the issues of cultural resource management in the state.

Other states have set-up simple mapping applications for plotting Aboriginal sites using commercial software. South Australia, the Northern Terri-

tory and some Queensland offices use MapInfo. The Northern Territory has recently completed a federally-funded review of its site register and GIS application (Mowat, Richardson 1997), and a separate GIS-based database, primarily of rock-art sites, exists for the federally-administered Kakadu National Park and surrounding areas. Tasmania uses Arc/Info for managing natural resources, and Aboriginal sites are included in this database. None of these states appear to have progressed much beyond the use of GIS for mapping sites onto topographic backdrops.

Victoria has the longest history of Aboriginal site register computerisation, with a mainframe database commenced by the Victoria Archaeological Survey (now Aboriginal Affairs Victoria) in the early 1970s and transferred to Minark in 1984. Although they are still using Minark as their basic database, data is exported to Arc/Info quarterly and used in a predictive system known as CRMgrid (MacNeill 1997). The CRMgrid system uses multivariate analysis of site characteristics within 1 km grid squares to classify the nature of the archaeological record and present it for use by cultural resource managers, developers, Aboriginal communities and the general public. The GIS database also generates maps of site locations and the extent of surveys, and allows spatial querying for relevant database resources. Other GIS applications in Victoria include a project by the Victoria Archaeological Survey to study the micro-topography and water flow for a system of Aboriginal fish traps using Arc/Info (van Waarden, Wilson 1994) and mapping of surveys by archaeological consultants.

In historical archaeology, all the states have register databases, but neither they nor the Australian Heritage Commission appear to have yet implemented GIS-based mapping of sites. This probably reflects the address-based origin of these databases, which were developed to manage built heritage largely in urban environments, while the Aboriginal sites registers dealing largely with non-urban environments used geographic coordinates from the start. Geocoding of street addresses is now a pretty standard function of most GIS, so the addition of mapping capabilities to these databases should not be too far off. CAD systems are, of course, commonly used by planners, architects and engineers, so it is not uncommon for historical site plans to be prepared in this way as part of development-related projects, but as far as I know GIS has not been much used. CAD systems have also been used for mapping historic shipwrecks.

2.4 *Digital data availability*

Probably the major factor inhibiting widespread use and development of GIS in the public archaeology GIS sector has been lack of availability and/or cost of background map data. Australian governments have adopted the user-pays principle with enthusiasm. At one stage, as I understood the story,

NSW NPWS digitised the Soil Conservation Service land-system maps in order to be able to do resource management studies and offered the digitised data to the SCS. SCS then wanted NPWS to pay for use of the digitised data!

AUSLIG, the national mapping authority (there are also individual state mapping authorities) provides digital data at small scale, but consistent data for larger scales are hard to come by. The main problem is the size of the continent (8M sq.km.) relative to the population (17M). As one moves away from the populated coastal areas around the major cities, the best scale of maps available drops from 1: 10,000 to 1: 25,000, 1: 50,000, 1: 100,000 and finally 1: 250,000. Only the 1: 250,000 scale maps are consistently available in analogue, let alone digital form, but many of those in the interior are characterised by a lot of paper and not much ink!

Availability is even more patchy for land classification maps such as soils, land-systems, geology or land-use. For example, land-system maps are only available for the western third of NSW, while soil susceptibility maps are available only along the eastern dividing range. Few of these maps are available in digital form.

Where maps are available in digital form, cost is another big issue. AUSLIG charges A$100 (US$75) per theme (hydrology, transportation, spot heights) for each 1: 250,000 mapsheet, for a total cost of A$19,000 for 1: 250,000 coverage of NSW alone. This gets you a license for internal use only (admittedly one license for an educational institution covers any number of users). If you want to create maps from this data for a report, let alone a publication, you are looking at a graduated reproduction rights fee of A$50 upward per illustration.

The net result of patchy availability and high cost of the resource is to drive archaeologists, among others, to make do with a bare minimum of background data, often digitised in-house to fulfil immediate needs. The short-sighted policy towards digital data practised by most Australian government departments has much to answer for in terms of holding back the effective use of GIS in Cultural Resource Management applications in Australia. If one can seek a hidden benefit it might be that the lack of available data has encouraged Australian archaeologists to become more self-sufficient in digital data collection and move towards obtaining equipment such as sub-metre DGPS.

2.5 *Research applications*

While much of Australian and New Zealand research archaeology continues on its way untouched by GIS fever, the new generation is lapping it up, at least where there is encouragement and the facilities to take GIS on board. At Sydney we have at least eight students making active use of GIS in their theses, reflecting the inclusion of databases and GIS in (optional) un-

dergraduate courses over the last few years and unrestricted student access to a well-equipped general computing and GIS lab. We have also been able to sponsor a series of international visitors – Dean Snow, Anne Vikkula, Zoran Stančič and Fred Limp – who have taught courses or workshops on GIS since 1993. Latrobe and Auckland also include GIS training in their undergraduate programs. Other universities – the Australian National University, the University of New England and the University of Queensland to my knowledge – have staff members using GIS and/or encouraging students to get involved. The result of this activity has been an eclectic mix of small GIS projects in which it is hard to see any general trends, other than the great variety and small-scale nature of the projects, which tend to be focussed on specific well-defined problems.

Student projects at Sydney include: analysis of historical census records for the historic 'Rocks' district of Sydney to examine socio-economic status and the existence of neighbourhoods (Wayne Mullen); analysis of the attributes of grave markers against topography at the historic Waverley cemetery on Sydney's eastern shoreline (Scott Banner); mapping excavated material from Muweilah and Tell Abraq in the United Arab Emirates to determine activity areas from the distribution of ground stone artefacts (Katia Davis); analysis of the location of 'desert kites' (stone-walled game drives) in eastern Jordan and their relation to topography and vegetation zones (David Burke); mapping the development of Pagan in Burma to identify the dynamics of settlement development (Bob Hudson); and landscape/settlement analyses of Bronze Age sites in Cyprus (Lita Diacopoulos) and agricultural terraces in Rarotonga (Matthew Campbell). All of these projects are primarily using MapInfo.

The University of Auckland has a number of GIS-based student and staff projects. The visibility and importance of *pa* sites (Maori hill-forts) has lead to work on their topographic position and layout, both as thesis projects and associated with *iwi* land claims, by Claire Reeler, Moira Jackson, Russell Gibb and Hans-Dieter Bader, mainly using Arc/Info and ArcView, but including attempts at neural network analysis (Reeler 1997). Thegn Ladefoged and Geoff Irwin are also looking at the distribution of defended and non-defended sites in the Hauraki Gulf (Irwin *et. al.* 1996) and Ladefoged is using GIS to analyse terracing and land divisions in the Hawaiian islands. Peter Sheppard is using MapInfo to map site locations in the Solomon Islands.

GIS is also being used routinely by Rod Clough, an Auckland-based consultant, to provide mapping of site locations or individual site plans in reports, and in support of *iwi* land claims. Clough is also using MapInfo to overlay historical maps, documents and excavation data in studying the historical development of the city of Auckland. The other New Zealand university, the University of Otago, does not seem to have much involvement in

GIS other than an MA project by Paul Rivett, who is studying pre-Angkor site distributions in north-east Thailand (RIVETT 1997).

At the Australian National University, Peter Hiscock is building a continental-scale database recording the location (precise or to 1: 100K mapsheet) and attributes of backed artefacts, with the aim of examining spatial patterns in backed artefact form with a view to testing models of function, standardisation, uniformity etc. He currently has around 5,000 artefacts recorded.

At the University of Queensland, Jim Smith has been using a number of packages in an investigation of the use of GIS for cultural heritage management and in modelling the distribution of lithic technology (SMITH 1995). Sean Ulm is compiling a comprehensive index of published date determinations for Australia, cross-referenced to original sources, and using MapInfo to investigate the spatial and temporal patterning of Aboriginal occupation of Australia. Jim Monaghan from James Cook University is studying surface water availability and human mobility patterns in Cape York.

At Latrobe University in Melbourne a major project has been initiated studying the distribution of artefacts on eroded landscapes in north-west NSW (HOLDAWAY *et al.* 1997, see below) and other staff and students involved in this project are also starting to apply GIS to their own particular questions. Trudy Doleman is carrying out a related project on Aboriginal stone quarries in the area; Caroline Bird and David Frankel are studying spatial distributions of artefacts and sites, based on existing records, for an area in western Victoria; and Richard Cosgrove is applying GIS to site location in southern Queensland. Cliff Ogleby at the University of Melbourne has been using GIS for some years in assisting the study of settlement patterns and landscape change on the Arawe Islands (OGLEBY 1994).

Staff and students at the University of New England (UNE) have been using GIS as part of a growing contract business, as well as in research projects. Research projects have included some studies of intra-site patterning using CAD and GIS (JAMES, DAVIDSON 1994; THEUNISSEN 1997), but the major effort is in landscape-based studies. Jane Balme (University of Western Australia) and Wendy Beck (UNE) are building a model of resource availability for a dry rainforest ecosystem in northern NSW, using ArcView, along with relevant archaeological and ethnographic records. Their aim is to model changes in vegetation resources through time, leading to a model of the response of human groups to changes in resource distribution.

Like the Latrobe University project discussed below, the Bayswater Archaeological Research Project, also based at the UNE and studying an area in the Hunter Valley north of Sydney, has been recording the individual positions of artefacts on the landscape with an EDM and ArcView, along with information on geomorphological processes and other disturbance, in order

to study the taphonomic processes involved in creation of the archaeological record. Over a period of four years, the project has surveyed approximately 25% of a study area of 47 sq.km., and excavated an area of more than 250 sq.m., funded by consulting work associated with development of extensive open-cut coal mines.

3. Sites and off-site archaeology

Traversing the Australian landscape, one is struck both by the long-term stability of large areas and the striking post-European impact of landscape modification, particularly erosion. As a result, much Aboriginal archaeology sits on the land surface as if it had been dropped yesterday, whether it has sat exposed in the interim or been covered and re-exposed. This is not such a familiar situation to people working in more geomorphologically active environments where substantial runoff or periglacial phenomena have reworked the land surface many times. Even rockshelter sites have the same sort of immediacy, with Aboriginal artefacts sitting on the surface and the entire Holocene represented by as little as a few centimetres of sand. The ubiquitous nature of Aboriginal stone artefacts as a continuous low-density scatter across the landscape makes Australian field archaeologists keenly aware of the importance of off-site archaeology.

A consequence of this immediacy of the archaeological record has been a number of projects which have tackled the spatial structure of the archaeological record artefact-by-artefact rather than site-by-site, using EDM theodolites, differential GPS and data loggers to collect the data, and GIS to manage and analyse them. The most ambitious of these projects are the Latrobe University project in Sturt National Park (Holdaway *et al.* 1997), the Bayswater Archaeological Research Project and the University of Sydney Central Australia Archaeological Project (Birmingham 1997), but there have been numerous antecedent off-site archaeology projects using non-GIS methods of analysing (typically) transect data.

The Latrobe University project is working in a landscape where the topsoild has been eroded and the archaeology exists as a lag deposit of stone artefacts. Using a large team of student volunteers, EDM theodolites for coordinate recording and palmtop computers as data loggers to record the attributes of the artefacts, they recorded approximately 24,000 stone artefacts during the 1996 field season, *in situ* with three-dimensional coordinates and typological and technological attributes for each artefact. At the same time they have mapped the geomorphology of the study area in detail, in order to control for the effects of size sorting and determine whether there is any relationship between the attributes of the artefacts and their geomorphological setting. There is some evidence that close study of the taphonomy of the

assemblage, through detailed study of the geomorphological history and landscape evolutionary processes, supported by an extensive program of dating based on Aboriginal hearths, may lead to an understanding of the formation of the archaeological record which can be extended beyond the study area to other semi-arid environments. If this can be achieved it offers an alternative to site-based predictive modelling in CRM applications (HOLDAWAY *et al.* 1997).

The Central Australia Archaeological Project is tracing the route of the Overland Telegraph, from Adelaide to Darwin, visiting Aboriginal/European contact sites associated with the route (either directly or as a consequence of European incursion along the corridor). These sites include telegraph repeater stations, missions, police stations, pastoral homesteads and mining sites. Unlike the Latrobe University project, the archaeology studied here is largely *in situ*, and dates mainly to the last couple of centuries. The sites are large because they consist not only of European buildings and rubbish scatters but also a palimpsest of shorter-term Aboriginal campsites in the surrounding countryside. Consequently, the CAAP is recording surfaces comparable in scale to the denuded landscape of the Latrobe Project.

However, the logistics of fieldwork hundreds of kilometres from sealed roads or commercial centres, and the number of sites to be recorded, has lead to a rather different recording strategy. The team is inevitably small and mobile – 6 – 8 people in a 4WD with a large trailer – travelling 10,000 km in a six week field season and spending from two days to two weeks on each site. The team cannot afford the overhead of establishing stations for a theodolite survey of each site, so the sites are mapped using differential GPS, with a base station set up at a temporary camp, powered from a portable generator, and two or three rovers in use on the site. The scatter of artefacts is less uniform across the landscape than might be the case for eroded lag material or generalised frequentation of the landscape, and mostly occurs in discrete concentrations, corresponding with occupation sites or material dumps. Rather than plotting individual artefacts, DGPS is used to fix a reference point on each site component (structure, artefact concentration or scatter) and a tape-measure or string grid is laid out for recording of the component. Concentrations of artefacts are mapped using the grid as a guide, and summary statistics – counts by class – are recorded for artefacts in the concentration. Additional observations are made by individually recording selected artefacts with significant temporal or functional attributes and by sampling artefacts from the diffuse background scatter between concentrations. One site can run to as many as 1,000 individual mapped concentrations.

In both these projects, the use of GIS has proved essential to managing and displaying the huge amount of data generated. Indeed, GIS was an integral part of the projects from the start, with both projects using direct data capture into data loggers and daily download of coordinate and attribute

data into a GIS running on a field computer. By building the GIS in the field, problems of data recording and lost data (e.g. when your GPS base-station computer runs out of juice) can be resolved the next day, a critical issue for such remote fieldwork. Also, immediate feedback can be created to guide the process of ongoing recording. Obviously, such recording systems require a considerable degree of expertise and dedication to data processing after a days hard work, so they are not for the fainthearted. On the other hand, they have proved an order of magnitude more productive in generating timely field data when compared with traditional recording methods with their inevitable post-fieldwork processing delays and discovered glitches.

GPS are being used increasingly in Australia to overcome the shortcomings of existing maps as one moves away from the major population centres along the coast. Many of the 1: 250,000 scale maps, which are the only ones available for much of the interior, have practically no information on them, other than general indications of dunes or rock ridges, unformed roads, water sources and the occasional homestead. In many places it is next to impossible to locate oneself accurately using these maps. Consequently GPS provide not only a means of finding one's way but of recording site locations in a repeatable fashion, allowing relocation of sites and correlation of sites with landscape features mapped, for example, from satellite photography. On a smaller scale, differential GPS provide a valuable means of generating detailed maps of large open sites, whether using a base-station at a known location or a portable unit in the field whose location is fixed approximately by averaging.

Even in the better-mapped coastal zones, archaeological consultants are moving towards the purchase of handheld units for basic site location recording, and site register authorities such as the NSW NPWS are incorporating protocols for GPS recording into their instruction booklets and recording forms. The falling price of hand-held units should make these items a ubiquitous part of the field archaeologist's toolkit within a few years. We can look forward to increasingly accurate results, thanks to DGPS and the promised removal of Selective Availability. The AusNAV system provides real-time differential correction data on the sideband of one of the popular rock music stations, available within a radius of each of the capital cities, for around $500/year; continent-wide differential correction data is available by satellite transmission from Fugro Starfix at a pricey $60/hr; and individual base-stations, such as the Sydney University Archaeological Computing Laboratory, provide post-processing correction data at low or no cost for specific areas.

Once differentially-corrected GPS are widely available at consumer prices we can look forward, not only to an improved quality of site records, but to some sort of solution to the perennial problem of interpreting site

distributions in the absence of information on where sites have been looked for. Reviews of existing survey reports suggest that only a small proportion provide adequate maps showing the boundaries of the area(s) surveyed; almost no reports give adequate information on how much of the land surface within those boundaries was actually covered. With a GPS in hand, or clipped to their pack, field archaeologists can not only record exactly where they have been but also the chronology of their recording. This could potentially be used to generate a spatially-registered measure of survey intensity which might be used to assess the representativeness of survey, the thoroughness of coverage and the archaeological 'yield' of different landscape units in relation to the survey effort expended.

None of this answers the thorny questions relating to the effects of exposure, visibility, survey conditions and geomorphological history, but it can potentially provide us with tools to start investigating those factors and deriving more accurate measures of archaeological occurrence across the landscape. Given our concern in Australia with landscape-scale phenomena, the shortcomings of existing mapping resulting from the scale of the continent with respect to its population, and the ready availability of appropriate equipment, I am optimistic that Australian researchers will be active over the next few years in developing ways of gathering meaningful archaeological survey data using DGPS.

4. Spatio-temporal mapping

Three projects at the University of Sydney are tackling the issues of applying GIS and related technologies to the mapping of cultural features which change through time. The overarching project is known as the TimeMap project, and seeks to develop a methodology for recording and displaying spatio-temporal data. The AsiaMap and Virtual Historic Sydney projects are application projects which aim to build on the TimeMap methodology to present historical information for use by researchers and the general public.

The TimeMap project (Johnson in press) aims to develop a software system which allows the superimposition of data layers in a time-enabled GIS interface, including base maps and satellite images and layers drawn from multiple distributed databases. The definition of a *metadata standard* allows pre-existing databases to conform to TimeMap standards without the need to reformat the data or carry out specialised programming on a case-by-case basis. The software will allow databases to be accessed remotely across the Internet, allowing organisations to maintain their own databases but to make some aspects of the data available to outside users with TimeMap software. It will also allow querying and display of the underlying attribute data, and linking from map objects on the screen to relevant WWW pages.

Additional aspects of the project include research into ways of recording and representing fuzziness in spatial and temporal data, methods of display of spatio-temporal data and the generation of 3D models and animations directly from the database rather than through case-by-case programming. It is also hoped to make the software available to run within a web browser. The prototype software currently operates on local 2D GIS databases on PC-based machines. By the end of 1997 we hope to have implemented access to remote SQL server databases, linking to WWW pages and limited in-line animation from database data.

The Virtual Historic Sydney project is collecting historical data and resources for eighteenth and nineteenth century Sydney, and recording them in TimeMap-compatible databases. The aim is to create an interactive front-end allowing the user to explore the history of Sydney using a map-based metaphor, follow links to historical resources (such as historic maps, paintings, photographs, events, reports, engineering plans, census data, synthetic accounts and multimedia resources), generate interpolated maps of the city at various scales for any chosen date and generate animations of the changing map. Further down the line we hope to be able to generate interactive walk-throughs or fly-overs, but for the moment we will be including pre-generated animations created on an SGI workstation.

The AsiaMap project is using aspects of the TimeMap methodology to generate a time-enabled map and animations of the rise and fall of Asian empires on a composite satellite base. So far data has been collected for the Mongols and the Tang, and animations have been generated for the Mongol Empire. Data collection is underway for the Indian sub-continent and for a larger scale study of the development of the city of Baghdad, the most complex pre-industrial city.

5. Selling the idea

What are the important lessons we can learn from the Australian and New Zealand experience in GIS application in archaeology? As in other countries, there is still a great deal of suspicion of GIS among our peers, despite the fact that so much Australian and New Zealand archaeological work is geographically-based and field-oriented, rather than reworking of existing collections. I think it is important that the archaeological community be made to realise that GIS is not just a specialised technological playground, but a new enabling technology which can be embedded into mainstream archaeological endeavour, in the same way that e-mail, word-processing, spreadsheets and presentation software are rapidly assuming the status of everyday tools.

GIS specialists, particularly the misguided missionaries of the ESRI camp

with their 'Arc/Info Rules' message, have much to answer for in shrouding GIS in mystery. To the best of my knowledge, no-one ever organised 'word-processing in Archaeology' conferences, yet we are churning out 'GIS in Archaeology' conferences at the rate of one or two a year (and I am just as much to blame as anyone else). What we need to do is make the rest of archaeology realise that GIS are no longer specialised, expensive, complex gadgets for techno-freaks, but simple, cost-effective mainstream tools for managing and visualising data with a spatial component – as is the case for most archaeological data. We should be out there selling the idea that everyone can and should be using a GIS, rather than maintaining the priesthood and marginalising ourselves in an increasingly secular world. We should be pushing low-end, appropriate tools such as ArcView, MapInfo, GeoMedia or Maptitude rather than arcane analytical beasts such as Arc/Info, MGE, GRASS, SPANS or Idrisi. It is also worth stressing the application of GIS to simple problems of excavation data management, as well as the landscape-based analyses with which the literature abounds, because the problems of data collection and interpretation are much simpler on this smaller scale, where the user is in full control of the data sources.

We also need to generate and share background data. We cannot expect the average user to go chasing obscure sources of digital data and battling incompatible formats to load it. We should be setting up well-documented archives of digital data, where copyright permits, or guides to available data and procedures for obtaining and loading it where copyright issues arise. We need to share our knowledge and share our data wherever possible. For example, the file server at the ACL has a globally-accessible directory ('map-data') within which a hierarchical system of subdirectories structures digital map resources by spatial coverage and data type. An intranet web page gives a directory of what is available, copyright obligations and examples of the appearance of the different types of data (which include global and wide-area relief maps, 1: 1M Digital Chart of the World data, 1: 250,000 AUSLIG data for selected map sheets, in-house digitising of larger scale maps, DEMs, scanned aerial photographs and historic maps). It also contains pointers to other sources of data with information on how to obtain them (sources, cost, conversion). Only by providing such a ready-to-wear source of background map data will the average potential user of GIS be encouraged to take the plunge.

6. Future directions

It is extremely hard to second-guess the direction that such a rapidly developing field as GIS will take. However, I am optimistic that we will soon see a 'critical mass' effect, leading to widespread adoption of GIS as a

routine tool in Australian and New Zealand archaeology, resulting from several factors: the widespread availability of adequate computing facilities in University departments and home offices; the falling cost of GIS software, bringing it within range of the individual, rather than institutional, budget; the increasingly intuitive interfaces and analytical capabilities offered by desktop mapping systems; the increasing availability of affordable and compatible digital data; the availability of affordable hand-held GPS for do-it-yourself data collection; and a supply of GIS-aware students who will expect to be given GIS and GPS to do their job.

I am not convinced we will see the widespread use of GIS by the new millennium, but larger field projects should be using them regularly by then, and many individuals will apply them to specific research problems. We will probably continue to see a lot of small, short-term field projects continuing to use manual or simple spreadsheet-style methods of data recording for a long time – everyone uses word-processors, and most people have caught up with spreadsheets by now, but only a handful have got beyond flat-file databases.

Administrative use of GIS for maintaining site registers and perhaps trying to extract more out of them than 'dots-on-maps' will probably continue in its rather sorry state. There is a great deal of corporate inertia to the adoption of new methods. The logic generally runs that the value of GIS is fully recognised and, rather than rushing into it, the issue will be assessed fully in relation to corporate goals and policies so that proper resources can be allocated. Unfortunately the band-wagon is moving too fast for the process to ever catch up with it, so GIS only happens when some individual has the motivation to short-circuit the system and get something up and running on a one-off basis.

I expect Australia and New Zealand to be particularly active in developing methods for recording off-site archaeology using GPS and GIS, reflecting our concern with the ubiquitous surface spread of archaeological material from a recent past. I expect us to carry GIS and GPS with us on fieldwork and cooperative programs around the Pacific region and increasingly into the Asian region, a move being strongly encouraged by government priorities. Many Asian countries have sophisticated GIS programs in economically important areas, including environmental management, but not necessarily in archaeology, so there is much potential. I also hope to see a particular development of spatio-temporal mapping applications, making use of the Internet as a means of distributing archaeological information to the wider public.

Ian Johnson
Archaeological Computing Laboratory
University of Sydney NSW

Acknowledgements

I would like to thank all the people, too numerous to mention individually, who responded to my email enquiries about GIS applications in train. I would particularly like to thank Andrew Wilson for reading and commenting on the draft of this paper. Any omissions or errors are my sole responsibility. I am sure I will have missed or misinterpreted much relevant material, as it became clear to me in writing this paper how much of the work is very much in progress and how little I knew of what was going on in the more geographically distant centres.

BIBLIOGRAPHY

Birmingham J. 1997, *Fieldwork in contact archaeology: Central Australia*, in C. Petrie, S. Bolton (eds.), *In the Field: Archaeology at the University of Sydney*, Sydney University Archaeological Methods Series, n. 4., Sidney, 1-12.

Challis A.J. 1978, *NZRAS: New Zealand Register of Archaeological Sites User Manual*, Wellington NZ, New Zealand Historic Places Trust.

Flood J., Johnson I., Sullivan S. (eds.) 1989, *Sites & Bytes: Recording Aboriginal Places in Australia*, Canberra, Australian Heritage Commission.

Holdaway S., Fanning P., Witter D. 1997, *The Western New South Wales Archaeological Project*, in M. North, I. Johnson (eds.), *Archaeological Applications of GIS, Proceedings of Colloquium II, UISPP XIIIth Congress (Forlì, Italy, September 1996)*, Sydney University Archaeological Methods Series, n. 5 (CD-ROM).

Hope J., Littleton J. 1995, *Finding out about Aboriginal Burials*, Murray-Darling Basin Aboriginal Heritage Handbooks, n. 1, Sydney, Mungo Publications.

Irwin G.J., Ladefoged T.N, Wallace R. 1996, *Archaeological fieldwork in the Inner Hauraki Gulf, 1987-1996*, «Archaeology in New Zealand», 39 (4), 254-263.

James R., Davidson I. 1994, *Sampling in Australian sites: A Selwyn case*, in I. Johnson (ed.), *Methods in the Mountains, Proceedings of UISPP Commission IV Meeting (Mount Victoria, Australia, August 1993)*, Sydney University Archaeological Methods Series, n. 2, Sydney, Sydney University Archaeological Computing Laboratory, 13-20.

Johnson I. 1984, *MINARK: A database system for archaeologists*, Advances in Computer Archaeology, vol. 1, 12-28.

Johnson I. 1987, *GMS Graphic Mapping System User Manual*, Arkansas Archaeological Survey Technical Paper, n. 4b.

Johnson I. 1989, *MINARK: A database for archaeologists*, in J. Flood, I. Johnson, S. Sullivan (eds.), *Sites & Bytes: Recording Aboriginal Places in Australia*, Canberra, Australian Heritage Commission, 295-302.

Johnson I. 1992, *Kosciusko National Park Baseline Heritage Study 1991 (Aboriginal Sites)*, NSW National Parks & Wildlife Service, Sydney, Cultural Heritage Division.

Johnson I., Grave P., Turner I., Vikkula A. 1993, *Archaeographic Systems Mapping of Western NSW Stage III: Field Testing – Analysis of Field Results*, Report to NSW NPWS, Sydney, Sydney University Archaeological Computing Laboratory.

Johnson I., Turner I. 1993, *Problems and solutions in the development of a regional site distribution model*, in *Actes du XII^eme Congrès International des Sciences Préhistoriques et Protohistoriques (Bratislava, 1-7 Septembre 1991)*, vol. 1, 399-407.

Johnson I. (ed.) 1994, *Methods in the Mountains, Proceedings of UISPP Commission IV Meeting (Mount Victoria, Australia, August 1993)*, Sydney University Archaeological Methods Series, n. 2, Sydney, Sydney University Archaeological Computing Laboratory.

JOHNSON I. 1995, *Mapping Archaeological Data: A Structured Introduction to MapInfo*, Sydney University Archaeological Methods Series, n. 3, Sydney, Prehistoric & Historical Archaeology.

JOHNSON I. (in press), *Mapping the fourth dimension: The TimeMap project*, in *CAA97: Proceedings of the 1997 Computer Applications in Archaeology Conference*, BAR International Series.

KNAPP A.B., JOHNSON I. 1994, *Quantifying survey data from Cyprus: The use of aerial photos for field recording and GIS input*, in I. JOHNSON (ed.), *Methods in the Mountains: Proceedings of UISPP Commission IV Meeting (Mount Victoria, Australia, August 1993)*, Sydney University Archaeological Methods Series, n. 2, Sydney, Sydney University Archaeological Computing Laboratory, 157-164.

KNAPP A.B., JOHNSON I. 1995, *The Sydney Cyprus Survey Project: Intensive survey, landscape archaeology and Cypriot society*, «The Artefact», 18, 71-76.

MACNEILL R. 1997, *CRMgrid: The Cultural Heritage Management Project, Victoria, Australia*, in M. NORTH, I. JOHNSON (eds.), *Archaeological Applications of GIS: Proceedings of Colloquium II, UISPP XIIIth Congress (Forlì, Italy, September 1996)*, Sydney University Archaeological Methods Series, n. 5 (CD-ROM).

MOWAT F., RICHARDSON N. 1997, *Computerisation of the Archaeological Sites Register, Museum and Art Gallery of the Northern Territory*, Report to Australian Heritage Commission, Canberra.

OGLEBY C. 1994, *Geographic Information Systems in archaeology and anthropology: A case study from the Arawe Islands, Papua New Guinea*, in I. JOHNSON (ed.), *Methods in the Mountains: Proceedings of UISPP Commission IV Meeting (Mount Victoria, Australia, August 1993)*, Sydney University Archaeological Methods Series, n. 2, Sydney, Sydney University Archaeological Computing Laboratory, 90-114.

REELER C. 1997, *Fuzzy logic, neural networks and the analysis of pa sites*, in M. NORTH, I. JOHNSON (eds.), *Archaeological Applications of GIS: Proceedings of Colloquium II, UISPP XIIIth Congress (Forlì, Italy, September 1996)*, Sydney University Archaeological Methods Series, n. 5 (CD-ROM).

RIVETT P. 1997, *Conceptual data modelling in an archaeological GIS*, *Proceedings of Geocomputation '97 and SIRC '97*.

SMITH J. 1995, *The Beaudesert Shire Regional Archaeological Project*, Report to Australian Heritage Commission, Canberra.

THEUNISSEN R. 1997, *A GIS-assisted approach to the spatial analysis of rock-shelter sites*, in M. NORTH, I. JOHNSON (eds.), *Archaeological Applications of GIS: Proceedings of Colloquium II, UISPP XIIIth Congress (Forlì, Italy, September 1996)*, Sydney University Archaeological Methods Series, n. 5 (CD-ROM).

VAN WAARDEN N., WILSON B. 1994, *Developing a hydrological model of the Lake Condah fish traps in western Victoria using GIS*, in I. JOHNSON (ed.), *Methods in the Mountains: Proceedings of UISPP Commission IV Meeting (Mount Victoria, Australia, August 1993)*, Sydney University Archaeological Methods Series, n. 2, Sydney, Sydney University Archaeological Computing Laboratory, 81-90.

WEBB C. 1993, *Archaeographic Systems Mapping of Western NSW Stage III: Field Testing*, Report to NSW NPWS, Sydney.

RESULTS OF THE QUESTIONNAIRE GIS AND ARCHAEOLOGY

Title of the project: The AAV Display Query system.

Year of beginning: 1992.

Foreseen term: Indefinite.

Geographic area: Victoria, Australia.
Excavation area:
Contact address: Brad Dilli, Heritage Services Branch Aboriginal Affairs Victoria.
E-mail address: bbd@dce.vic.gov.au
WWW address:
Short description: The DQ system allows users to retrieve summary reports of sites and approximate site locations within areas selected by the user from across the State of Victoria. Its primary use is to provide location maps and summary reports to assist in protecting archaeological sites from mining development, as required by legislation.
Published references:
Hardware/software: Sun workstations and HP plotters, wide area network. Software: Arc/Info GIS package, UNIX operating system with PERL routines for specific data reformatting.
Application of descriptive standards:
Application of spatial analysis:

****

Title of the project: The Cultural Resource Management (CRM) grid project.
Year of beginning: 1995.
Foreseen term: Indefinite.
Geographic area: Victoria, Australia.
Excavation area:
Contact address: Richard MacNeill, Heritage Services Branch Aboriginal Affairs Victoria.
E-mail address: rqm@nrsc.com.au
WWW address:
Short description: The CRMgrid makes use of a data base of registered archaeological sites across the state of Victoria to generate characteristics relating to the Aboriginal Cultural Heritage that are landscape based rather than restricted to the point locations of archaeological sites. This information is intended for use by the Aboriginal communities of Victoria and researchers and land managers. It is intended that, as the extent and quality of a range of data sets relating to the degree of archaeological research across the state increases, more complete cultural heritage characteristics will be generated.
Published references: MacNeill 1997.
Hardware/software: Sun workstations and HP plotters, wide area network. Arc/Info GIS package, UNIX operating system with.
Application of descriptive standards: Academic research, land management.
Application of spatial analysis: Creation of site frequency statistics per site type, multivariate.

****

Title of the project: The structure and function of Maori pa sites in New Zealand.
Year of beginning:
Foreseen term:
Geographic area: New Zealand.
Excavation area:
Contact address: Claire Reeler, Department of Anthropology, University of Auckland, Private Bag 92019, Auckland, NZ.
E-mail address: cnr@antnov1.auckland.ac.nz
WWW address:
Short description: An analysis of the structure and function of Maori pa sites in New Zealand.
Published references: Reeler 1997.
Hardware/software: Arc/Info, Paradox, FuzzyCOPE.
Application of descriptive standards:
Application of spatial analysis:

****

Title of the project: Archaeology, CRM, GIS on the Pouto Peninsula, New Zealand
Year of beginning: 1997.
Foreseen term:
Geographic area: Pouto Peninsula, New Zealand.
Excavation area:
Contact address: Moira Jackson, Department of Anthropology, University of Auckland, Private Bag 92019, Auckland, NZ.
E-mail address: Maj@antnov1.auckland.ac.nz
WWW address:
Short description: Project completed Feb. 1997. Used existing archaeological site location data together with physical and other information. Brief examination of issues of site accuracy. Also examined relationship of pa with the surrounding physical landscape using buffer zones.
Published references:
Hardware/software:
Application of descriptive standards:
Application of spatial analysis:

****

Title of the project: GIS-based Iwi land claims project.
Year of beginning:
Foreseen term:
Geographic area: New Zealand.

Excavation area:
Contact address: Moira Jackson, Department of Anthropology, University of Auckland, Private Bag 92019, Auckland, NZ.
E-mail address: Maj@antnov1.auckland.ac.nz
WWW address:
Short description: Several projects of GIS-based sites and land ownership databases associated with iwi land claims – Te Uri O Hau and Ngati Whatua ki te Tonga are tangata whenua groups using GIS in this way.
Published references:
Hardware/software:
Application of descriptive standards:
Application of spatial analysis:

****

Title of the project: New Georgia Culture History Project.
Year of beginning: 1996.
Foreseen term: 2000.
Geographic area: Roviana Lagoon, New Georgia Solomon.
Excavation area: Roviana Lagoon, New Georgia, Solomon Islands.
Contact address: Peter Sheppard, Centre for Archaeological Research, Department of Anthropology.
E-mail address: P.Sheppard@auckland.ac.nz
WWW address: http: //www.auckland.ac.nz/ant/car.htm
Short description: Study of cultural diversity within the Roviana region over the last 6000 years.
Published references:
Hardware/software: 486 Laptop and Desktop MapInfo.
Application of descriptive standards:
Application of spatial analysis:

****

Title of the project: Spatial Analysis in the Hauraki Gulf.
Year of beginning: 1993.
Foreseen term: 1998.
Geographic area: Hauraki Gulf, New Zealand.
Excavation area: Hauraki Gulf, New Zealand.
Contact address: Thegn Ladefoged and Geoff Irwin, Department of Anthropology, University of Auckland.
E-mail address: t.ladefoged@auckland.ac.nz
WWW address:
Short description: The project investigates the spatial distribution of defended and

undefended archaeological features on the islands in the Hauraki Gulf of New Zealand. The composition and location of feature complexes is analysed in relation to social and environmental variables.

Published references: Irwin, Ladefoged, Wallace 1996.

Hardware/software: Intel based personal computers Windows NT; Arc/Info NT 7.1.1; Excel 7.0; SPSS 6.1.

Application of descriptive standards:

Application of spatial analysis:

****

Title of the project: Visualisation and reconstruction of historic landscapes.

Year of beginning:

Foreseen term:

Geographic area: New Zealand.

Excavation area:

Contact address: Russell Gibb, Geography Department, University of Auckland, Private Bag 92019, Auckland, NZ.

E-mail address: Rgib001@hauraki.geog.auckland.ac.nz

WWW address:

Short description: "Visualization and reconstruction of historic landscapes" – use of multimedia to recreate historic landscapes, including spatial and temporal issues, scale of reconstruction – true 3D GIS for sites and recreation of natural/anthropogenic landscape change.

Published references:

Hardware/software:

Application of descriptive standards:

Application of spatial analysis:

****

Title of the project: AsiaMap.

Year of beginning: 1996.

Foreseen term: Indefinite.

Geographic area: Asia.

Excavation area:

Contact address: Roland Fletcher, Archaeology A14, University of Sydney 2006, Australia.

E-mail address: Roland.Fletcher@archaeology.usyd.edu.au

WWW address: http: //www.archaeology.usyd.edu.au/research/time_map/

Short description: AsiaMap: data-based animation of ecology, empires and trade routes for the Asian region.

Published references:

Hardware/software: Delphi, MapInfo, Houdini. SGI workstation.
Application of descriptive standards:
Application of spatial analysis:

****

Title of the project: Modelling Aboriginal subsistence in dry rainforests.
Year of beginning: 1997.
Foreseen term: 2000.
Geographic area: North Eastern NSW.
Excavation area:
Contact address: Jane Balme and Wendy Beck, Centre for Archaeology, University of Western Australia.
E-mail address: Jbalme@cyllene.uwa.edu.au Wbeck@metz.une.edu.au
WWW address:
Short description: The principal aim of this study is to model a dry rainforest ecosystem as a resource for hunting and gathering. Currently we are mapping the distribution of different vegetation types and their associated ethnographic and archaeological records in northern NSW. We are then quantifying the plant and animal resources of samples from different vegetation types by estimating the productivity (yields per unit area) of different resources to identify the differences between dry rainforests and other vegetation types as sources for hunting and gathering for present day forests. Changes in vegetation patterns over time will be modelled from palaeoenvironmenatal data and ultimately a model about the responses of human groups to changes in vegetation resource distribution will be produced from this analysis.
Published references:
Hardware/software: IBM ArcView.
Application of descriptive standards:
Application of spatial analysis:

****

Title of the project: Modelling Aboriginal subsistence in northern NSW forests.
Year of beginning: 1997.
Foreseen term: 2000.
Geographic area: Northern NSW.
Excavation area:
Contact address: Jane Balme and Wendy Beck, Department of Archaeology, University of New England, Armidale, NSW, 2351 Australia.
E-mail address: jbalme@cyllene.uwa.edu.au Wbeck@metz.une.edu.au
WWW address:
Short description: Modelling Aboriginal subsistence in northern NSW forests.
Published references:

Hardware/software:
Application of descriptive standards:
Application of spatial analysis:

****

Title of the project: A spatial analysis of stone artefacts at Petzkes Cave, northern NSW.
Year of beginning: 1994.
Foreseen term: 1995.
Geographic area: Near Yetman, Northern NSW, Australia.
Excavation area: >20 square metres.
Contact address: Robert Theunissen, 6 Pepper St, Everton Hills QLD 4053.
E-mail address: rtheunis@powerup.com.au
WWW address:
Short description: A GIS assisted spatial analysis of stone artefacts at Petzkes Cave. A GIS platform was used to map the spatial patterning of stone artefacts at Petzkes Cave and to model aspects of cave topography such as ceiling height, sediment compaction and ground slope. The analytical capabilities of the GIS was used to assess whether post-depositional human trampling operating under the influence of cave topography was a significant contributing factor determining the distribution and size-sorting over space of stone artefacts recovered from the cave. As part of the project, an experiment was carried out whereby artefacts placed across the site were trampled by excavators for a few weeks. The start and finish points of experimental artefacts in space was recorded and the GIS used to evaluate the degree of horizontal displacement occurring in different topographic 'zones' related to human trampling – such as ceiling height above and below average adult human height. The results were used to evaluate the archaeological distribution and it was concluded that human trampling operating under the influence of cave ceiling height, and to a lesser degree sediment compaction, had indeed contributed significantly to the spatial pattern of stone artefacts found at the cave.
Published references: R.G. Theunissen, A GIS assisted spatial analysis of stone artefacts at Petzkes Cave, Northern New South Wales, Poster paper presented at the UISPP XIIIth Congress (Forlì, Italy, September 1996), on Archaeological Applications of GIS; R.G. Theunissen, J. Balme, W. Beck (in press), Headroom and Human Trampling (currently undergoing second review for acceptance by «Antiquity»).
Hardware/software: IBM PC DX4-100 IDRISI for DOS 4.0; IDRISI for Windows 1.0 and.
Application of descriptive standards:
Application of spatial analysis: K-means Cluster Analysis.

****

Title of the project: Surface water availability and human mobility patterns in Cape York.
Year of beginning:

Foreseen term:
Geographic area: Cape York, QLD.
Excavation area:
Contact address: Jim Monaghan, School of Tropical Environment Studies & Geography, James Cook University, Townsville QLD 4811, Australia.
E-mail address: James.Managhan@jcu.edu.au
WWW address:
Short description: Surface water availability and human mobility patterns in Cape York.
Published references:
Hardware/software:
Application of descriptive standards:
Application of spatial analysis:

****

Title of the project: Archaeological site risk modeling: River Richmond.
Year of beginning:
Foreseen term:
Geographic area: Richmond River, NSW.
Excavation area:
Contact address: Bill Boyd, Southern Cross University, PO Box 157, Lismore, New South Wales 2480 Australia.
E-mail address: bboyd@scu.edu.au
WWW address:
Short description: Archaeological site risk modlling: GIS risk assessment for management of historical shipwreck heritage at the mouth of the Richmond River.
Published references:
Hardware/software:
Application of descriptive standards:
Application of spatial analysis:

****

Title of the project: Comprehensive Regional Assessments of the forest regions of Australia.
Year of beginning: 1996.
Foreseen term: 1998.
Geographic area: Australia.
Excavation area:
Contact address: Brian Prince.
E-mail address: Brian.Prince@dest.gov.au
WWW address:

Short description: CRAs (Comprehensive Regional Assessments) leading to RFAs (Regional Forest Agreements) of the forest regions of Australia being undertaken by Commonwealth & State governments for completion by end 1998. CRAs include cultural heritage. Data limited by availability, time constraints and in some cases wishes of indigenous communities. Information will be published as assessment reports.
Published references:
Hardware/software:
Application of descriptive standards:
Application of spatial analysis:

****

Title of the project: The Western New South Wales Archaeological Project.
Year of beginning: 1996.
Foreseen term:
Geographic area: Stud Creek, north-west NSW.
Excavation area:
Contact address: Simon Holdaway, Department of Archaeology, La Trobe University Bundoora VIC 3083 Australia.
E-mail address: s.holdaway@latrobe.edu.au
WWW address:
Short description: Artefact distributions with respect to geomorphology in north-west NSW.
Published references: Holdaway, Fanning, Witter 1997.
Hardware/software: TotalStation, GPS, Arc/Info and ArcView.
Application of descriptive standards:
Application of spatial analysis:

****

Title of the project: GIS analysis of quarries in Tibooburra NSW.
Year of beginning:
Foreseen term:
Geographic area: North-west NSW.
Excavation area:
Contact address: Trudy Doleman, Department of Archaeology, La Trobe University Bundoora VIC 3083 Australia.
E-mail address:
WWW address:
Short description: GIS analysis of quarries in Tibooburra area, north-west NSW.
Published references:
Hardware/software:

Application of descriptive standards:
Application of spatial analysis:

****

Title of the project: MAGNT Archaeological Sites Register.
Year of beginning: 1994.
Foreseen term: Ongoing, permanent.
Geographic area: Northern Territory, Australia.
Excavation area:
Contact address: Fiona Mowatt, Museum & Art Gallery of the NT GPO Box 4646, Darwin NT 0801.
E-mail address: fiona.mowat@nt.gov.au
WWW address:
Short description: Plot the distribution of archaeological sites in the Northern Territory. Find biases in distribution of sites based on the professional background of the recorder.
Published references: Mowat, Richardson 1997.
Hardware/software: NEC PowerMateV Pentium MapInfo.
Application of descriptive standards:
Application of spatial analysis:

****

Title of the project: Site Patterning.
Year of beginning:
Foreseen term:
Geographic area:
Excavation area:
Contact address: Robin Gregory, Department of Archaeology, Northern Territory University, Darwin NT 0909, Australia.
E-mail address:
WWW address:
Short description: Site patterning, limited use of GIS.
Published references:
Hardware/software: MapInfo.
Application of descriptive standards:
Application of spatial analysis:

****

Title of the project: Mapping of backed artefact distributions.
Year of beginning: 1997.
Foreseen term:

Geographic area: Australia.
Excavation area:
Contact address: Peter Hiscock, Department of Archaeology and Anthropology, Australian National University Canberra, ACT 0200 Australia.
E-mail address: Peter.Hiscock@anu.edu.au
WWW address:
Short description: Mapping of backed artefact distributions, started 1997, 5000 records. Artefact attributes plus 1: 100K mapsheet or better location to look at spatial patterns in backed artefact form with a view to testing models of functional uniformity, standardisation, uniformity etc.
Published references:
Hardware/software: MapInfo.
Application of descriptive standards:
Application of spatial analysis:

****

Title of the project: Rock art GIS for New South Wales.
Year of beginning: 1994.
Foreseen term: 1 year.
Geographic area: NSW.
Excavation area:
Contact address: Nicholas Hall and Katharine Saile, Archaeology A14, University of Sydney 2006, Australia.
E-mail address:
WWW address:
Short description: Rock art GIS for New South Wales (AIATSIS funded project 1994).
Published references:
Hardware/software:
Application of descriptive standards:
Application of spatial analysis:

****

Title of the project: Artefact scatter in a rockshelter in SW Queensland.
Year of beginning: 1993.
Foreseen term: 1 year.
Geographic area: SW Queensland.
Excavation area: 300 square metres.
Contact address: Ros James, Department of Archaeology, University of New England, Armidale, NSW, 2351 Australia.
E-mail address: rjames@metz.une.edu.au
WWW address:

Short description: Database-CAD based plotting of artefact scatter in a rockshelter in SW Queensland, and analysis of artefact distribution sampling.
Published references:
Hardware/software:
Application of descriptive standards:
Application of spatial analysis:

****

Title of the project: Bayswater Archaeological Research Project.
Year of beginning: 1993.
Foreseen term: 1998/99.
Geographic area: Hunter River Valley, New South Wales Wales.
Excavation area: We have excavated in excess of 250 square.
Contact address: Katrina MacDonald, Department of Archaeology, University of New England, Armidale, NSW, 2351 Australia.
E-mail address: kmacdona@metz.une.edu.au
WWW address: www.une.edu.au/~Arch/ArchHome.html
Short description: The BARP is investigating Aboriginal archaeology in the Hunter Valley in the context of research as cultural resource management. We are taking a non-site approach and have completed full surface surveys of approximately 25% of the study area (total area = 47 square kilometres). All Aboriginal stone artefacts in the survey areas have been collected and their location recorded using an EDM. Details on factors such as erosion and other disturbance have also been plotted so that we can interpret the effects of taphonomic processes on the archaeological record. Most of the fieldwork for the project has been completed and we are now in the Analysis and Interpretation phases of the project.
Published references:
Hardware/software: Twin Pentium Pro ArcView + Windows NT.
Application of descriptive standards:
Application of spatial analysis:

****

Title of the project: TimeMap: a methodology for mapping historical or archaeological features which change through time.
Year of beginning: 1996.
Foreseen term: Indefinite.
Geographic area:
Excavation area:
Contact address: Ian Johnson, Archaeology A14, University of Sydney 2006, Australia.
E-mail address: johnson@acl.archaeology.usyd.edu.au
WWW address: http: //www.archaeology.usyd.edu.au/research/time_map/

Short description: TimeMap Project: development of a methodology for mapping historical or archaeological features which change through time. The project aims to integrate distributed data across the Internet into a time-enabled GIS interface, with active links to other web-based data and the ability to generate data-based animations in 2D and 3D.
Published references:
Hardware/software: Delphi, MapInfo, GeoMedia & toolkits.
Application of descriptive standards:
Application of spatial analysis:

****

Title of the project: GIS and Bronze Age Settlement patterns in southwestern Cyprus.
Year of beginning: 1994.
Foreseen term: Mid-1998.
Geographic area: SW Cyprus.
Excavation area:
Contact address: Lita Diacopoulos, Archaeology A14, University of Sydney 2006, Australia.
E-mail address: poulos@acl.archaeology.usyd.edu.au
WWW address: http: //www.archaeology.usyd.edu.au/research/thesis/
Short description: Applying spatial analysis using MapInfo to archaeological survey data in SW Cyprus, with particular reference to the Bronze Age settlement pattern of the region.
Published references:
Hardware/software: MapInfo.
Application of descriptive standards:
Application of spatial analysis:

****

Title of the project: Historic Neighbourhoods in The Rocks, Sydney.
Year of beginning: 1993.
Foreseen term: 1 year.
Geographic area: The Rocks, Sydney.
Excavation area:
Contact address: Wayne Mullen, Archaeology A14, University of Sydney 2006, Australia.
E-mail address: mullen@acl.archaeology.usyd.edu.au
WWW address: http: //www.archaeology.usyd.edu.au/research/thesis/
Short description: Mapping 19th C. historic property records for "The Rocks", Sydney and analysis to identify the spatial distribution of socio-economic classes and the existence, or otherwise, of neighbourhoods (BA project).

Published references:
Hardware/software: MapInfo.
Application of descriptive standards:
Application of spatial analysis:

****

Title of the project: British colonial sites in Poona, India.
Year of beginning: 1994.
Foreseen term: 5 years.
Geographic area: Poona, India.
Excavation area:
Contact address: Wayne Mullen, Archaeology A14, University of Sydney 2006, Australia.
E-mail address: mullen@acl.archaeology.usyd.edu.au
WWW address: http: //www.archaeology.usyd.edu.au/research/thesis/
Short description: GIS mapping of British colonial sites in India (PhD project).
Published references:
Hardware/software: MapInfo.
Application of descriptive standards:
Application of spatial analysis:

****

Title of the project: Function of ground stone tools in the northern Oman peninsula.
Year of beginning: 1997.
Foreseen term: 2000.
Geographic area: Northern Oman Peninsula.
Excavation area: Muweilah and Tell Abraq, Sharjah Emirate, United Arab Emirates.
Contact address: Katia Davis, Archaeology A14, University of Sydney 2006, Australia.
E-mail address: davis@acl.archaeology.usyd.edu.au
WWW address: http: //www.archaeology.usyd.edu.au/research/thesis/
Short description: This project is designed to determine the function of ground stone tools in the northern Oman peninsula from c. 2400 BC - AD 400. This involves analysis of starch and DNA present on use-wear surfaces. The project is also designed to determine specific activity areas at Muweilah and Tell Baraq based on the spatial distribution of ground stone. The program MapInfo is being used to plot distributional data over a plan of these sites.
Published references: K.M. Davis, Preliminary results of residue analysis on the ground stone tools from Mleiha, in M. Mouton (ed.), Mleiha: Strategies de Subsistance et Exploitation des Resources Naturelles, Maison de'Orient (forthcoming); K.M. Davis, A Preliminary study of the ground stone tools from Muweilah, Sharjah Emirate,

United Arab Emirates, «Arabian Archaeology and Epigraphy» (forthcoming, May 1998); K.M. Davis, Ground stone, in P. Magee, Preliminary Report on the Second Season of Excavation at Muewilah, Sharjah Emirate, United Arab Emirates, Prepared for the Directorate of Antiquities, Sharjah Archaeological Museum, 1996.

Hardware/software: Pentium 100, 32 Mb of RAM, MapInfo, Word 7, Excel 7, Paint Shop Pro 4.1.

Application of descriptive standards:

Application of spatial analysis: Muweilah and Tell Abraq ground stone assemblages.

****

Title of the project: GIS Analysis of Waverley Cemetery, Sydney.

Year of beginning: 1997.

Foreseen term: 1 year.

Geographic area: Waverley Cemetery, Sydney.

Excavation area:

Contact address: Scott Banner, Archaeology A14, University of Sydney 2006, Australia.

E-mail address: banner@acl.archaeology.usyd.edu.au

WWW address: http: //www.archaeology.usyd.edu.au/research/thesis/

Short description: Examination of the correlation of monument height and cost with topographic location in Waverley Cemetery, Sydney.

Published references:

Hardware/software: MapInfo, DGPS.

Application of descriptive standards:

Application of spatial analysis:

****

Title of the project: Pagan and its Monasteries.

Year of beginning: 1997.

Foreseen term: 1 year.

Geographic area: Pagan, Burma.

Excavation area:

Contact address: Bob Hudson, Archaeology A14, University of Sydney 2006, Australia.

E-mail address: bhudson@extro.ucc.su.oz.au

WWW address: http: //www.archaeology.usyd.edu.au/research/thesis/

Short description: Pagan is a medieval city in upper Burma, where more than 2,000 brick temples, monasteries and stupas remain from its heyday as the core of a Buddhist Kingdom. Pagan is conventionally dated from around AD 1044 to AD 1283, when it supposedly went into rapid decline following an invasion by Kublai Khan's Mongol army. According to current archaeological evidence, however, Pagan was

unstable decades before the Mongols arrived. Using new survey material, a Geographical Information Systems (GIS) model of temporal and spatial change at Pagan will be developed, and use to refute the "crash due to invasion" theory. This "time and space" model will also be used to test Michael Aung Thwin's hypothesis that the decline of Pagan was due to competition between the city's ruling elite and the increasingly influential clergy, which overstretched the city's resources in a decades-long religious building boom. The conclusion is that while archaeological evidence does support the Aung Thwin hypothesis, there were actually several significant oscillations in Pagan's history, and we must look for more complex models of social and structural change.

Published references:

Hardware/software: PC, MapInfo.

Application of descriptive standards:

Application of spatial analysis:

****

Title of the project: Predictive modelling of archaeological potential in western NSW.

Year of beginning: 1989.

Foreseen term:

Geographic area: Western NSW.

Excavation area:

Contact address: Ian Johnson and Ian Turner, Archaeology A14, University of Sydney 2006, Australia.

E-mail address: johnson@acl.archaeology.usyd.edu.au

WWW address:

Short description: Predictive modelling of archaeological potential in western NSW using GIS to map the distribution of landscape features and associated qualitative information derived from 'expert knowledge'.

Published references:

Hardware/software: ERMS.

Application of descriptive standards:

Application of spatial analysis:

****

Title of the project: Mapping of Aboriginal burial sites in the Murray-Darling Basin.

Year of beginning: 1993.

Foreseen term: 2 years.

Geographic area: NSW, Victoria, South Australia.

Excavation area:

Contact address: Jeanette Hope and Ian Johnson, Archaeology A14, University of Sydney 2006, Australia.

E-mail address: johnson@acl.archaeology.usyd.edu.au

WWW address:
Short description: Mapping of Aboriginal burial sites in the Murray-Darling Basin. Maps prepared to show the distribution of different types and modes of burial, including correlation with landforms (recorded as attributes of burial sites) on small-scale base maps.
Published references:
Hardware/software: MapInfo.
Application of descriptive standards:
Application of spatial analysis:

****

Title of the project: GMS: Aboriginal site locations from the NSW NPWS site register.
Year of beginning: 1985.
Foreseen term: 1988.
Geographic area: NSW.
Excavation area:
Contact address: Ian Johnson, Archaeology A14, University of Sydney 2006, Australia.
E-mail address: johnson@acl.archaeology.usyd.edu.au
WWW address:
Short description: Development of a simple mapping capability ("GMS") as part of Minark DBMS for plotting Aboriginal site locations from the NSW NPWS site register onto simple topographic base maps. Development ceased 1988. Limited 1: 250K basemaps digitised.
Published references:
Hardware/software: Turbo Pascal, Minark.
Application of descriptive standards:
Application of spatial analysis:

****

Title of the project: Archaeological survey projects in NSW.
Year of beginning: 1989.
Foreseen term:
Geographic area: NSW.
Excavation area:
Contact address: Ian Johnson, Archaeology A14, University of Sydney 2006, Australia.
E-mail address: johnson@acl.archaeology.usyd.edu.au
WWW address:
Short description: Project to work out coverage outlines for all archaeological sur-

vey projects in NSW, categorise survey intensity and digitise outlines.
Published references:
Hardware/software: DIGIT, DIGEDIT.
Application of descriptive standards:
Application of spatial analysis:

****

Title of the project: Sydney-Cyprus Survey Project.
Year of beginning: 1992.
Foreseen term:
Geographic area:
Excavation area:
Contact address: Ian Johnson and Nathan Meyer, Archaeology A14, University of Sydney 2006, Australia.
E-mail address: johnson@acl.archaeology.usyd.edu.au
nathan@archaeodata.com
WWW address:
Short description: Sydney-Cyprus Survey Project, Director A. Bernard Knapp. Creation of large scale base map from registration of air photographs, digitisation of survey units and association of field-recorded attribute data. Using GPS (1996 on) for recording of registration points and surveyed units.
Published references: Knapp, Johnson 1994, 1995.
Hardware/software: Minark, MapInfo, Access, DGPS.
Application of descriptive standards:
Application of spatial analysis:

??

****

Title of the project: Central Australia Archaeology Project.
Year of beginning: 1992.
Foreseen term: Indefinite.
Geographic area: South Australia and Northern Territory.
Excavation area: 1200 square metres.
Contact address: Andrew Wilson and Judy Birmingham, Archaeology A14, University of Sydney 2006, Australia.
E-mail address: wilson@acl.archaeology.usyd.edu.au
judy.birmingham@archaeology.usyd.edu.au
WWW address: http: //www.archaeology.usyd.edu.au/research/caap/
Short description: Central Australia Archaeology Project. Survey of Aboriginal/European contact sites along the ninteenth century communications and transport route from Adelaide to Darwin. Individual sites are surveyed using Total Station (to 1995) or sub-metre DGPS (from 1996). Structures and artefact concentrations recorded

for quantitative and qualitative analysis. Focus on spatial distribution of artefacts and Aboriginal acquisition and re-use of European materails as evidence of interaction process.

Published references:

Hardware/software: MapInfo, Access, TotalStation, DGPS.

Application of descriptive standards:

Application of spatial analysis:

****

Title of the project: Archaeological Investigations at Regentville.

Year of beginning: 1985.

Foreseen term: Indefinite.

Geographic area: Regentville, western Sydney.

Excavation area: 950 square metres.

Contact address: Andrew Wilson and Judy Birmingham, Archaeology A14, University of Sydney 2006, Australia.

E-mail address: wilson@acl.archaeology.usyd.edu.au
judy.birmingham@archaeology.usyd.edu.au

WWW address: http: //www.archaeology.usyd.edu.au/research/regentville/

Short description: Archaeological Investigations at Regentville. The survey and documentation of a 4000 ha early colonial estate on the western margin of Sydney, and excavation of the estate's mansion. EDM and GPS used in planning surveyed and excavated features, MapInfo used for spatial analysis of 200,000 excavated artefacts.

Published references: A. Wilson, The failed colonial squire: Sir John Jamison at Regentville, in J. Birmingham, _Bairstow, A. Wilson (eds.), Archaeology and Colonisation: Australia in the World Context, ASHA, Sydney 1988.

Hardware/software: Minark, EDM, Trimble DGPS, MapInfo.

Application of descriptive standards:

Application of spatial analysis:

****

Title of the project: Virtual Sydney.

Year of beginning: 1996.

Foreseen term:

Geographic area: Sydney.

Excavation area:

Contact address: Ian Johnson and Andrew Wilson, Archaeology A14, University of Sydney 2006, Australia.

E-mail address: johnson@acl.archaeology.usyd.edu.au
wilson@acl.archaeology.usyd.edu.au

WWW address: http: //www.archaeology.usyd.edu.au/research/time_map/

Short description: Virtual Sydney. Through-time GIS showing the development of the site of Sydney over the past 5000 years. Map interface allows access to 2D and 3D imaging of geographical and historical data, including maps and pictures. Part of the TimeMap Project.
Published references:
Hardware/software: TimeMap, Delphi, MapInfo, Access.
Application of descriptive standards:
Application of spatial analysis:

****

Title of the project: Desert Kites: a regional analysis.
Year of beginning: 1997.
Foreseen term: Indefinite.
Geographic area: Eastern Jordan/ Southern Syria.
Excavation area:
Contact address: Alison Betts, Archaeology A14, University of Sydney 2006, Australia.
E-mail address: betts@acl.archaeology.usyd.edu.au
WWW address: www.archaeology.usyd.edu.au
Short description: Area study of stone-walled game drives in the lava region of eastern Jordan to study orientation and relation to topography. Study based on data obtained from maps and low-level photography. Use of satellite imagery is being explored. Study of these game drives may provide important data on animal populations, particularly gazelle, in an area where they are now virtually extinct. In prehistoric times they were a primary food source.
Published references: A. Betts, S. Helms, The desert Kites of the Badiyat al-Sham and North Arabia, «Paleorient», 13 (1), 1987, 41-67.
Hardware/software: Pentium 166, MapInfo.
Application of descriptive standards:
Application of spatial analysis:

****

Title of the project: Australian Archaeological Expedition to the United Arab Emirates.
Year of beginning: 1989.
Foreseen term: Indefinite.
Geographic area: Middle East.
Excavation area:
Contact address: Dan Potts, Archaeology A14, University of Sydney 2006, Australia.
E-mail address: dan.potts@archaeology.usyd.edu.au
WWW address: www.archaeology.usyd.edu.au
Short description: Australian Archaeological Expedition to the United Arab Emirates.

Published references:
Hardware/software: PCs, MapInfo.
Application of descriptive standards:
Application of spatial analysis:

****

Title of the project: GIS in the Arawe Project.
Year of beginning: 1993.
Foreseen term:
Geographic area: Arawe Islands, Papua New Guinea.
Excavation area:
Contact address: Cliff Ogleby, Department of Surveying and Land Information, University of Melbourne, Parkville VIC 3052 Australia.
E-mail address: cliff_ogleby@mac.unimelb.edu.au
WWW address:
Short description: GIS mapping of landscape and sites in the Arawe Islands, Papua New Guinea to show current land use and reconstruct previous landscape. Map data derived from satellite imagery, aerial photography, GPS and field survey.
Published references: Ogleby 1994.
Hardware/software: Landsat, Magellan GPS, Intergraph Modular GIS Environment (MGE).
Application of descriptive standards:
Application of spatial analysis:

****

Title of the project: Identification of 'wahi tapu' (sacred sites) on the Chatham Islands.
Year of beginning:
Foreseen term:
Geographic area: Chatham Islands, New Zealand.
Excavation area:
Contact address: Moira Jackson, Department of Anthropology, University of Auckland.
E-mail address: maj@antnov1.auckland.ac.nz
WWW address:
Short description: Identification of 'wahi tapu' (sacred sites) on Department of Conservation land in the Chatham Islands.
Published references:
Hardware/software:
Application of descriptive standards:

Application of spatial analysis:

****

Title of the project: Origins of the Civilisation of Angkor.

Year of beginning: 1995.

Forseen Term: 1998-9.

Geographic area: 1350 km/sq.

Excavation area:

Contact address: Paul Rivett, P.O.Box 56, Dunedin, New Zealand

E-mail address: paul.rivett@stonebow.otago.ac.nz

WWW address: www.otago.ac.nz//Anthropology/yResearchProjects/Angkor/-angkor.html

Short description: The overall project is concerned with the prehistory of Northeast Thailand up until the time of the civilisation of Angkor. My part in the project is the distribution of sites within the study area and, more specifically, the identification of communities formed by these sites.

Published references: Rivett 1997, at http: //divcom.otago.ac.nz: 800/conferences/geocomp97/cd-rom/geocomp97/papers /rivett/htm for an abstract and a pdf file of the paper.

Hardware/software: UNIX Arc/Info, ArcView, Imagine, MatLab

Application of descriptive standards:

Application of spatial analysis:

****

Title of the project: Gooreng Gooreng Social Landscapes Project.

Year of beginning: 1996.

Foreseen term: 1997.

Geographic area: Eastern Central Queensland.

Excavation area:

Contact address: Ian Lilley, Aboriginal and Torres Strait Islander Studies Unit The University of Queensland.

E-mail address: i.lilley@mailbox.uq.oz.au

WWW address: www.uq.edu.au/ATSIS/

Short description: Mapping sites of contemporary significance to Gooreng Gooreng Aboriginal people.

Published references:

Hardware/software: IBM clones, MapInfo.

Application of descriptive standards:

Application of spatial analysis:

****

Title of the project: Prehistoric socio-political transformations and agricultural intensification in Kohala, Hawai'i.

Year of beginning: 1995.

Foreseen term: 1999.

Geographic area: Hawai'i, USA.

Excavation area:

Contact address: Thegn Ladefoged, Department of Anthropology, University of Auckland.

E-mail address: tn.ladefoged@auckland.ac.nz

WWW address:

Short description: The project investigates the relationship between agricultural intensification and prehistoric socio-political transformations in Kohala, Hawai'i Island. A GIS analysis of an upland 19 by 4 km dryland field system has identified variability in agricultural development that corresponds to a range of social and environmental contexts.

Published references: T. Ladefoged, N. Michael, W. Graves, R. Jennings, Dryland agricultural expansion and intensification in Kohala, Hawai'i Island, «Antiquity», 70, 1996, 861-880.

Hardware/software: Intel based personal computers Windows NT; Arc/Info NT 7.1.1; Excel 7.0; SPSS 6.1.

Application of descriptive standards:

Application of spatial analysis:

****

Title of the project: Bytes on the Landscape.

Year of beginning: 1995.

Foreseen term: 1998.

Geographic area: Southeast Queensland.

Excavation area:

Contact address: Jim Smith, c/- Anthropology Museum, the University of Queensland 4072 Australia.

E-mail address: s168463@student.uq.qdu.au

WWW address:

Short description: Research investigating the design of archaeological DBMS with particular emphasis on the importance of this in relation to employment of GIS in cultural heritage management.

Published references:

Hardware/software: IBM compat Pentium 166, 16 Mb RAM, 2m video adapter, Mustek Flatbed.

Application of descriptive standards:

Application of spatial analysis:

****

Title of the project: Archaeology of Western Victoria.
Year of beginning: 1995.
Foreseen term: 1999.
Geographic area: Willaura mapsheet, Victoria.
Excavation area:
Contact address: Caroline Bird and David Frankel, Department of Archaeology, La Trobe University Bundoora VIC 3083, Australia.
E-mail address: C.Bird@latrobe.edu.au d.frankel@latrobe.edu.au
WWW address:
Short description: Analysis of chronological and spatial patterning of stone artefacts and sites from previous excavations and surface surveys in Western Victoria.
Published references:
Hardware/software: IBM-PC, ArcView.
Application of descriptive standards:
Application of spatial analysis:

****

Title of the project: Australian Archaeological Dated Site Index (AADSI).
Year of beginning: 1995.
Foreseen term: Indefinite.
Geographic area: Australia (including Torres Strait).
Excavation area:
Contact address: Sean Ulm, Aboriginal & Torres Strait Islander Studies Unit, University of Queensland 4072, Australia.
E-mail address: s.ulm@mailbox.uq.edu.au
WWW address: http: //www.uq.edu.au/ATSIS/
Short description: Compilation of the Australian Archaeological Dated Site Index (AADSI) commenced in 1995 to provide a cumulative reference source for Australian archaeologists and researchers in allied fields who need access to information on dates and references relating to archaeological sites in Australia. The Index has two primary objectives: 1) To provide a comprehensive and authoritative index of published date determinations (C-14, TL & OSL at this stage) from archaeological sites in Australia (obtained on both cultural and non-cultural materials and deposits); and 2) To provide a citation index for these sites covering sources reporting primary information about sites (rather than more interpretative secondary works). The Index is being constructed through a systematic survey of published sources which report research throughout Australia. Geographical data on each site is being used to investigate spatial and temporal distributional patterns of Aboriginal occupation of Australia since first settlement using MapInfo.
Published references:
Hardware/software: Dell OptiPlex GXL 590, MapInfo.

Application of descriptive standards:
Application of spatial analysis:

****

Title of the project: Rukeis, Eastern Jordan: area survey.
Year of beginning: 1994.
Foreseen term: 2005.
Geographic area: Limited region within northeastern Jordan.
Excavation area:
Contact address: Alison Betts, Archaeology A14, University of Sydney 2006, Australia NSW 2006.
E-mail address: betts@acl.archaeology.usyd.edu au
WWW address: www.archaeology.usyd.edu.au
Short description: Reconstruction of Middle Bronze Age landscape including settlement, water harvesting systems and fields.
Published references: A. Betts *et al*., Studies of Bronze Age occupation in the wadi al-'Ajib, Southern Hauran, «Levant», 28, 1996, 27-39.
Hardware/software: Pentium 166, MapInfo.
Application of descriptive standards:
Application of spatial analysis:

****

Title of the project: Archaeological GIS database for Matakana Island, Tauranga Harbour.
Year of beginning:
Foreseen term:
Geographic area: Matakana Island, New Zealand.
Excavation area:
Contact address: Moira Jackson, Department of Anthropology, University of Auckland.
E-mail address: Maj@antnov1.auckland.ac.nz
WWW address:
Short description: Archaeological GIS database for Matakana Island, Tauranga Harbour, incorporating the work of several archaeologists involved in a major resource management project. Hopes to develop a paper on predictive modelling and GIS related to this project.
Published references:
Hardware/software:
Application of descriptive standards:
Application of spatial analysis:

****

Title of the project: Kosciusko National Park Baseline Archaeological Survey.
Year of beginning: 1990.
Foreseen term: 1991.
Geographic area: Kosciusko National Park, NSW.
Excavation area:
Contact address: Ian Johnson, Archaeology A14, University of Sydney 2006, Australia.
E-mail address: johnson@acl.archaeology.usyd.edu.au
WWW address:
Short description: Kosciusko National Park Baseline Archaeological Survey (1990/1991). Sample survey and correlation of site locations with landscape characteristics – primarily altitude, slope, aspect and land systems – to develop general statements about potential site locations and management recommendations relating to development in the park.
Published references:
Hardware/software: Minark, ERMS.
Application of descriptive standards:
Application of spatial analysis:

****

Title of the project: Inland Settlement Patterns Rarotonga, Cook Islands.
Year of beginning: 1996.
Foreseen term: 5 years.
Geographic area: Rarotonga, Cook Islands.
Excavation area:
Contact address: Matthew Campbell, Archaeology A14, University of Sydney 2006, Australia.
E-mail address: campbell@acl.archaeology.usyd.edu.au
WWW address: http: //www.archaeology.usyd.edu.au/~campbell/
Short description: Mapping of abandoned agricultural terrace systems and garden plots on Rarotonga, Cook Islands, using differential GPS. Terraces and garden plots are being related to topography within radial valley systems in an effort to examine the evolution of the agricultural and settlement system of the island.
Published references:
Hardware/software: MapInfo, Access, DGPS.
Application of descriptive standards:
Application of spatial analysis:

****

Title of the project: Mapping and analysing the locations of kites in Jordan.
Year of beginning: 1997.

Foreseen term: 1 year.
Geographic area: Eastern Jordan.
Excavation area:
Contact address: David Burke, Archaeology A14, University of Sydney 2006, Australia.
E-mail address: burke@acl.archaeology.usyd.edu.au
WWW address:
Short description: Mapping and analysing the locations of "kites" (probable game traps) in Jordan, with the aim of supporting theories on their function through their relationship to grazing land and topography.
Published references:
Hardware/software:
Application of descriptive standards:
Application of spatial analysis:

****

Title of the project: Yorta-Yorta Land Claim.
Year of beginning: 1996.
Foreseen term: 1996.
Geographic area: Barmah Forest area, Murray River Valley.
Excavation area:
Contact address: Terry Bonnhomme and John Craib Bonhomme, Craib & Associates Archaeological Consultants.
E-mail address:
WWW address:
Short description: Mapping land claims and sites onto 1: 250,000 AUSLIG topographic base for the Barmah Forest area, for use in land claim tribunal.
Published references:
Hardware/software:
Application of descriptive standards:
Application of spatial analysis:

****

Title of the project: Beaudesert Shire Regional Archaeological Project.
Year of beginning: 1992.
Foreseen term: 1995.
Geographic area: Beaudesert Shire, southeast Queensland.
Excavation area:
Contact address: Jim Smith, c/- Anthropology Museum, the University of Queensland QLD 4072, Australia.
E-mail address: s168463@student.uq.qdu.au

WWW address:
Short description: Project was aimed at modelling the temporal/spatial distribution of particular technological aspects of stone artefact manufacture.
Published references: SMITH 1995.
Hardware/software: IBM compat 486 DX266, 20 Mb RAM, 2m video adapter, 256 greyscale scanner (hand held), HP DeskJet 1200C printer, MapInfo Professional, MS Access V2, SPSS, MS Excel 4.
Application of descriptive standards:
Application of spatial analysis:

****

Title of the project: Archaeological Site Distribution in North Kaipara, New Zealand.
Year of beginning: 1996.
Foreseen term: 1998.
Geographic area: Northern Kaipara.
Excavation area:
Contact address: Rod Clough, 209 Carter Road, Oratia, Auckland NZ.
E-mail address: reclough@iconz.co.nz
WWW address:
Short description: Analysis of site type and distribution as part of Kaipara Land Claim (Waitangi Tribunal).
Published references:
Hardware/software: Pentium II (266, 128 Mb RAM), Geoexplorer GPS, MapInfo.
Application of descriptive standards:
Application of spatial analysis:

****

Title of the project: The Making of Auckland.
Year of beginning: 1997.
Foreseen term: 1999/2000.
Geographic area: Downtown Auckland.
Excavation area: Britomart Development.
Contact address: Rod Clough, 209 Carter Road, Oratia, Auckland NZ.
E-mail address: reclough@iconz.co.nz
WWW address:
Short description: A variety of sources are used to map changes in the social and geographic history of Auckland: historic maps reveal the infilling and creation of downtown Auckland – Archival evidence maps the social districts – slums, industrial, commercial, and administrative. This is then integrated with material culture from archaeological excavations.

Published references:
Hardware/software: Pentium II (266, 128 Mb RAM), Geoexplorer GPS, MapInfo.
Application of descriptive standards:
Application of spatial analysis:

****

Title of the project: Mapping for Ngati Whatua o Kaipara ki te Tonga.
Year of beginning: 1996.
Foreseen term: 1998.
Geographic area: South Kaipara.
Excavation area:
Contact address: Hans-Dieter Bader, PO Box 68653, Newton, Auckland, NZ.
E-mail address: hdbader@clear.net.nz
WWW address:
Short description: Visualisation of the alienation of Ngati Whatua o Kaipara ki te Tonga from their land, using a variety of sources. The maps will be used in presenting the case of Ngati Whatua o Kaipara in their land claim against the Crown. The distribution of archaeological sites is used to illustrate pre-European settlement pattern of Ngati Whatua o Kaipara.
Published references:
Hardware/software: PC – P70 Arc/Info / ArcView on NT.
Application of descriptive standards:
Application of spatial analysis:

****

Title of the project: Butler Point Pa model.
Year of beginning: 1996.
Foreseen term: 1996.
Geographic area: Mangonui, Far North.
Excavation area: Butler Point Pa.
Contact address: Hans-Deiter Bader, PO Box 68653, Newton, Auckland, NZ.
E-mail address: hdbader@clear.net.nz
WWW address:
Short description: 3D model of an excavated pa (Maori hillfort), for the purpose of a visitor sign on the site.
Published references:
Hardware/software: SG Arc/Info(tins) on UNIX.
Application of descriptive standards:
Application of spatial analysis:

****

Title of the project: GPS pilot project for the Auckland Regional Council.
Year of beginning: 1997.
Foreseen term: 1997.
Geographic area: Auckland, 3 different archaeological sites.
Excavation area:
Contact address: Hans-Dieter Bader, PO Box 68653, Newton, Auckland, NZ.
E-mail address: hdbader@clear.net.nz
WWW address:
Short description: Three sites in the Auckland region are used, to evaluate the future use of differential GPS by the ARC in managing archaeological sites. Critical is the link of the existing database, the Cultural Heritage Inventory, to the GPS data and the presentation of the GPS in the GIS system of the ARC. The biggest problem is the step from one single East/North value per archaeological site in the Inventory to multiple point, line and polygon data from the GPS survey (Trimble ProXL and Advantage laser range finder).
Published references:
Hardware/software: 486, Sun InMagic, Trimble, DBase, Arc/Info UNIX.
Application of descriptive standards:
Application of spatial analysis:

****

Title of the project: Lake Victoria Cultural Heritage Conservation Project.
Year of beginning: 1994.
Foreseen term: 1997.
Geographic area: Western NSW.
Excavation area:
Contact address: Lake Victoria Cultural Heritage Conservation Project, PO Box 144, Wentworth NSW 2648.
E-mail address: lakevic@ruralnet.net.au
WWW address:
Short description: Conservation planning for protection of Aboriginal burials, and other Aboriginal and European heritage on the shores of Lake Victoria, a regulated water storage on the Murray River. Aboriginal burials, middens, hearths, stone artefacts, historic sites with bricks, ceramics etc. mapped by GPS (combined with standard survey for heights and profiles) onto digitised Murray River floodplain air photographs. Data analysed by MapInfo for assessment of both archaeological and erosional patterning. Future potential for including stratigraphic and chronological data.
Published references:
Hardware/software: Trimble GPS Pathfinder Pro XL, Fugro Omnistar differential service provider.
Application of descriptive standards:
Application of spatial analysis:

****

Title of the project: Aboriginal Landscapes of the Keep River Region: Archaeological and Geographic Perspectives.

Year of beginning: 1987.

Foreseen term: 5 more years.

Geographic area: Nothwestern Northern Territory, Australia.

Excavation area: Six sites, approx 20 square metres.

Contact address: Lesley Head, Richard Fullager School of Geosciences, University of Woolongong, NSW 2522.

E-mail address: l.head@uow.edu.au

WWW address:

Short description: Mapping of archaeological and Aboriginal sites, vegetation distributions and fire history.

Published references: L. Head, R. Fullagar, Aboriginal land-use and resource management around a pastoral excision – Marralam, «N.T. Australian Aboriginal Studies», 1991 (1), 39-52; L. Head, R. Fullagar, Palaeoecology and archaeology in the East Kimberley, «Quaternary Australasia», 10 (1), 1992, 27-31; L. Head, A. O'Neill, J. Marthick, R. Fullagar, A comparison of Aboriginal and pastoral fires in the north-west Northern Territor, in I. Moffitt, A. Webb (eds.), Conservation and Development Issues in North Australia, North Australia Research Unit, Australian National University, Darwin 1992, 130-144; R.D. Fullagar, D. Price, L. Head, Early human occupation of northern Australia: stratigraphy and dating of the Jinmium rockshelter, Northern Territory, «Antiquity», 70, 1996, 751-773; L. Head, R. Fullagar, Hunter-gatherer archaeology and pastoral contact: perspectives from northwest Northern Territory, «World Archaeology», 28 (3), 1997, 418-428; R. Fullagar, L. Head (in preparation), Aboriginal landscapes of the northwest Northern Territory, Australia, in R. Layton, P. Ucko, D. Austin (eds.), Frontiers of Landscape Archaeology, London, Routledge.

Hardware/software: EDM Total Station, MapInfo, ArcView.

Application of descriptive standards:

Application of spatial analysis:

ABSTRACT

This paper discusses the way in which GIS applications have flourished in Australia and New Zealand through a combination of high levels of computer ownership, environmental awareness and the scale of the landscape relative to population. The paper covers administrative applications such as site registers; traditional landscape-based research applications of GIS; and recent attempts to apply GIS to off-site archaeology and distributions of artefacts on a micro-topographic scale.

The critical effects of data availability and the use of GPS are discussed, as well as research into extending GIS or desktop mapping to cope with chronological change.

The paper concluded by looking at ways in which the use of GIS can be encouraged within the wider archaeological community, the importance of sharing digital map data and some ideas on future directions in the application of GIS within Australian and New Zealand archaeology.