Orange County
PROFILES
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GEOGRAPHIC INFORMATION SYSTEMS: GIS

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INTRODUCTION

Geographic information is a key component to how we understand the world. Technological changes have increasingly made geographic information more readily available. It is as simple as downloading map directions from your home to your child's new school, your place of work or vacation destination. Access to demographic, economic, health and many other data topics are now available online and it is estimated that 80 percent of all data contains a geographic component, such as a city name, ZIP code or street address. Geographic Information Systems are, as described by ESRI, one of the leading GIS companies, "a collection of computer hardware, software, and geographic data for capturing, managing, analyzing, and displaying all forms of geographically referenced information." This issue of Orange County Profiles provides a brief overview of GIS and various examples of GIS projects completed by the Center for Demographic Research (CDR) since it was established at California State University, Fullerton. These applications will illustrate how this technology has become an essential tool for local and regional planning efforts in Southern California.

WHAT IS GIS?

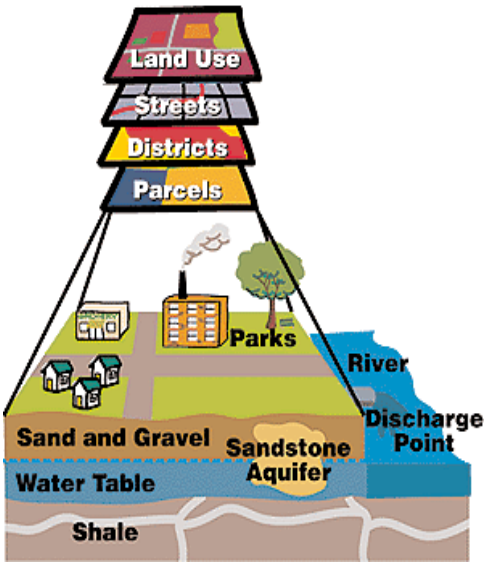
A geographic information system, or GIS, is often described as "maps on a computer." However, a GIS operates on many levels. At the most basic level, GIS is used as computer cartography, i.e. mapping. However, the real benefits of GIS are seen when using spatial and statistical methods augmented by critical analysis to examine attribute and geographic information.

In its simplest form, one can think of a GIS as a series of transparent overlays, each with information (spatial: where it is and attribute: what it is) related to a specific subject. For example, one layer might be property parcels; another, land use; yet another streets or streams (Figure 1). By looking through the layers, one can see the interrelationship between the various layers. This notion of interrelationships between layers is at the heart of GIS. It reveals patterns and relationships that would otherwise be invisible.

ADDRESSING SPECIFIC NEEDS THROUGH GIS ANALYSIS

To help visualize real-world phenomena, simple and complex maps can be created in a GIS. Simple, standard maps include such commonly used themes as General Plans, city boundaries and Census Tracts. Custom maps range from simple location maps to complex publications using a combination of prepared data from local agencies and common geographic data layers. Final mapping products can be delivered in a variety of sizes and formats from hard copy maps to electronic files that can be easily added to a PowerPoint presentation or report, or PDF for printing and web display.

Figure 1
Example of Geographic Overlays



GIS can be used for a variety of projects and fields, such as demography, transportation and urban planning, real estate, health care and crime statistics. We accomplish this by using GIS to assist demographers, urban planners and others when exploring developmental opportunities and visualizing geographic relationships. Many GIS projects are related to future land use and transportation development.

In 2002, the CDR was contracted by the Orange County Families and Communities Together (FaCT) to develop a series of maps that were used in the research and development of community-based programs throughout Orange County. Using data from the 2000 U.S. Census and the Orange County Social Service Agency, the CDR developed a series of maps and overlays, as well as detailed analysis using cluster techniques. Figure 2 shows one example of a standard map using public data from the 2000 U.S. Census shown at the census tract level.

In 2003, the CDR collaborated with the Orange County Council of Governments (OCCOG) and Western Riverside Council of Governments (WRCOG) on an infill capacity analysis study. This Inter-regional Partnership was undertaken under the assumption that future residential development in Orange and western Riverside County will rely extensively on infill. Using a combination of GIS tools and data sources, the CDR was able to identify candidate infill/refill (physically or economically underutilized property based on a formula) housing sites in transit-rich and employment-rich areas in western Riverside and Orange County (Figure 3).

Figure 2
Orange County Families and Communities Together (FaCT)
Social Indicators Study

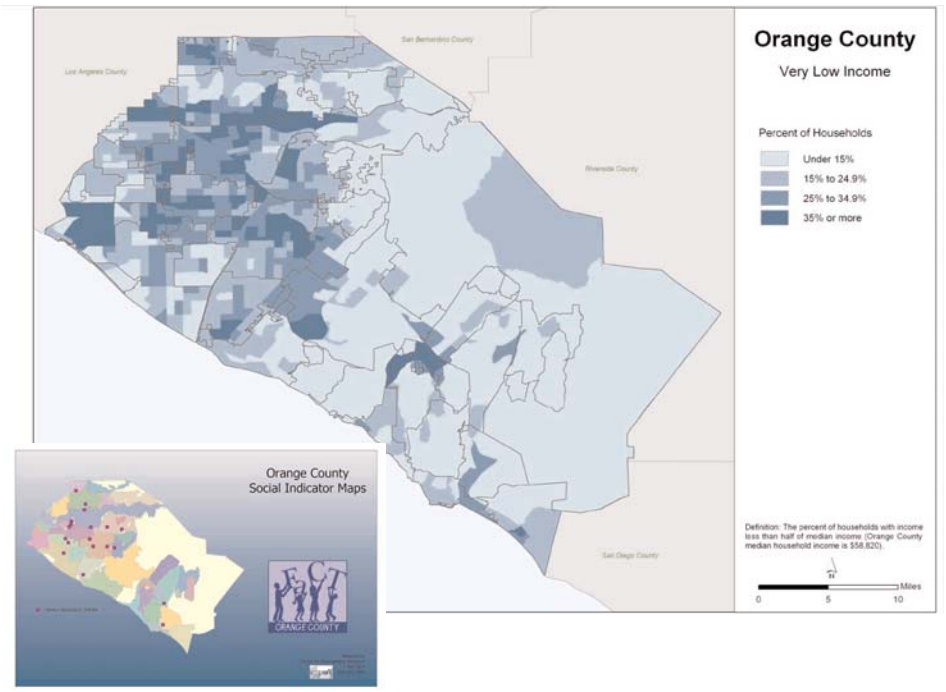
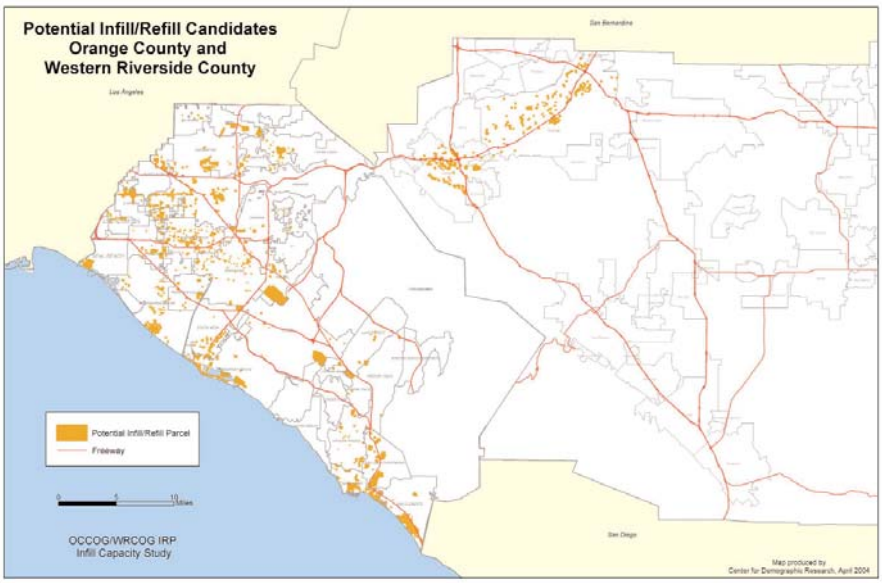


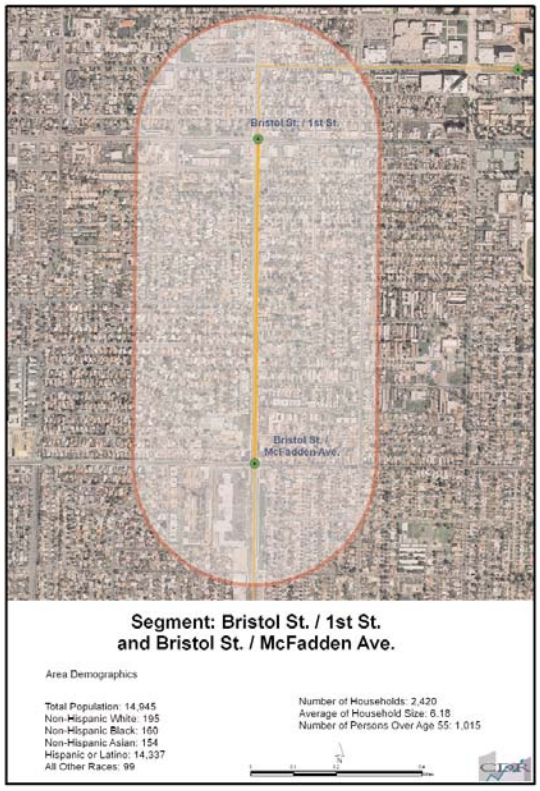
Figure 3
Inter-Regional Partnership Infill Capacity Analysis Study



CUSTOM DEMOGRAPHIC DATASETS AND GIS DATA LAYERS

Both the public and private sector can benefit from knowing the current and projected demographics of a particular geographic area. GIS at the CDR plays a major role in maintaining our current demographic

Figure 4
Demographic Data Summary for Specified Project Area & Buffer Zone



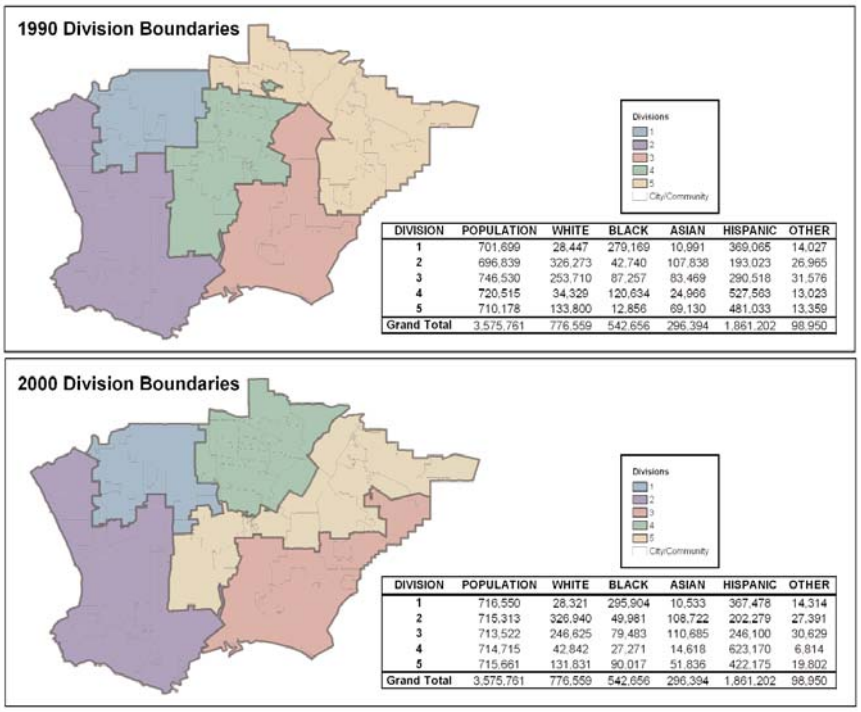
estimates, forecasts and Census data. Baseline data for population and housing projections is in a GIS data layer. This 25,000+ polygon database of Census Blocks is a single layer of nested polygons that include U.S. Census geographies (block, block group, census tract) and various Orange County administrative units such as Traffic Analysis Zones (TAZ) and Community Analysis Areas (CAA). The nested geography model allows the CDR to simply allocate Census population and housing unit counts at various geographic levels and service areas. Such information can be used to create customized demographic datasets, GIS data layers and mapping products for any area in Orange County. Examples include a radius from an intersection or address, a buffered area, or user defined service area (Figure 4). These types of applications allow GIS professionals and non-GIS users alike to view and map a variety of information.

Custom demographic datasets and GIS data layers have also been developed for a number of redistricting/reapportionment projects. In 2001, The Water Replenishment District of Southern California (WRD) contracted with the CDR to assist them with the adjustment of their division boundaries. Initially, the CDR digitized the current division boundary then aligned it with the Census geography and calculated the population and race/ethnicity for each division. Based on guidelines set by WRD, the CDR then developed a series of twelve potential division boundaries. Demographic profiles and maps were created for each scenario and were reviewed by the WRD Board until an agreement was reached on the final division boundaries (Figure 5). After approval of the final boundary, the CDR continued to work with WRD and the Los Angeles Registrar of Voters to ensure they had the newly realigned boundary file and data. Similar projects have been completed for the Orange County Supervisorial Districts, Municipal Water District of Orange County (Figure 6) and various community college districts in Orange County.

SUMMARY

This issue of Profiles covered a variety of uses of GIS through several examples of projects completed by the CDR. GIS technology allows for the management and analysis of large sets of

Figure 5
Water Replenishment District of Southern CA Redistricting Project



DIVISION	POPULATION	WHITE	BLACK	ASIAN	HISPANIC	OTHER
1	701,699	28,447	279,169	10,991	369,065	14,027
2	696,839	326,273	42,740	107,838	193,023	26,965
3	746,530	253,710	87,257	83,469	290,518	31,576
4	720,515	34,329	120,634	24,966	527,563	13,023
5	710,178	133,800	12,856	69,130	481,033	13,359
Grand Total	3,575,761	776,559	542,656	296,394	1,861,202	98,950

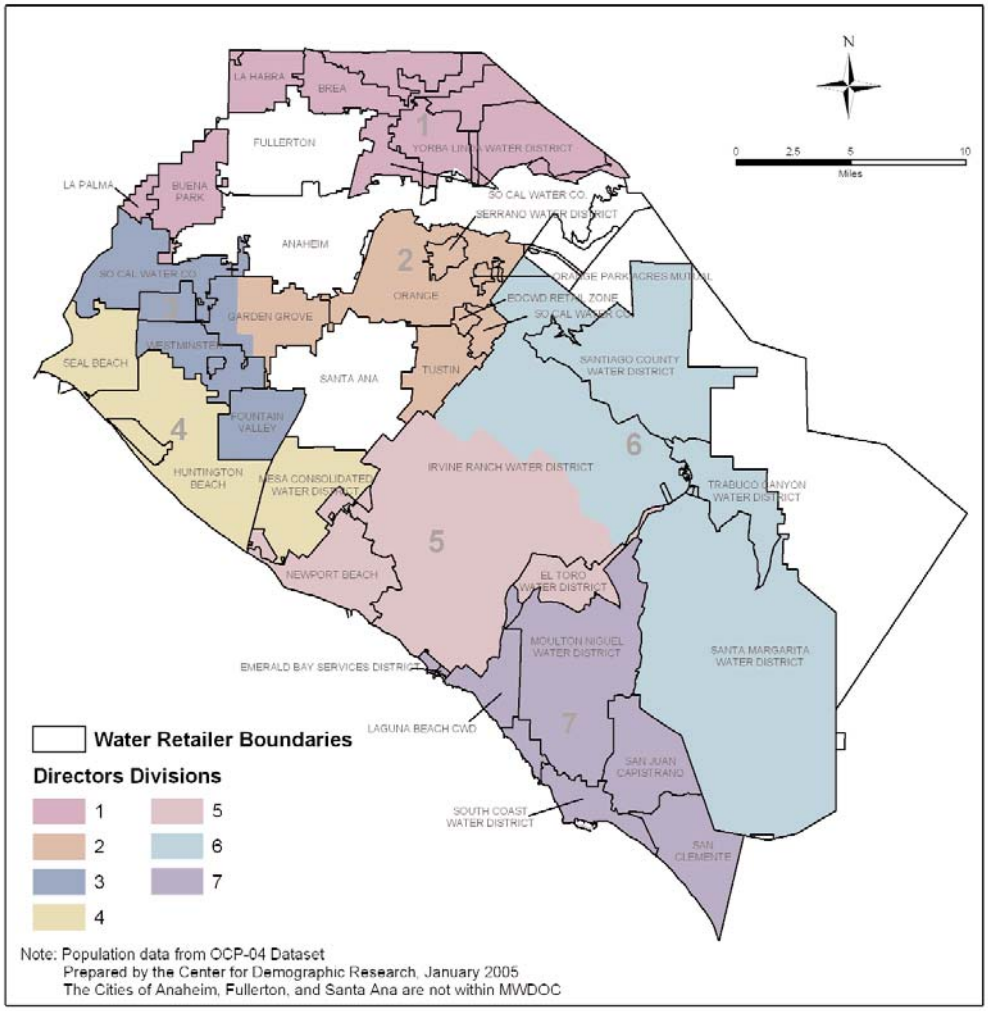
DIVISION	POPULATION	WHITE	BLACK	ASIAN	HISPANIC	OTHER
1	716,550	28,321	295,904	10,533	367,478	14,314
2	715,313	326,940	49,981	108,722	202,279	27,391
3	713,522	246,625	79,483	110,685	246,100	30,629
4	714,715	42,842	27,271	14,618	623,170	6,814
5	715,661	131,831	90,017	51,836	422,175	19,802
Grand Total	3,575,761	776,559	542,656	296,394	1,861,202	98,950

both demographic and spatial information, and has become increasingly important in planning efforts of various agencies throughout Orange County and Southern California.

GIS SERVICES PROVIDED BY THE CDR

Since launching its operations at California State University, Fullerton in 1996, the variety and scope of GIS projects and agencies served by the CDR has steadily grown. The CDR has used GIS technology as a tool for the display and synthesis of geographic information and provided expert GIS technical support and mapping services. The CDR has collected, analyzed and mapped geographic data for many GIS applications and projects related to demography, land use, transportation and public safety. The CDR provides GIS analysis, data management and conversion, mapping and materials on a project-by-project basis to public and private entities. Many types of GIS analysis and custom products are available from CDR. For more information, please visit our website: www.fullerton.edu/cdr

Figure 6
Municipal Water District of Orange County Directors Divisions



MWDOC NEW DIRECTORS DIVISIONS POPULATION

MUNICIPAL WATER DISTRICT OF ORANGE COUNTY

Div	2005 Population	2005 Pct of Mean	2010 Population	2010 Pct of Mean
1	321,303	-1%	339,874	-2%
2	331,784	+3%	349,876	+1%
3	337,385	+4%	354,332	+2%
4	338,171	+5%	356,539	+3%
5	306,753	-5%	324,059	-6%
6	298,673	-8%	352,183	+2%
7	328,841	+2%	345,198	-0%
TOTAL	2,262,910		2,422,061	

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