

GOVERNMENT MATTERS

for State and Local Government

Just a Thought... on the 2000 Census

By Christopher Thomas, State and Local
Government Solutions Manager

Flashback to the 1990 Census

It seems like it was only yesterday. I was sitting at my computer terminal trying to correlate precensus population figures with the cryptic land use database for the City of Ontario. What had I gotten myself into? My new job as the demographic planner for Ontario made me responsible for all the tasks relating to the 1990 census. Though I was uncertain about what I had gotten myself into, I was confident that I could perform anything related to demographic analysis.

I had just left a position performing growth studies for the Administrative Services Branch of the County of Riverside's Planning Department. I was used to tracking and maintaining housing developments by geographic components. At the time, Riverside was the fastest growing county in the United States.

However, I had raised the stakes by telling my new employer that I could identify deficiencies in the census numbers by using my advanced computer skills. Advanced is a relative term. In reality, I was scared to death but I needed to prove myself worthy of a career in urban planning. I was going to have to quickly develop a comprehensive land use database, analyze the data, and identify and report problem areas. The now-defunct precensus local review process allowed only 15 calendar days to report any discrepancies. Feeling frustrated and beaten down, I kept thinking there must be an easier way to accomplish this task.

Part of my job description included helping to integrate the computer mapping software that was located in the Engineering Department with the operations of the Planning Department. A pilot GIS project at the County of Riverside had used this technology. Computer mapping promised to make government processes more efficient. With this in mind, I introduced myself to Robert Flores of the Engineering Department. He had recently received the dubious title of computer mapping technician.

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Counting on ESRI for Census 2000

From partnering with the U.S. Census Bureau in developing tools and programs that help make census data more accessible to assisting state and local governments in verifying addresses, ESRI supports many aspects of Census 2000. GIS tools from ESRI help end users, whether in government or business, more effectively analyze data and quickly disseminate information.

Since 1790, the decennial census has provided the baseline demographic profile for the United States. It supplies the data not only for the statistics and projections used by government but is also the basis for commercial demographic data. Government funding on all levels is tied to census data. Representation in government on all levels—federal, state, and local—is determined by census data. Long-range planning, whether by a county deciding where to build a road or a company determining the best location for a new store, depends on census data. It is the gauge used to measure change in population.

ESRI's support of Census 2000 with the best in GIS technology will help improve the accuracy of the count...

Basis for Funding

Following the 1990 census, many governments, particularly those with large numbers of immigrant or homeless residents, believed their populations were undercounted. Governments that disputed census figures were often unsuccessful because they were unable to show specifically where errors were made. The City of Ontario, California, was successful in its appeal thanks to GIS. The City disputed census numbers because illegal or modified units were not included in the count. Maps created using the City's GIS demonstrated where undercounts had occurred. The resulting revised census numbers increased funding for the City.

In order to save both time and money and improve the accuracy of the upcoming census, a new program provides a mechanism for updating the Census Bureau's Master Address File

(MAF). The Local Update of Census Addresses (LUCA) project allows local and tribal governments to update the MAF list before the census by reviewing the address data contained in the Topologically Integrated Geographic Encoding and Referencing (TIGER) database.



TIGER/Line 1995 files available free of charge at the ESRI Web site.

The TIGER database, developed to assist census takers in 1990, covers the entire United States. In order to use the TIGER database with GIS software, the Census Bureau releases periodic extracts of the database, including the TIGER/Line files, to the public.

ESRI has made TIGER/Line 1995 files available in shapefile format free of charge from ArcData Online located on the ESRI Web site. With this data, governments can immediately perform analysis for LUCA using ArcView GIS or ARC/INFO. Other GIS companies sell the same information for up to \$4,000. Providing TIGER/Line 1995 files is just one part of ESRI's commitment to supporting Census 2000.

Geocoding addresses verifies both the aggregate number and the actual location of residents. This means needy areas will be properly identified so they may qualify for assistance programs. ESRI's tools let governments respond more effectively. In addition, geocoding and analysis done with GIS lets regional and state governments suggest block and tract splits so that boundaries will make more sense and give the Census Bureau a more complete picture of where population centers are located.

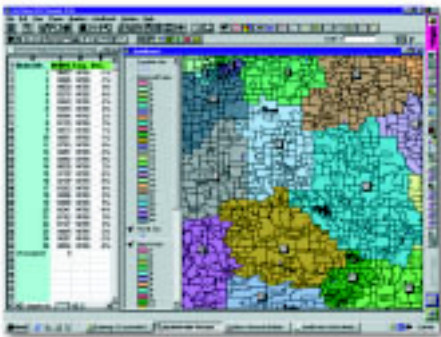
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Census 2000 Solutions Providers

The following ESRI business partners can help state and local governments participate more effectively in Census 2000. They provide applications, consulting services, and data that work with ESRI products and data.

Digital Engineering Corporation

Digital Engineering Corporation (DEC) is an applications software firm focused on the development of GIS technologies. DEC, a certified ESRI technology developer has been providing GIS solutions and technical services to private and government entities worldwide for more than 12 years. DEC provides single source solutions for clients with specialized requirements for high performance computer systems.



DEC's professional redistricting and reapportionment system, autoBound, creates balanced regions using point or polygon data.

DEC's primary GIS products are A/VReports Pro, A/VNotify, and autoBound.

- A/VReports Pro is a report writing extension that integrates Crystal Reports with ArcView GIS.
- A/VNotify is a location-based notification and mailing list management system.
- autoBound, DEC's professional redistricting and reapportionment system application, creates balanced regions using point or polygon data.

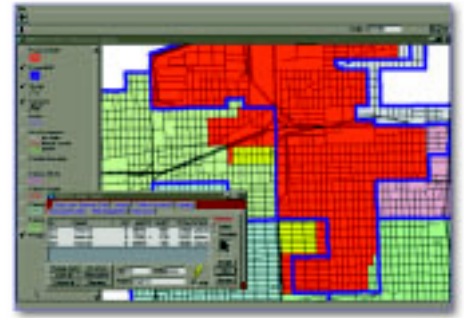
Additional information on DEC's products and services can be obtained at www.digitalcorp.com or by contacting DEC at 410-715-2300.

Election Data Services, Inc.

Election Data Services, Inc. (EDS), is a Washington, D.C.-based consulting firm specializing in redistricting, election administration, and the analysis and presentation of census and political data. The firm was founded in 1977 and maintains nationwide databases on election returns, election administration, and voting equipment. In addition to redistricting software, the firm offers political information products that include files of congressional and state legislative district boundaries and a ZIP+DISTRICT database linking district boundaries to postal ZIP Codes.

EDS has developed the six solutions based on ArcView GIS for state and local governmental organizations participating in census programs.

- REMAP 2000 Redistricting software redraws electoral districts using population data from the year 2000 census and includes tools to analyze redistricting plans and generate maps and reports.
- BBSP (Block Boundary Suggestion Project) software—Census 2000 Redistricting Data Program for Phase 1 tags TIGER/Line segments as 2000 census block boundaries and generates BBSP equivalency files and sketch maps of TIGER feature updates for the Census Bureau.
- VTDP (Voting District Project) software—Phase 2 of the Census 2000 Redistricting Data Program maps voting and electoral districts and generates polygon equivalency files for the Census Bureau as well as creating sketch maps for TIGER feature updates.
- VERIFY software—Census 2000 Redistricting Data Program analyzes TIGER/Line files and verifies the accuracy of Phase 1 BBSP and Phase 2 VTDP submissions to the Census Bureau.
- TAZ-UP (Traffic Analysis Zone Update) software—2000 Census Transportation Planning Package (CTPP) maps traffic analysis zones (TAZ) and generates polygon equivalency files for the Census Bureau in addition to generating sketch maps for TIGER feature updates.



PRECIS from EDS redraws precincts using TIGER/Line basemap and geocoded voter data.

- PRECIS Precinct Information System redraws voting districts (precincts) using a TIGER/Line basemap and geocoded voter data and generates maps, reports, and street files for voter registration systems.

Visit the EDS Web site at electiondataservices.com or contact them by phone at 202-789-2004.

A Little Help from Your Friends

Other GIS professionals in state and local government are often the very best source of information on innovative ways to use GIS, solve problems, or handle day-to-day operations. There are several ways to network with your GIS peers.

- Visit the Online Local Government Discussion Forum. Discussion topics are determined by the participants. Access the forum through the State and Local Government industry page (www.esri.com/industries/localgov/) at the ESRI Web site.
- Join the ESRI Local Government User Group or one of the dozens of independent regional user groups. These groups meet throughout the year to share information, data, tips on software usage, and project news. Information on regional and special interest user groups is available at www.esri.com/usersupport/usergroups/usergroups.html or from your local ESRI regional office in the United States or an international distributor if you are outside the United States.

Taking the Politics Out of Redistricting

As the decennial census approaches, states are again preparing to redraw electoral districts to ensure equal representation in Congress and state legislatures. The scheming, bargaining, and backroom deals that characterize the process in some states have caused it to be called “the purest of political blood sports” [*New York Times*]. This aspect of redistricting has largely been eliminated in the State of Iowa. In Iowa, a nonpartisan legislative agency—the Legislative Service Bureau (LSB)—is charged with redrawing congressional and legislative districts.

Professional Redistricting

The professional staff of the LSB provides bill drafting and research services to the committees and members of the Iowa General Assembly as well as preparing and presenting congressional and legislative redistricting plans to both houses of the General Assembly.

The Iowa Code requires the LSB to prepare and deliver three congressional and legislative district plans to the General Assembly. The first and second plans must be either accepted without amendment or rejected. The third plan can be amended. If no plan is adopted prior to September 15, the Iowa Constitution provides that the Iowa Supreme Court shall cause the State to be redistricted.

Iowa's Redistricting Standards

The Iowa Code contains strict standards that must be adhered to by the LSB in drafting a redistricting plan. Districts must be nearly equal in population and the maximum variances allowed are stipulated. The division of counties and cities between districts is discouraged. The goal is to create as few divisions as possible. Districts must be composed of contiguous territory and be compact in form. The Code prescribes a length–width compactness standard. The LSB may not use data such as the addresses of incumbent members, political affiliation of voters, results from prior elections, or demographic data other than head counts except as required by federal laws and the Constitution though this type of data is typically part of a redistricting database.

Redistricting in 1990

This process works! Iowa was the first state with more than one congressional district to complete the 1990 round of redistricting. The LSB obtained software and a database from Election Data Services Inc. (EDS) to draft the new congressional and legislative district plans. EDS software included special functions such as a compactness report that applied the length–width compactness standard in the Iowa Code to districts. The database used to create the district contained no political data but did include a unique feature—Redistricting Data Units (RDUs).



PRECIS Map Tools simplifies map production once new precincts have been drawn.

RDUs are the basic building blocks for creating districts in Iowa. They consist mostly of election precincts keyed to total population counts from the census. Using RDUs rather than census blocks speeds map drawing and further removes politics from the process. RDUs cover a larger area than census blocks and are often composed of whole political subdivisions or recognized election districts.

To assist the legislature in evaluating the redistricting plans drafted by the LSB, EDS also provided identical databases to Republican and Democratic caucuses of the General Assembly. These databases included political data such as election results, voters' party affiliation, and incumbent members' addresses so that legislators could analyze the political ramifications of the new redistricting plans.

Preparing for Redistricting 2000

The LSB is currently preparing for year 2000 redistricting by participating in the Census 2000 Redistricting Data Program. In Phase 1 of the program, called the Block Boundary Suggestion Project (BBSP), the LSB is using an EDS application based on ArcView GIS. This software enables the LSB to participate electronically in BBSP. EDS, the State's redistricting vendor in 1990, also provided the LSB with a database of current election precincts.

Using the ArcView GIS-based BBSP software, the LSB will prepare submissions to the Census Bureau indicating which geographic features in the TIGER/Line files form boundaries of election precincts and should be retained as block boundaries for the year 2000 census. The LSB also uses the BBSP software to generate sketch maps that can be annotated with corrections or missing features and submitted to the Census Bureau as proposed TIGER/Line feature updates.

EDS is also providing the LSB with software for electronic participation in Phase 2 of the Redistricting Data Program—the Voting District Project (VTDP). The LSB will use the ArcView GIS-based VTDP software to prepare polygon files of current election precincts and legislative districts for submission to the Census Bureau. The submissions will entitle the State to receive population counts for those geographic units for redistricting from the year 2000 census.

The LSB will be able to reuse the election precinct boundaries database from the Census 2000 Redistricting Data Program to prepare the database for year 2000 redistricting. The precincts will be available with other units of the census geography to construct a new set of RDUs for the year 2000 redistricting database.

*For more information, please contact
Kim Brace
Election Data Services, Inc.
1225 I Street, N.W., Suite 700
Washington, DC 20005-3954
Tel.: 202-789-2004, Fax: 202-789-2007
E-mail: kbrace@aol.com*

GIS Solutions for Census 2000

The Census 2000 Redistricting Data Program, created as a result of Public Law 94-171, is a Census Bureau program that provides states with the information necessary to create legislative districts with balanced populations. Digital Engineering Corporation's autoBound Intelligent Redistricting software, which works as an extension to ESRI's ArcView GIS software, helps states participate effectively in the Census 2000 Redistricting Data Program.

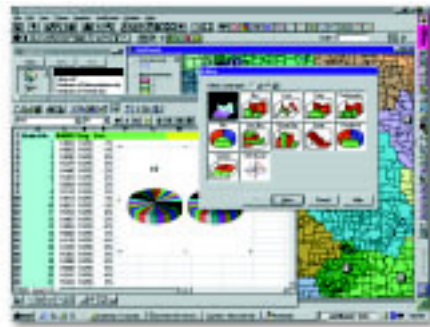
This program is executed in three phases. Phase 1, the Block Boundary Suggestion Project (BBSP), allows states to submit maps or equivalency files that suggest features such as roads, rivers, or ridgelines that should be maintained in establishing census block boundaries. Completed maps are returned by the Census Bureau so states can verify the locations of the features they suggested. The Census Bureau provides explanations in cases where suggested features were not included.

In Phase 2, the Voting District Project (VTDP), the Census Bureau delivers hard-copy maps and electronic files to the states displaying all the features to be used in the creation of census blocks. Participating states outline their election precincts using the features shown on these maps and return the maps or files to the Census Bureau. Phase 2 provides states with population totals based on their election precincts.

Phase 3, the Data Delivery phase, is required by Public Law 94-171. The Census Bureau provides each state with population totals by race, origin, and voting age for counties; American Indian areas; cities; towns; county subdivisions; census tracts; block groups; and blocks. States participating in Phase 2 will also receive these population totals for their election precincts.

Phase 2 redistricting was currently scheduled to begin in January of 1999. In this phase the Census Bureau will provide TIGER/Line files and/or hard-copy maps for each state. TIGER/Line files are digital database files of geographic features. In order to use these files, states must have a GIS capable of importing TIGER/Line data.

AutoBound Intelligent Redistricting software's TIGER import tool makes TIGER/Line data accessible. Once the TIGER/Line files are imported, states can use these files to delineate their election precincts. The states are responsible for submitting existing election precinct lines in Phase 2. For most states, these lines have been "frozen" for a period of time. For example, the State of Nevada, one of autoBound's Phase 2 users, has its precinct lines frozen during the years ending in the numeral six until the years ending in numeral one for each census period. Consequently, its precinct lines have remained unchanged since 1996.



Use autoBound to balance voting districts.

California and South Dakota are the only states not participating in Phase 2. South Dakota has already selected autoBound as its software for Census 2000 redistricting. When the Census Bureau delivers population data for Census 2000, the states not participating will receive data for census blocks, census tracts, and other geographic areas, but not for their election precincts.

States have several reasons for participating in Phase 2. The most obvious reason is that they will have population totals by race, origin, and voting age for their election precincts, which is helpful for redistricting. Participation in Phase 2 also familiarizes each state with the TIGER/Line files. Although its format may slightly change by the time of final Phase 3 redistricting, the importing done for Phase 2 allows states to fine-tune redistricting techniques.

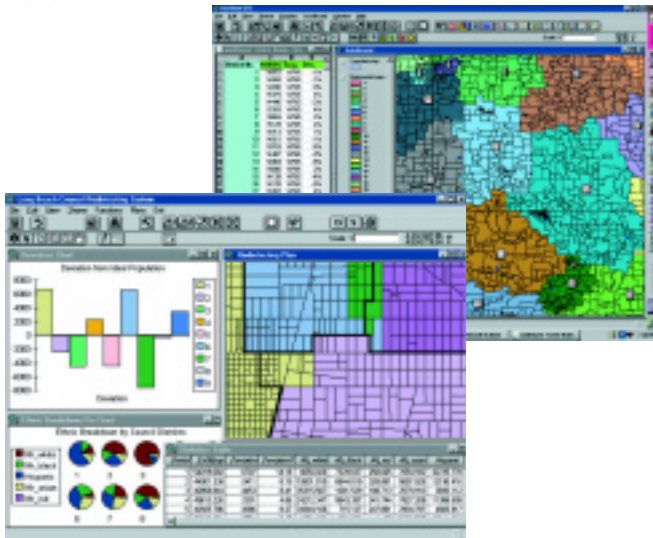
According to Kathy Steinle, GIS specialist with the Nevada Legislative Counsel Bureau, "participation in Phase 2 will prepare us for the task of redistricting, which is usually under a time crunch." Nevada must complete its redistricting plan by the end of the legislative session in 2001. The session runs from February to May, and the Census Bureau will have the data available by April. At best, they only have a few months to determine the redistricting plan and don't want to waste time on technical issues.

AutoBound, which runs in conjunction with ArcView GIS, provides the tools necessary for performing Phase 2 from start to finish. First, autoBound provides a TIGER import tool that allows TIGER files to be imported by county. The autoBound interface displays a seamless view of geographic features across county boundaries. In addition, requirements for Phase 2, as set forth in the Census Bureau's Phase 2 Technical Guidelines, have been incorporated into the functionality of autoBound.

By spring 1999, most states will have made a decision on Phase 2 software. Those who have chosen autoBound will not only step smoothly through Phase 2 but will also be a step ahead for the redistricting process. AutoBound's integration with ESRI's ArcView GIS provides a comprehensive turnkey solution for the Census 2000 Redistricting Data Program.

*For more information, please contact
Monica Dombrowski
Digital Engineering Corporation
5525 Twin Knolls Road, Suite 321
Columbia, Maryland 21045, USA
Tel.: 410-715-2300, Fax: 410-715-5507*

What Will the 2000 Census Say About Your Community? Count on ESRI for Solutions.



The 2000 census is critical to delivering government services. Representation and funding on all levels of government are determined by census data. Long-range planning of all types is predicated on census results. ESRI geographic information system (GIS) software solutions offer the right tools to analyze and present population and housing statistics. Whether you're looking for solutions for redistricting, participating in localized pre-census programs, or communicating data to your constituents via an Intranet or Internet, ESRI® can provide the best solution to meet your needs. ESRI solutions range from desktop to organization-wide systems. Call ESRI today to learn how GIS can help you develop better strategies for participating in the census.

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**Free TIGER® data at ArcData™ Online.
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Don't Miss *these* Presentations

Learn how state and local government professionals are preparing for Census 2000 by attending these paper presentations at this year's ESRI International User Conference.

Importance of MdProperty View for the Local Update of Census Addresses (LUCA) Program

By Michel A. Lettre, MSc.
Maryland Office of Planning—Planning Data Services

The Maryland Office of Planning, the principal agency providing technical assistance to 18 counties and their municipalities participating in the Census Bureau's 1998 LUCA program, has developed ArcView GIS-based project files that work with a State-wide property database called MdProperty View.

The Spatial Delineation of Political Communities of Interest

By John K. Wildgen, Ph.D.
University of New Orleans—Urban and Regional Affairs

Since the mid 90s, a series of Supreme Court decisions has started to develop the notion of "community of interest" as an additional criterion of fair districting. This paper explores some techniques borrowed from remote-sensing approaches and map algebra to help those performing redistricting with this hard-to-quantify and hard-to-map concept.

Census 2000: A 1990 Repeat? Concerns and Implications for GIS Professionals

By Christopher Williamson, Ph.D.
GIS Distance Learning Program—Geography Department

Local governments will need to develop legally defensible decisions and policies regarding the use of census data with known undercounts and/or adjusted census data—and use the data carefully. Pre-

liminary results of a national survey of municipal planners who use census data shows that skills in evaluating census data quality and making adjustments are little known and not perceived as a high priority training need.

Building a Redistricting Application for the North Carolina General Assembly Using MapObjects and Visual Basic

By Kevin Gainey
North Carolina Center for Geographic Information and Analysis

The North Carolina General Assembly's Information Systems Division is responsible for enabling State legislators, legal counsel, and Division staff to draw and analyze political districts. A main-frame system was used in the 1990 census. The Division is developing a similar application using Microsoft Visual Basic and MapObjects for a PC platform. This new application will increase efficiency, flexibility, stability, and scalability within the Windows environment for the upcoming 2000 census.

Counting on ESRI for Census 2000

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Critical to Long-Term Planning

Census information gives local governments a handle on change. Whether predicting service demands for police and fire protection, developing housing elements for master plans, or performing any of the other major tasks of city development, governments need to acquire, analyze, and disseminate census data efficiently.

ArcExplorer and ArcView GIS provide users with ready access to census data. With ArcView GIS and extension software such as ArcView Spatial Analyst, ArcView 3D Analyst, and ArcView Network Analyst, census data can be manipulated and classified from the desktop. Data for more extensive jurisdictions can be managed using ARC/INFO. Using MapObjects Starter Applications, governments of all sizes can quickly publish census data on Intranets or the Internet. Internet technology is especially helpful to governments trying to publish data from the Public Law File, the initial data report generated by the Census Bureau.

Improved Redistricting

Changes in population necessitate redrawing the political boundaries from city council districts to congressional districts. Governments that have established GIS programs have begun using GIS to handle redistricting. GIS has changed this process from an arduous and lengthy manual operation to one in which many scenarios can be rapidly modeled to arrive at the best available solution.

Expertise in redistricting is available from a variety of ESRI business partners. Visit www.esri.com/partners/ to learn more about products and services that help state and local governments deal effectively with the 2000 Census.

Working for a Better Count

In addition to assisting governments in using census data, ESRI continues to help the Census Bureau coordinate the enumeration and communicate and analyze the results. The Census Bureau is distributing Census Mapper, a version of ArcExplorer packaged with select tables from the 1997 Statistical Abstract of the United States,

free of charge as part of a cooperative research and development agreement between ESRI and the Census Bureau. Census Mapper will allow users to explore data to reveal hidden spatial patterns, relationships, and trends.

As part of another cooperative agreement, ESRI and IBM are jointly developing the Data Access Dissemination System (DADS), which will supply unparalleled access to the data collected in the 2000 survey. Users will be able to query geographic, demographic, economic, and other data via the Web and generate thematic maps. This increase in customer service will also reduce costs for the Bureau. This system will support a large number of users including congressional, White House, and Census staff.

ESRI's support of Census 2000 with the best in GIS technology will help improve the accuracy of the count and the dissemination of this important information.

Just a Thought...on the 2000 Census

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In those years, the word GIS was not typically included in the job titles of professionals in state and local governments. Robert and I toyed around with the idea of taking the database I had created and having the "machine" isolate a geographic area, compare it with the census numbers, and identify areas that showed differences.

Although this process seems unremarkable in a world where GIS is becoming more and more commonplace, at that time nobody had ever really used GIS for census-related work at a local government level. By developing a program that did nothing more than report back problem areas, we identified over 650 housing units the Census Bureau had missed, which would have cost the City \$2,000,000 in lost State and federal funding over a 10-year period. Not bad for

a first try. On the basis of this success, Robert and I became mesmerized by the potential of the ESRI technology and embarked on an effort to implement GIS in all the City's activities.

Fast Forward to the 2000 Census

The decennial census has descended upon us once again, and it's exciting to know that ESRI solutions can and will play an important role in assisting state and local government agencies in securing more accurate population and housing counts. Though some programs have changed, the goal of assisting the Census Bureau in this massive undertaking remains the same.

As census statistics become available, government agencies will need effective methods for making sense of the data. ArcView GIS is already being used by municipal and county agencies participating in precensus programs such as the Boundary and Annexation Survey, Local Update of Census Addresses (LUCA), and re-

districting. After the census is complete, governments can use the MapObjects Internet Starter Applications' demographic browser to disseminate demographic data throughout their organizations and to the public.

Laying a Solid Foundation

Working on the census can jump-start a government's GIS program. The necessary components for census work—street networks, address files, census tract boundary files, and demographic data—are the basis for GIS applications throughout a government. The work done for the census can produce immediate results in the form of maps that show population locations and demographics to decision makers. If you recognize the potential for leveraging your work, the census can be the best thing that ever happened to your government's GIS.

Order Your Reprint

While supplies last, you can get a free copy of "Census 2000: Counting on GIS," an article reprinted from **American City & County** magazine that describes how the Census Bureau and governments across the United States are using GIS for Census 2000.

Call 1-800-447-9778 or send an E-mail to info@esri.com to reserve your copy.

"ARC/INFO GIS saved our City more than \$2 million on a single project."

—Christopher Thomas, GIS Coordinator, City of Ontario, California.

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*Send inquiries to
Chris Thomas,
State and Local Government
Solutions Manager, at cthomas@esri.com*

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California

Redlands,

380 New York Street

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