A significant part of the project involves the creation of several versions of the database corresponding to the different scales included in the NHGIS. This requires developing systematic and robust procedures for geographic generalization. The first component of this work involves determining which scales will best meet the needs of potential users. Will users require detailed metropolitan-level data, or more generalized county-level data for a multistate analysis? Our preliminary work has identified three scales as potentially most useful: one at 1:150,000 for detailed tract-level mapping; one at 1:400,000 for county-level mapping, and one at 1:1,000,000 for regional and national mapping. Current research is focusing on the exact methods of generalization to be applied, the potential measurements that are needed to ascertain both the selection of the algorithms, and the determination of tolerance levels. A final consideration is the Web-based delivery of multiscale geographical data.

The NHGIS is being developed at the University of Minnesota's Population Center. By 2005, researchers expect to have completed almost all census-tract editing. This work includes producing county-level boundary files containing the census tracts for each of the years for which tracts existed. Focus has now turned to comparing the completed files with the census data and making any necessary modifications prior to their release. The project began releasing test versions of the census data in late 2004, with modifications to the test files continuing as necessary. The final release of all tract and county-level data is scheduled for July 2006.

NHGIS Resources Online

• National Historical GIS online: http://www.nhgis.org

—Robert B. McMaster and Pétra Noble
University of Minnesota

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The Great Britain Historical GIS

Work on what was to become the Great Britain Historical GIS (GBHGIS) began in 1994 when Ian Gregory teamed up with Humphrey Southall at Queen Mary, University of London. In previous research with David Gilbert, Southall had created a large database of nineteenth-century demographic statistics. This consisted of census data published every ten years, vital registration statistics from the *Registrar General's Annual Reports* and *Decennial Supplements*, Poor Law statistics from the Returns of the Poor Law and Local Government Board usually published bi-annually, and an assortment of other data published at a variety of dates. Their initial aim was to create a GIS holding the changing boundaries of the administrative units to which these data referred.

Early in the project an architecture was developed whereby changes to administrative boundaries were stored in ArcInfo using "date-stamps" such that when a user specified a particular date, accurate to the day, the system would retrieve the actual boundaries in existence on that day and assemble them into an ArcInfo coverage. The ArcInfo coverages contained place-names that enabled them to link to the statistical data which also contained place-names and were stored in an Oracle relational database management system. Gazetteers were used to handle historical changes and variations in the spellings of place-names.

Building on this highly flexible architecture, the project was expanded to store the changing boundaries of all of the major administrative units of Great Britain from the early nineteenth century until 1974. Data for the post-1974 period were not included as these were already available in digital form. At the same time the Centre for Data Digitisation and Analysis at the Queen's University, Belfast (see separate report on Ireland) was added to the project to create a comprehensive statistical database of tables that recur in nineteenth and twentieth century census and vital registration statistics—data to populate the GIS. This project was completed for England and Wales in 2000 at around the time when Gregory and Southall moved to the University of Portsmouth. Scotland has been added subsequently. The data are freely available to the academic community. The boundary data can be extracted from the UKBorders units of EDINA at the Data Library, University of Edinburgh while the statistical data are available as the Great Britain Historical Database (GBHDB) from the Arts and Humanities Data Service, History (see URLs below). Unfortunately, users currently have to extract the spatial and attribute data separately and rejoin them themselves.

In recent years, the work of the key members of the original project has diverged. Ell's work is covered later in this volume. Southall's main emphasis has been on creating a website to disseminate information about British localities to a wide audience. This work has been funded by the New Opportunities Fund. At its core is a statistical database on individual places taken from the GBHGIS, some of which has been simplistically interpolated (re-districted) onto a standard administrative geography to allow comparisons over time. Additional information includes textual data on places taken from both gazetteers such as the *Imperial Gazetteer from the 1870s* and Frederic A. Youngs *Guides to the Local Administrative Units of England*, and contemporary accounts of places such as those written by Daniel Defoe, Cecilia Fiennes, and William Cobbett. Creating this system in a way that can be easily disseminated over the Internet has involved redesigning the architecture of the system so that all of the data are primarily held in Oracle. Content from this system is increasingly being made available over the Internet through the "Vision of Britain through Time" website.

Gregory's main emphasis has been on developing analytical approaches to using the information within the GBHGIS and similar systems. Early

work, including collaborations with Southall and others, explored a variety of topics including changing migration patterns over time and changing patterns of poverty in England and Wales over the twentieth century. Work on poverty has been taken further to explore causal relationships between living conditions and health inequalities, although these studies have a primarily statistical rather than geographical emphasis. Gregory's recent work has focused on how data from multiple dates can be interpolated onto a single administrative geography to allow them to be compared over time. Key to this is the ability to perform the interpolation as accurately as possible but also to explicitly handle the error that the results of any interpolation inevitably contain. Further work has concentrated on techniques for analyzing both the geographical and temporal nature of data contained in a national historical GIS. This work has particularly focused on the potential of geographically weighted regression building on the analysis presented in *Mapping the Great Irish Famine* by Kennedy et al. (1999).

A second aspect to Gregory's work has been in establishing how GIS can best be used within historical research. To this end he has written *A Place in History: A Guide to Using GIS in Historical Research* (Oxbow, 2002 and online [see URL below]), which includes an extensive bibliography of historical GIS scholarship. He and Paul Ell are currently writing a monograph titled *GIS for Historical Research* (Cambridge University Press) that will provide a more extensive overview of the field and its methods.

GBHGIS Resources Online

- Boundary data: http://www.edina.ac.uk/ukborders.
- Demographic data: http://hds.essex.ac.uk/studybrowse (then go to "GBHD Online").
- Vision of Britain through Time: http://www.visionofbritain.org.uk. See also: http://www.gbhgis.org.
- Ian N. Gregory, *A Place in History: A Guide to Using GIS in Historical Research*: http://hds.essex.ac.uk/g2gp/gis/index.asp.

—Ian N. Gregory
Centre for Data Digitisation and Analysis, Queen's University, Belfast

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A Historical GIS for Ireland

The Centre for Data Digitisation and Analysis (CDDA) at the Queen's University, Belfast has a long-standing interest in the computerization, visualization, and statistical analysis of large numeric, spatially referenced historical databases. The Centre has, for example, digitized most of the