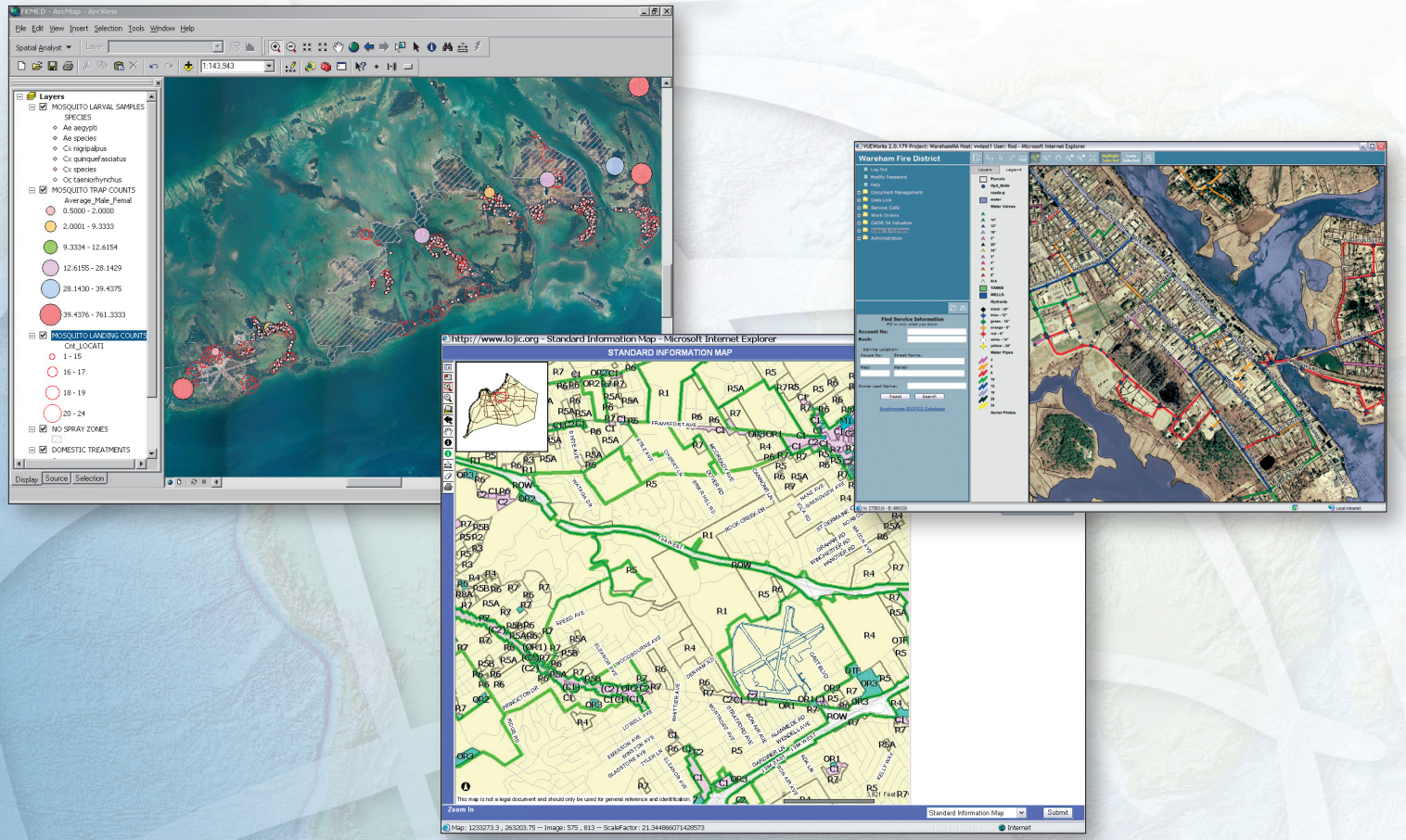
GIS Best Practices

GIS for Special Districts



February 2007

ESRI

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What Is GIS?

Making decisions based on geography is basic to human thinking. Where shall we go, what will it be like, and what shall we do when we get there are applied to the simple event of going to the store or to the major event of launching a bathysphere into the ocean's depths. By understanding geography and people's relationship to location, we can make informed decisions about the way we live on our planet. A geographic information system (GIS) is a technological tool for comprehending geography and making intelligent decisions.

GIS organizes geographic data so that a person reading a map can select data necessary for a specific project or task. A thematic map has a table of contents that allows the reader to add layers of information to a basemap of real-world locations. For example, a social analyst might use the basemap of Eugene, Oregon, and select datasets from the U.S. Census Bureau to add data layers to a map that shows residents' education levels, ages, and employment status. With an ability to combine a variety of datasets in an infinite number of ways, GIS is a useful tool for nearly every field of knowledge from archaeology to zoology.

A good GIS program is able to process geographic data from a variety of sources and integrate it into a map project. Many countries have an abundance of geographic data for analysis, and governments often make GIS datasets publicly available. Map file databases often come included with GIS packages; others can be obtained from both commercial vendors and government agencies. Some data is gathered in the field by global positioning units that attach a location coordinate (latitude and longitude) to a feature such as a pump station.

GIS maps are interactive. On the computer screen, map users can scan a GIS map in any direction, zoom in or out, and change the nature of the information contained in the map. They can choose whether to see the roads, how many roads to see, and how roads should be depicted. Then they can select what other items they wish to view alongside these roads such as storm drains, gas lines, rare plants, or hospitals. Some GIS programs are designed to perform sophisticated calculations for tracking storms or predicting erosion patterns. GIS applications can be embedded into common activities such as verifying an address.

From routinely performing work-related tasks to scientifically exploring the complexities of our world, GIS gives people the geographic advantage to become more productive, more aware, and more responsive citizens of planet Earth.

GIS for Special Districts

Special districts use GIS to track assets, manage capital improvement projects, deliver better service to citizens, and much more. GIS provides special districts with tools for data collection, management, and analysis; cataloging histories of assets; creating reports for elected officials and board members; quickly locating projects on detailed maps; and sharing critical data throughout a government organization. GIS streamlines workflows to improve productivity and efficiency in a myriad of activities.

ESRI software is the number one choice of local governments worldwide for their mapping and analytical needs. Updating a district's information technology system with GIS helps it meet and exceed demands and fosters better interactions with other local agencies. Using GIS software from ESRI, local government employees have discovered how to perform traditional tasks more effectively and how to accomplish tasks that were previously impractical or impossible.

The following articles show examples of how special districts have used GIS for initiatives such as creating a Web-based work order system, geographically displaying the findings of a public health study, and even controlling mosquitoes.

Web Application Integration to a Work Order System

By Fred Wong, Union Sanitary District

The Union Sanitary District is an independent special district that provides wastewater collection, treatment, and disposal services to the residents and businesses of the cities of Fremont, Newark, and Union City in southern Alameda County, California.

The district serves a population of 322,450 and maintains 760 miles of wastewater mains in a 60-square-mile service area. The daily average dry weather flow is 29 million gallons of water per day. The district has 130 employees, and the annual operating budget is $20,450,000.

Background

The GIS program began in 1996 with ArcInfo and ArcView running on a few workstations, and during the early years much of the time was spent on data conversion. A GIS task force was formed within the district to identify and prioritize applications that were to be developed. The task force compiled a list of 17 applications with the highest priority for a GIS connection to the work order system.

In 2002, the district decided to implement Web-based applications on its Intranet to deploy GIS throughout the organization. ArcIMS was installed on a dedicated GIS server, and MoosePoint Technology, Inc., was contracted to help create the initial applications using their GeoSmart product to quickly build the application. GeoSmart is a browser-based application that allows easy creation and updating of Web applications using wizards to go through a series of steps that will build the application.

Priority Applications

The highest ranked application needed was for a GIS connection to the work order system. One of the reasons this was such a high priority was the district has more than 10 years of sewer main and manhole work order data in the Hansen Information Technologies system.

Four other applications were also initially developed to meet some of the other priority applications (Figure 1). The initial GIS applications that have been developed have similar basic functions but are customized for different specific purposes.

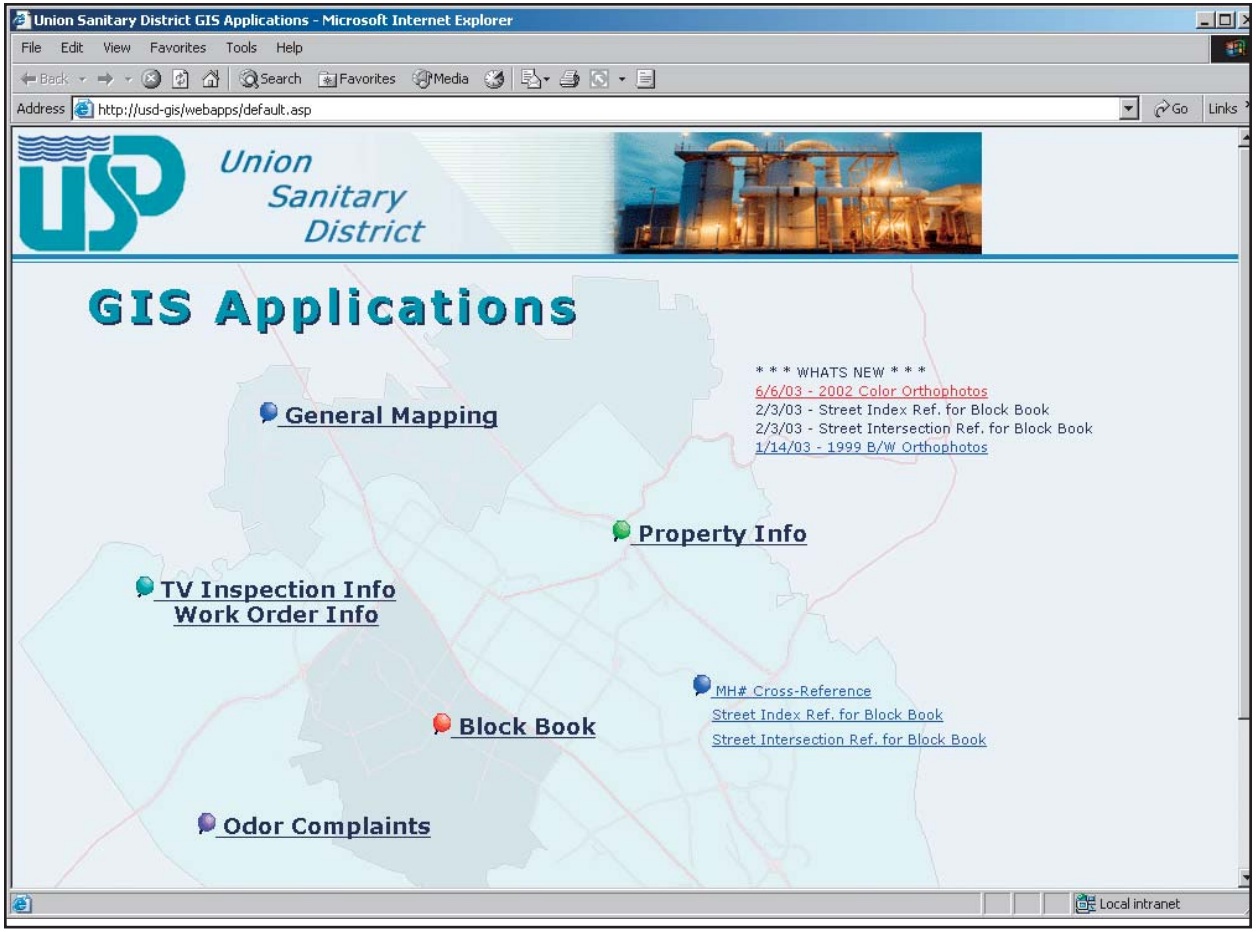


Figure 1

The applications have been designed to provide more data and details as the view is zoomed to. There are two basic steps: (1) Locate the main, manhole, etc., by zooming in on the map and searching by address or street and cross street or query for a manhole number and (2) Identify/Select the main, manhole, or other feature. There are several other standard functions such as viewing various data layers and getting their information, printing, clearing the previous data, and returning to the main menu.

Application	Purpose
General Mapping	For general mapping with 30 data sets that may be overlaid for ad hoc mapping
Property Info	For looking up parcel information such as property owner and mailing address
TV Inspection Info/Work Order Info	For locating a main and recalling a TV Inspection Report or work order summary via link with the Hansen Infrastructure Management System
Block Book	For locating a block book sheet with the latest mains and manholes update
Odor Complaints	For displaying locations of odor complaints

Work Order Database Integration

As the highest priority application, the TV Inspection Info application was designed to perform three primary functions. The key function was to view the TV inspection reports for the selected main. The report data from the Hansen system database includes the TV inspection number, the date, the operator, the upstream and downstream manholes, and the readings with distances from the camera setup, clock position of the lateral or defect observed, the code/defect, a short description, and the associated comment (Figure 2). A second function was to list all the past work orders for the main to get an idea of whether it historically has had problems and what has been done (Figure 3).

The third function was to provide a Cleaning Area Report. The district has a 72-month maintenance program for the mains so each of the mains will be cleaned and checked for defects during that period. Each main is assigned to a cleaning area, and grouped work orders are issued to the crews. The Cleaning Area Report is a tool for the crews or supervisors to quickly view how the cleaning work is progressing (e.g., if 50 percent of the year or quarter is over, approximately 50 percent of the cleaning areas for that year or quarter should be completed). The report summarizes the number of mains and the total footage for the selected cleaning area, the number of mains and footage cleaned to date, and the calculated percentage completed. It also lists each main in the cleaning area, its length, and the date it was cleaned (Figure 4).

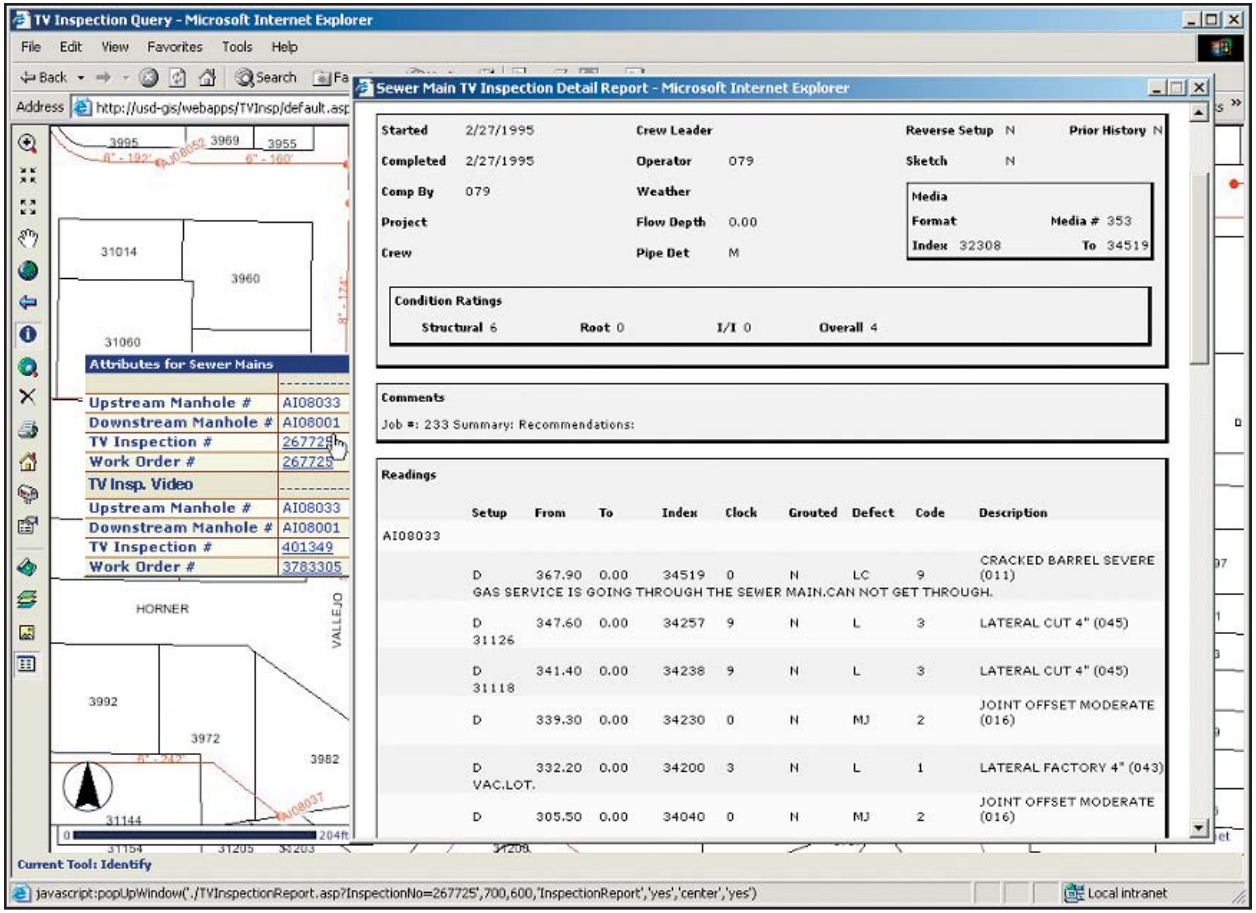


Figure 2: TV Inspection Report

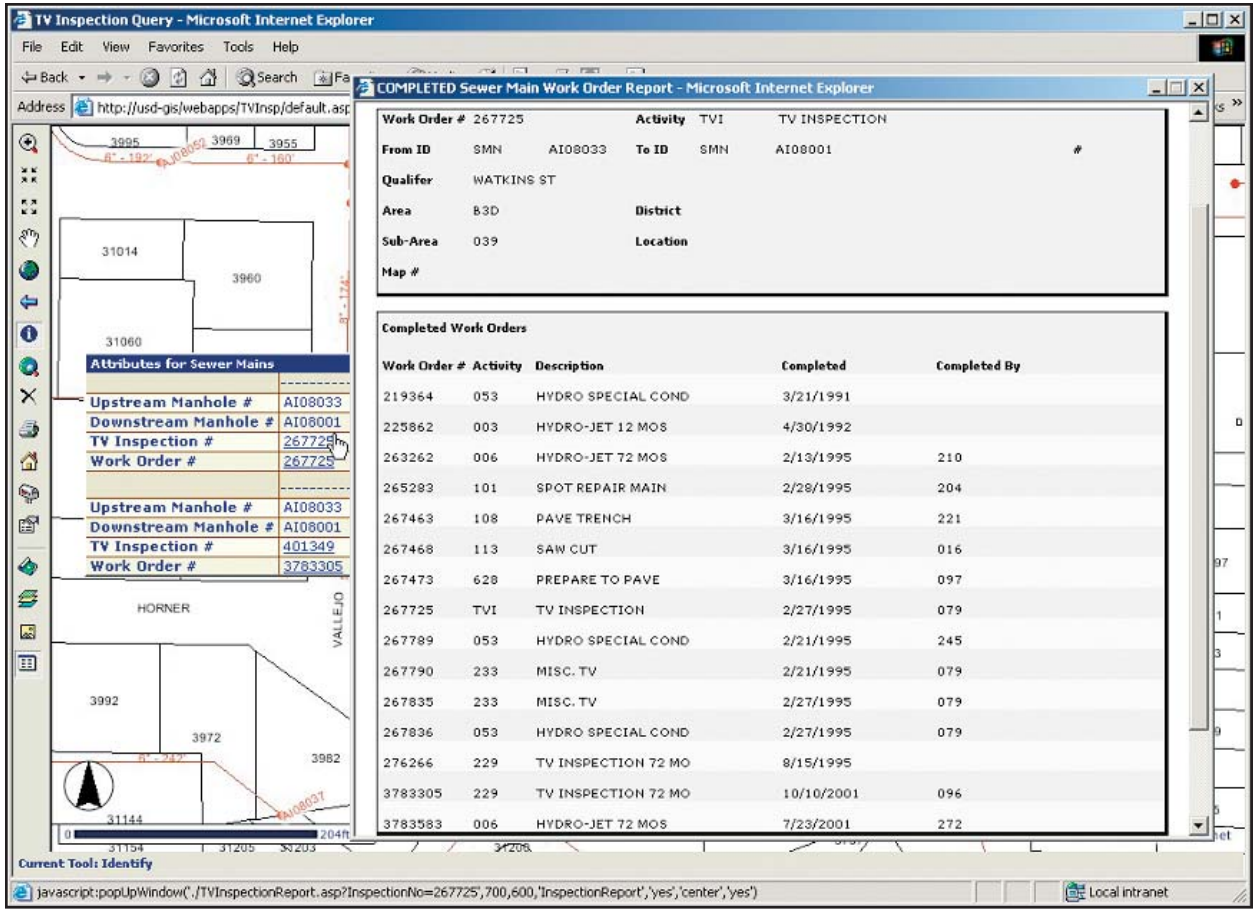


Figure 3: Past Work Orders

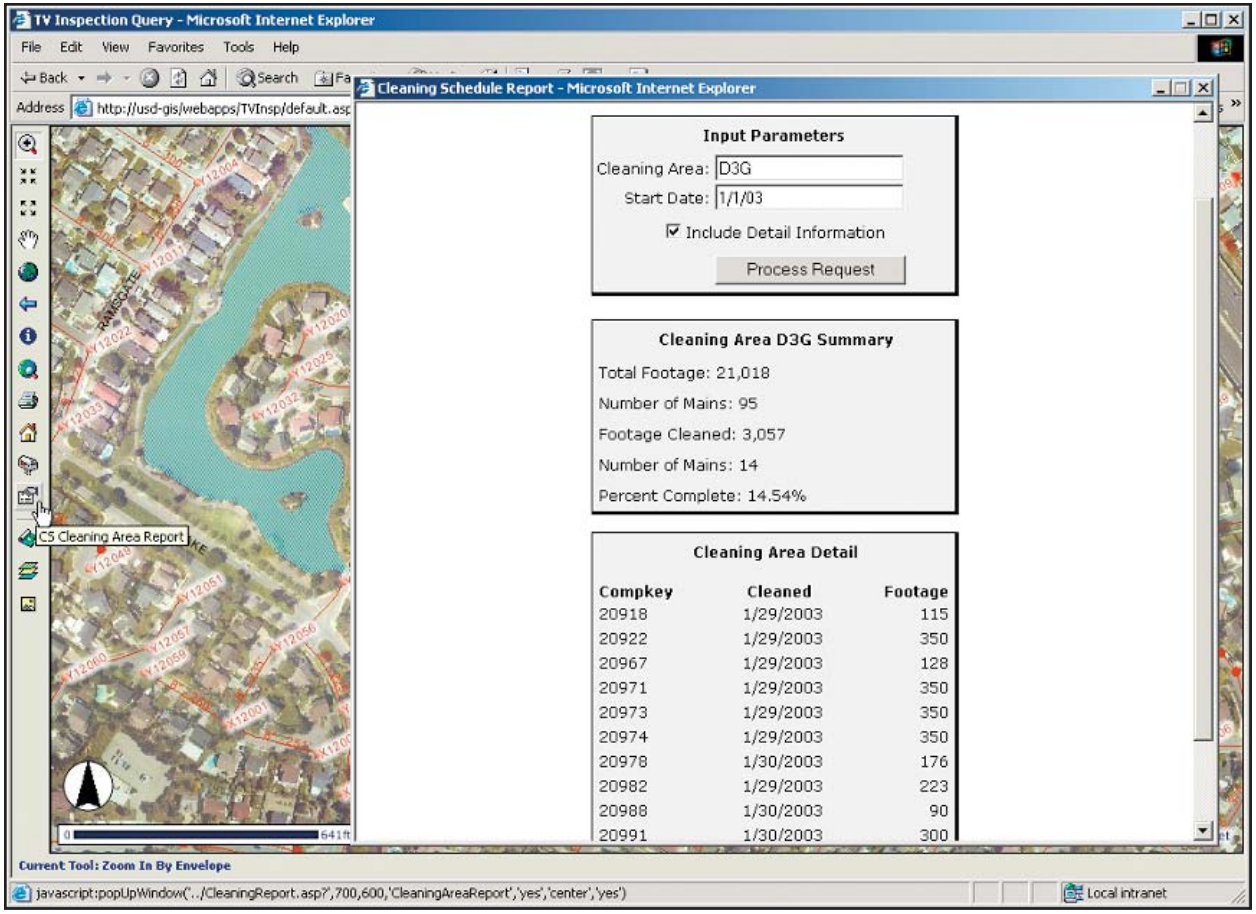


Figure 4: Cleaning Area Report Summary

Each of the three functions retrieves data from the work order system database. The first two functions are listed as hyperlinks with the sewer main's attributes. The third function is executed as a special tool on the application's toolbar.

Available Data Sets

Some of the available GIS themes include

• Odor Complaints	• USD Grid
• Pump Stations/Plants	• Railroads
• Sewer Manholes	• Streets
• Sewer Mains	• Sewer Easements
• Laterals	• Drainage Basins
• Sewer–Historical	• Rights-of-Way
• Storm Water Inlets	• Parcels
• Storm Water Mains	• Tracts
• Hydrants	• Streams
• Water Valves	• Lakes
• Water Mains	• 2002 Color Aerial Photos
• Survey Control	• 1999 Black-and-White Aerial Photos
• Curbs	• USGS Topo Map
• Contours	

Future Application Functionality

A new function of the TV Inspection Info application will be a link to videos of the TV inspections. Similar to the other hyperlinked functions, the digital videos will be another attribute listed for the main, and when the attribute is selected, the videos will be streamed over the Intranet from the GIS server to standard media player software on any computer. Currently, the TV inspection videos are recorded on VHS tapes that waste valuable cabinet storage space. Moreover, when a tape is checked out, it can be hard to find by someone who needs to see it. By transitioning to digital videos, the storage is on hard disks or other media, freeing up cabinet space; in addition, by making it accessible through the GIS, more than one person can view it simultaneously if the situation warrants. A prototype of the GIS application with streaming digital video has been developed and tested with good results (Figure 5); the district is investigating the cost to convert to digital video capture in the TV trucks and to convert the videos on VHS tapes.

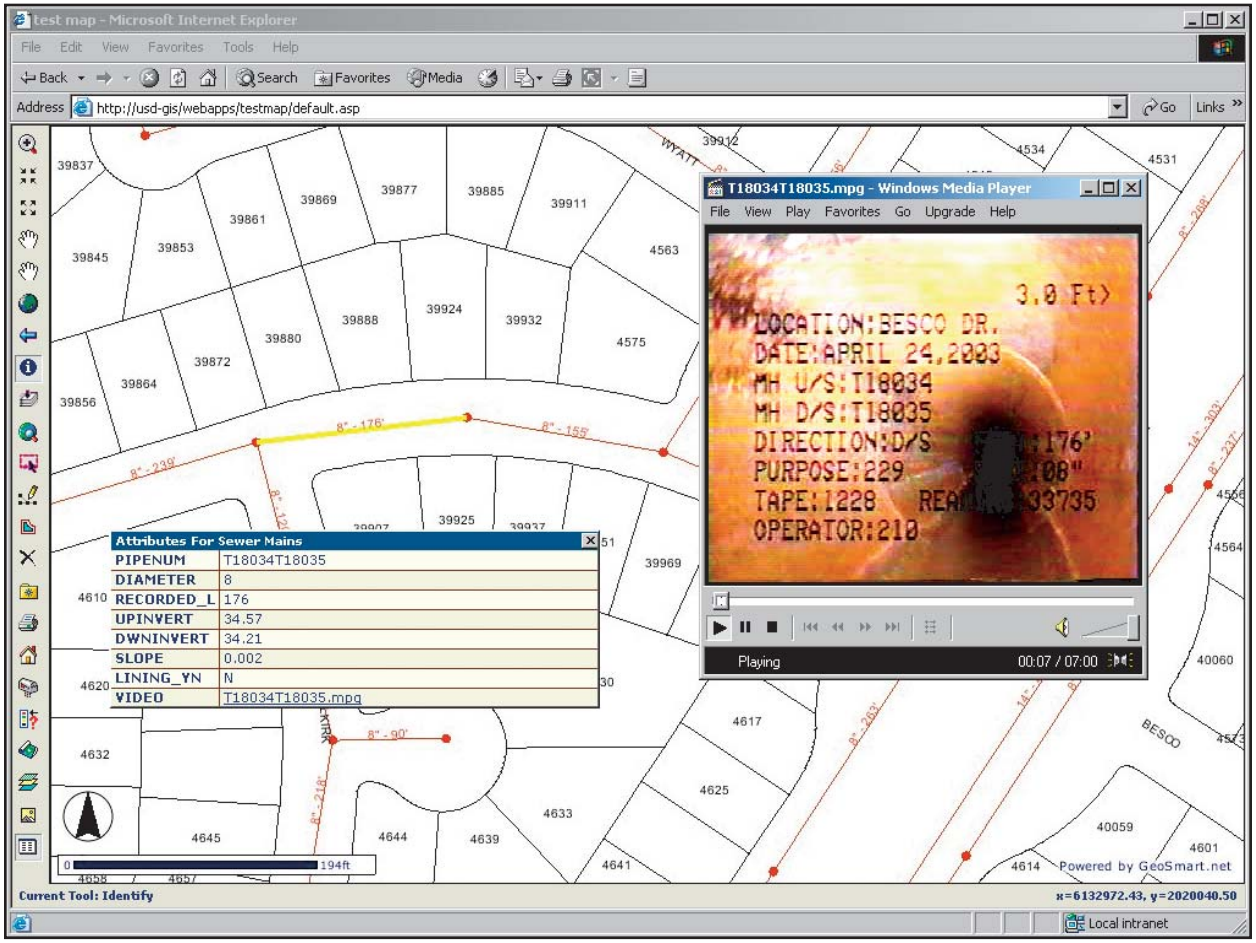


Figure 5

Benefits of Web-Based GIS Applications

Some of the benefits of using Web-based applications for deploying GIS enterprisewide are that it provides easy and user-friendly access to information for all staff. Having information organized within one source also makes accessing information more efficient when responding to customers or trouble calls, and it helps to provide consistent support to everyone.

There are also benefits from GIS integration with the work order system. An easy-to-use tool to locate and identify any particular piece of infrastructure, GIS can quickly display the information about the main, manhole, or other components of infrastructure. Then there is the ability to create new GIS data sets, such as pipe defects, from the data in the TV inspection reports so that the defects, for example, can be color coded and mapped for a graphical presentation (Figure 6).

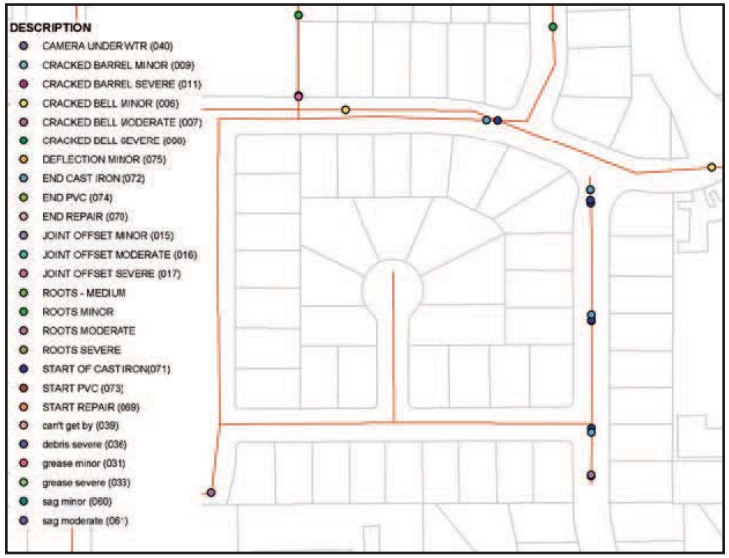


Figure 6

Software

The GIS server is a Dell PowerEdge 2450 server with Windows 2000, IIS, and Microsoft Internet Explorer. ArcIMS and GeoSmart provide the map services and applications. GeoSmart handles the connection to the Hansen system Microsoft SQL Server database. The applications are in ArcXML with some of the special functions in ASP and Java scripts.

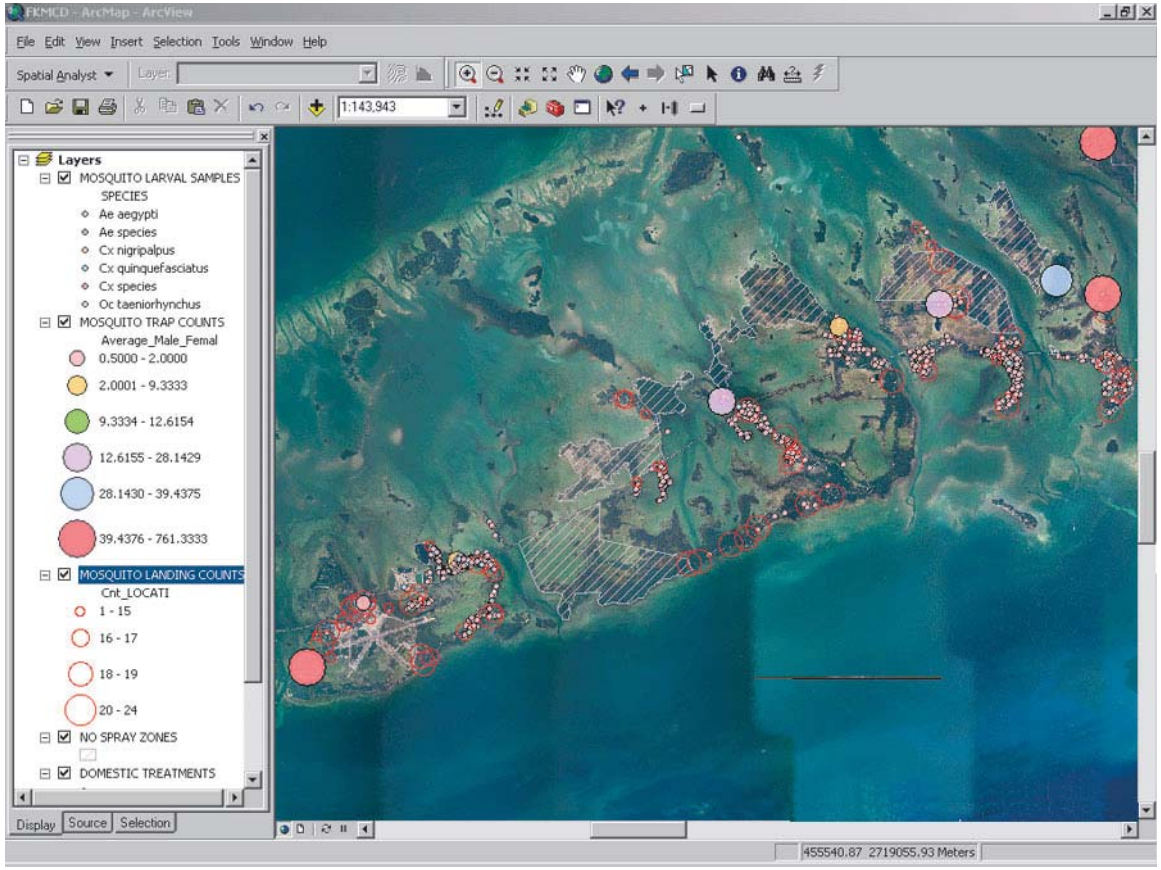
(Reprinted from the Winter 2005 issue of *Water Writes* newsletter)

Mosquito Control Operations at Florida Keys Mosquito Control District Integrates GIS

The Florida Keys is a cluster of hundreds of islands interconnected by more than 40 bridges that stretch southwest of the mainland Florida tip and end just 90 miles from Cuba. The only living coral reef in the continental United States resides off these islands, making it one of the most popular fishing and diving spots in the world. The Florida Keys also has a rich and colorful history.

In 1949, the Monroe County Anti-Mosquito District was created by a special act of the Florida legislature. The district has undergone two name changes and is now the Florida Keys Mosquito Control District (FKMCD, or "the district"). There are a number of mosquito-borne diseases that are of concern in Florida, particularly eastern equine, St. Louis, and West Nile encephalitis. With a subtropical environment, more than 40 species of mosquito, and an extremely high tourism rate, controlling mosquitoes is essential to the health and economy of the Florida Keys.

FKMCD has been at the forefront of modern technology in mosquito control for years. In 2003, it contracted CompassCom, Inc., to provide an automatic vehicle location system. The system allows staff in the office to monitor the movements of the mosquito control vehicles in real time. This has proved useful in FKMCD's adult mosquito spray missions, where an in-office dispatcher can ensure that the proper areas have been treated by watching the activities of the vehicles.



The Florida Keys Mosquito Control District can easily view all of the data layers that are created.

FKMCD started using the Vector Control Management System (VCMS) by Advanced Computer Resources Corp. in 2000. This is a database and field collection system that was designed specifically for mosquito control agencies; users have the option of using Sybase, Oracle, or Microsoft SQL Server as the database platform. The system allows FKMCD to collect information about mosquito inspections and treatments in the field, as well as enter mosquito identifications and West Nile virus test results in the office.

FKMCD realized the importance of incorporating GIS into the program. Understanding that a comprehensive GIS program would make analysis more efficient, the district began to develop a program based on the following set of requirements. Having the GIS data accessible in real time was not necessary, but FKMCD wanted to be able to easily retrieve data from the previous day's activities. As considerable training, money, and time went into the use of the VCMS program, it was also important to continue using the program's mobile software to collect data in the field. Finally, a multiuser system was required, as the district has three offices and multiple users. Based on these requirements, FKMCD decided on ArcSDE to provide the gateway between the database and its existing ArcView software.

Designing the Database

The first step in the process of developing the new GIS program was designing the database. FKMCD information technology and GIS staff met with the field supervisors and laboratory staff to gain a better understanding of what uses and products would be beneficial to their operations from a GIS standpoint. From this information, staff members were able to determine what data was needed to build the spatial layers.

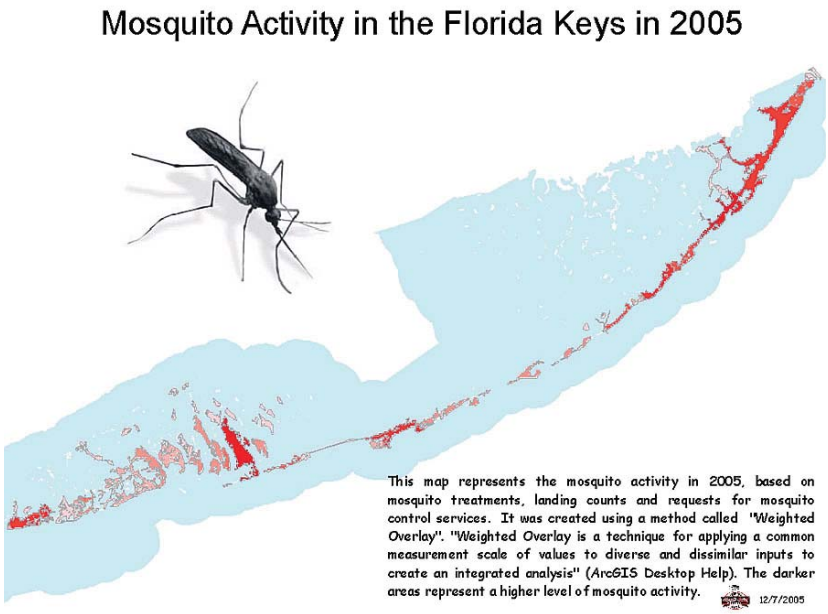
Data is entered in the field.

In April 2005, FKMCD contracted with ESRI Professional Services to create the geodatabase and the Visual Basic (VB) scripts that would pull data from the VCMS program to create the feature classes. There are two separate instances of the FKMCD Oracle database: one for the VCMS program and the other for the GIS program. Each morning, prior to staff arriving at the office, the VB scripts run and copy data from the VCMS instance of the Oracle database into the GIS instance of the database. A series of scripts is then executed, each one pulling fields from various tables, linking them to the spatially referenced table and creating feature classes that are saved in the geodatabase.

The end result is readily accessible data. "When your ultimate goal is to be able to view and analyze data," states Shana Lowe, GIS technician, "it makes the process much smoother when you don't have to spend half the day creating the data. We have taken our GIS program from the data creation mode to the data analysis mode, which was the reason for the GIS in the first place."

Along with the ability to quickly view activities and make maps, FKMCD has now taken its analysis to a whole new level—a spatial level. "Mosquito control is a science," Lowe continues, "and being in an environmentally sensitive area like the Florida Keys, it has to be a precise science. The ability to analyze our data on a spatial scale allows us to target our operational activities more effectively."

With the new program in place, the GIS department now produces a monthly GIS report for the district's board of commissioners. This report includes maps of monthly activities, as well as examples of some of the analysis that is taking place. FKMCD will continue to examine its data with the GIS program. The goal of all this analysis is simple: better control of mosquitoes.



Maps displaying mosquito control activities and analysis of data help keep the public and local agencies informed. This map was created for a local government agency to show where mosquito activity was high after Hurricane Wilma.

"GIS has helped put a picture to a multitude of facts and figures," states Jennifer Fahey, domestic supervisor of the program that inspects and treats residents' yards. "Spatial representation of our data has helped us execute plans of control more efficiently than ever." By examining mosquito breeding patterns, efficacy of mosquito control products, species composition, and contributing climatic factors, the district will gain a better understanding of its practices and how to utilize its staff more effectively.

(Reprinted from the Winter 2005/2006 issue of *ArcNews* magazine)

Federal, State, and Local Governments Use GIS to Work Together on Yellowstone River Study

By Brian Raber, Vice President, GeoSpatial Solutions, Merrick & Company

The Yellowstone River is near and dear to the hearts of many people in Montana as well as around the globe. The scenic 670-mile-long river, the longest undammed naturally flowing river in the continental United States, is home to an abundance of fish and wildlife. The Yellowstone River supports a variety of economic activities such as agriculture, tourism, recreation, transportation, petroleum refining, and residential development. The river's natural and economic importance and the back-to-back 100-year floods in 1996 and 1997 raised awareness of the need to examine the physical impacts of human activity on the river to ensure its sustainability.

After the 1997 flood, Montana governor Mark Racicot established the Upper Yellowstone River Task Force to examine problems resulting from the floods and human impact on the river in hard-hit Park County, Montana. In 1999, the Yellowstone River Conservation District Council (Council) was formed to focus on issues that affect the entire river. The Council is made up of elected conservation district officials from the 12 counties through which the river flows and a representative of the Montana Association of Conservation Districts.

In the same year, the Water Resources Development Act of 1999 directed the U.S. Army Corps of Engineers (USACE), a federal agency, to perform a cumulative effects study of the Yellowstone River to address the hydrological, biological, and socioeconomic cumulative impacts of human activity on the river. The study, now in progress, will be used to develop best management practices for managing the river, both by individual property owners and larger entities such as businesses, railroads, and highway departments. Because the Yellowstone River is significant on local, national, and global levels, the existence of the Council ensures that local citizens can offer input for the management of the river at a local level.

With a cumulative effects study of the Yellowstone River that involves all levels of government, the Yellowstone River Conservation District Council ensures participation from local citizens. Source: MT DNRC

USACE, Omaha District and the Council entered a joint cost-sharing agreement of 75 percent and 25 percent, respectively, to perform this $5.8 million cumulative effects study. There are also a number of Montana state agencies contributing in-kind services through personnel time or grant dollars such as the Montana Department of Fish, Wildlife, and Parks and the Montana

State Library. For example, the Montana Department of Natural Resources and Conservation (MT DNRC) provides technical assistance to the Council and administers state reclamation and development grants. Approximately $800,000 has been awarded by the Montana State Legislature to the Council so far.

The Yellowstone River basin comprises approximately 70,271 square miles in north central Wyoming and southeastern Montana and includes the Wind/Bighorn, Powder, Shoshone, Tongue, Clarks Fork, and Yellowstone rivers. Map by: United States Geological Survey, Cheyenne, Wyoming.

In April 2004, this grant money supported the award of the $400,000 Precision Topographic and Bathymetric Mapping project by the Council to ESRI business partner Merrick & Company (Aurora, Colorado). This first geospatial data acquisition effort, which won the Engineering Excellence Award from the American Council of Engineering Companies of Colorado, covers 295 square miles of the Yellowstone River floodplain and includes 200 river miles. Of the 200 river miles, 130 river miles of channel bathymetric data was collected and integrated with lidar-generated overbank data to produce a continuous terrain model of the river channel and adjacent floodplain. Geospatial data was collected for approximately 40 percent of the cumulative effects study area.

This data supports three specific scopes of work as outlined in the cumulative effects study including scientific analysis of hydraulics, hydrology, and geomorphology. In addition, some of this geospatial data will be used in the biological scopes of work such as the analysis of fisheries, riparian vegetation, wetlands, and water quality. Currently, USACE is using the data as a topographic base for hydraulic modeling of the Yellowstone River floodplain to produce flood-hazard maps for Stillwater, Yellowstone, and Dawson counties. The geospatial data delivered by Merrick and other projects sponsored by the Council are now available for download at the Montana State Library's Natural Resource Information System (NRIS), its electronic data clearinghouse at www.nris.mt.gov/yellowstone.

All levels of local, state, and federal governments are involved in supporting this cumulative effects study. The Nature Conservancy, a nongovernmental organization, has also contributed time and funds. Montana State University, Billings, and Montana State University, Bozeman, have provided technical support in examining the areas of economics, sociology, and fisheries biology. Local environmental groups have been involved at various points in the process. Ultimately this study's success and applied value lie in the continued cooperation between all vested parties and in continued funding.

ESRI's ArcInfo, ArcView, and ArcIMS are being used by the organizations involved in this study to assess the current state of the Yellowstone River ecosystem and predict its future condition. The software is enabling the distribution and use of large amounts of GIS data to both public and local decision makers as well as researchers, students, and the technical team. In addition, ArcInfo and ArcView are used for GIS analysis in an interdisciplinary context.

The results of the study will offer local landowners a set of voluntary best management practices recommendations for ensuring a sustainable and cooperative use of the Yellowstone River by everyone—from local landowners to visitors from around the world.

Visit the Yellowstone River Conservation District Council on the Web at www.dnrc.mt.gov/cardd/yellowstonerivercouncil. Visit the Montana State Library's Natural Resource Information System at nris.state.mt.us. Visit Merrick & Company on the Web at www.merrick.com/servicelines/gis.

GIS software allows distribution of GIS data to members of the technical team as well as decision makers, researchers, and students.
Source: Merrick & Company

(Reprinted from the Summer 2006 issue of *Government Matters* newsletter*)*

System Streamlines Water Management

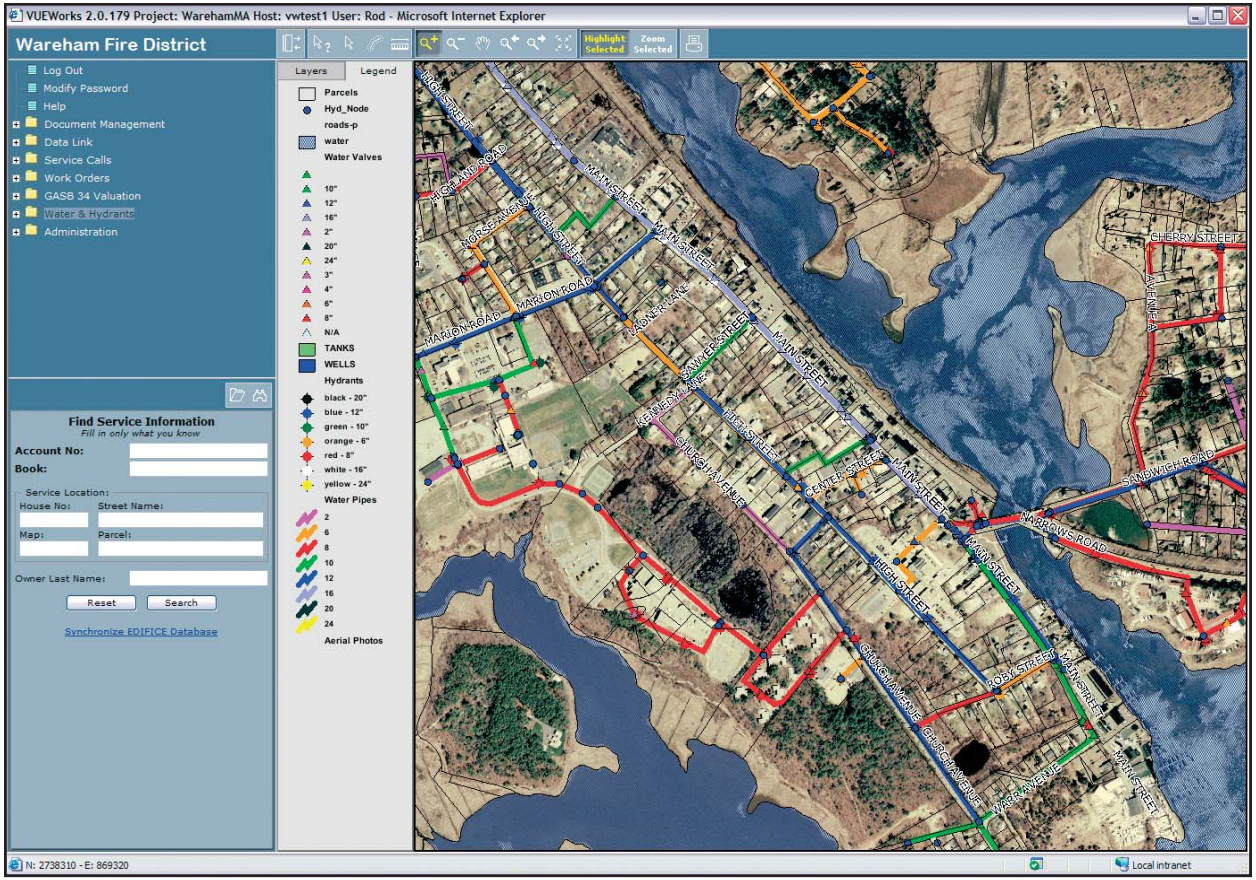
Located on Buzzards Bay just west of Cape Cod, the coastline community of Wareham, Massachusetts, has traditionally been an alternative vacation destination for those fortunate enough to discover its less crowded beaches and warm waters. However, in recent years the pressures of development and growth have been mounting as more people discover this small coastal community.

The Wareham Fire District is responsible for supplying high-quality drinking water and adequate water supplies for fire suppression. This water comes from a sole source aquifer in this area. As development accelerated in recent years, the district realized its paper-based methods for record keeping, mapping, and asset management could not keep up with projected growth rates.

The district turned to SEA Consultants, Inc., to help modernize Wareham's systems and processes so that high standards for water quality could be preserved as the community grows. The district and SEA Consultants developed a multiyear plan that incorporated VUEWorks AM software. VUEWorks AM is powered by ESRI's GIS technology.

Now in its third year of implementation, the system has already streamlined management of the district's water system by integrating operational functions, condition assessments, hydraulic modeling, and long-range capital improvement planning. Each year, the district and SEA Consultants meet to discuss the effectiveness of the previous year's enhancements and decide how the system can be enhanced to better support the district's business processes. The project exemplifies how a phased, multiyear approach can be used to engineer a complete and comprehensive system that builds on the successes of previous phases.

Phase one, completed in early 2003, involved the creation of a GIS basemap of the existing Wareham Fire District water distribution system. Geographic data was collected using ArcPad and a handheld GPS receiver with submeter accuracy. The digital water system map was created as an overlay to the assessor's GIS parcel map that is maintained by the town of Wareham. Color orthophotographic imagery at 1:5,000 scale was available from MassGIS and was incorporated to help orient nontechnical map users. The mapped features include valves, hydrants, storage facilities, pump stations, and treatment facilities. Attribute data is maintained—such as valve and hydrant identification numbers; location descriptions; and pipe diameters, material, and year of construction—for these features.



The VUEWorks AM CORE module is a Web-enabled infrastructure asset management application that incorporates ArcIMS to link the GIS data collected in phase one to the district's billing system and service location cards.

Phase two, completed in early 2004, included the implementation of the VUEWorks AM CORE module, a Web-enabled infrastructure asset management application that incorporates ArcIMS to link the GIS data collected in phase one to the district's billing system and service location cards.

Before VUEWorks was implemented, district staff had to search in at least three locations to locate this information. Using VUEWorks, staff can access billing data, scanned service card images, and GIS attributes from desktop computers while on the phone with customers.

Phase three, completed in May 2005, incorporated more traditional asset management functions contained in VUEWorks. Conditional assessment through the incorporation of hydraulic modeling and other features will help the district track the value of its water system assets and control costs. Features and services provided in this phase included

- The addition of the VUEWorks AM Water module for tracking conditions such as tuberculation (scale buildup that impedes water flow) and leaks; monitoring water quality; performing maintenance activities and risk assessment; and organizing GASB 34 valuation and flow test data.
- The addition of the VUEWorks AM Capital Improvement Planning (CIP) module for developing prioritized capital improvement projects.
- Enhancement of the water system model that assigns water system performance characteristics, such as pressure and flow to the GIS data, and is available in VUEWorks AM.
- The addition of attribute information required for GASB 34 valuation calculations and risk. Attributes included historical cost; material type; year of installation; expected useful life based on material; and size, zone, and asset function.

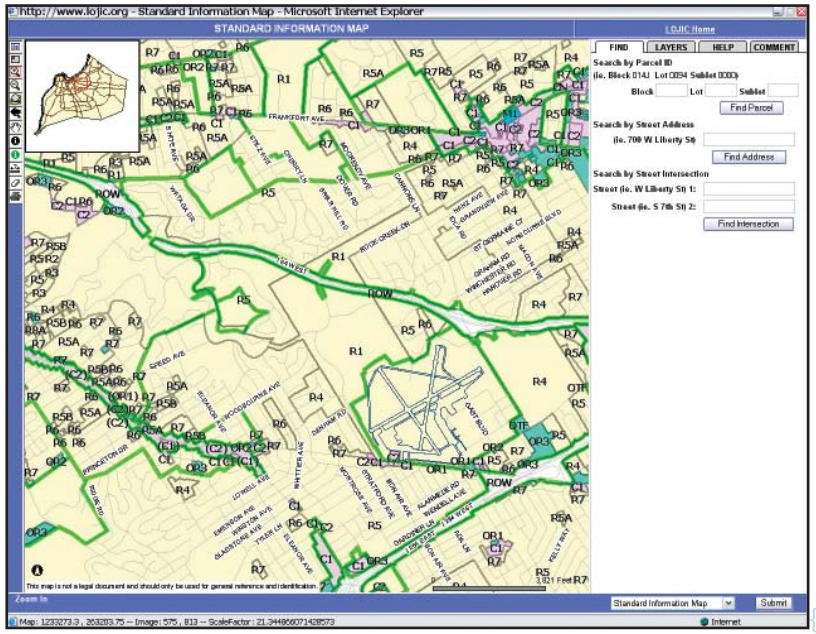
Michael Martin, the district's water superintendent, states, "From the start of this project, the district has reaped the rewards of having current and accessible data right at our fingertips. The professional image VUEWorks has provided my office has impressed all who have seen it or benefited from its use." With the ongoing success of the first three phases, Wareham has planned a fourth phase that will add the ability to make corrections and additions to GIS maps directly from the VUEWorks-ArcIMS interface. It will also add a hydrant flushing program and utilize service call and work order management features currently available in the VUEWorks software.

(Reprinted from the Fall 2005 issue of *Government Matters* newsletter)

Louisville Consortium Maintains Parcels with GIS

The Louisville and Jefferson County Information Consortium (LOJIC) was established as a community-wide, shared GIS partnership in the mid-1980s. The Metropolitan Sewer District is its lead organization along with the city of Louisville, Kentucky; the Louisville Water Company; Jefferson County; and the Jefferson County Property Valuation Administrator (PVA). Since LOJIC's formation, the county has gone to a metro government, so Louisville and Jefferson County have now merged into Louisville Metro Government.

The leadership of these member organizations formed an executive committee that oversees and manages the consortium. LOJIC's technical committee is composed of two representatives, domain experts, from each organization. A representative from Manatron Computer Aided Mass Appraisal (CAMA) also serves on the committee because the company has been heavily involved with PVA's real estate operations since 1979.



The Louisville and Jefferson County Information Consortium (LOJIC) was established as a community-wide, shared GIS partnership in the mid-1980s.

In 1986, the LOJIC technical committee hired a GIS industry consulting firm to develop Request for Proposals for a comprehensive GIS system. After an extensive evaluation, a small but up-and-coming GIS software vendor from Redlands, California, with a long name that nobody could remember, was selected from a field of eight vendors. LOJIC picked ESRI from a list that included the biggest names in the GIS business at the time including Intergraph.

ArcInfo software was first installed on a Prime minicomputer. Within two years, ArcInfo was moved to a Sun client/server network running UNIX. The parcel layer was created in 1989. A contractor was hired to digitize thousands of PVA paper maps and create more than 200,000 parcels in digital form that were stored in ArcInfo Librarian. LOJIC programmers created the initial parcel maintenance tools in ARC Macro Language (AML) and trained PVA map technicians to maintain the new parcel layer in ArcInfo.

When PVA began migrating from the legacy CAMA system to Manatron ProVal in 1997, the decision was made to interface the LOJIC parcel layer with the CAMA software so all parcel creation would take place in GIS. In 1998, the LOJIC parcel editor was rewritten in AML to provide parcel redescription transactions to the CAMA system along with all data required to automatically create the parcels without duplicate entry. The new, integrated GIS-to-CAMA process went live in January 1999, and GIS has been the only source of new parcel information since then.

"The Jefferson County PVA has always prided itself in being on the cutting edge of technology," said Donna Hunt, Jefferson County PVA chief deputy. "We are very proud that we were one of the initial LOJIC consortium members, and our decision in 1997 to interface the LOJIC parcel layer with our Manatron CAMA software so that all parcel creation would take place in GIS has won us acclaim not only in the United States but also around the world."

In 2003, LOJIC began planning the migration of the parcel layer to a geodatabase in Oracle. The organization needed technical assistance that was supplied as part of PVA's consulting and support arrangement with Manatron. To prepare for this migration, Manatron facilitated a proof-of-concept investigation and developed a Statement of Work (SOW) for database migration and commercial off-the-shelf (COTS) parcel editing software. This investigation recognized that the days of developing these applications in-house had passed. The SOW was used as the basis for a Request for Bid (RFB).

The project was awarded to Smart Data Strategies, Inc. (SDS), in early November 2004, and the conversion was planned for spring 2005. The SDS Mapper parcel layer geometry editing

software will perform all parcel redescription and call a standard Manatron application program interface (API) to automatically pass all information to CAMA. In fall 2005, the PVA office will migrate to Manatron GRM Records.

"In 2003 we made the decision that it was in the best interest of our office to move on to the next generation of integration and to again help set a standard in moving our parcel layer to a geodatabase," said Hunt. "We feel that with the help of Manatron and Smart Data Strategies, Inc., we will again be on the cutting edge of technology in land records geodatabase design. We are also excited about our plan for migrating to Manatron GRM Records, which will give us the capability of providing current, real-time data to all LOJIC consortium members through Web services."

According to LOJIC GIS coordinator Curt Bynum, LOJIC accurately and aggressively maintained property data that is essential for a comprehensive municipal GIS operation. This project will allow LOJIC to better leverage recent advancements in GIS technology and integrate two key land records operations—CAMA and parcel map maintenance. This will not only streamline PVA business processes but will also result in a more robust land records database for our other partners and users."

(Reprinted from the Fall 2005 issue of *Government Matters* newsletter)

Marin Municipal Water District Updates Infrastructure With GIS

ESRI and SAP Integrated Water Management Solution

Gentle streams flow through the rolling hills of Marin County, California, where children dive from shady banks into the cool waters. At its southern tip, the graceful cables of the Golden Gate Bridge span the Pacific entrance to San Francisco Bay. The wealth of Marin has always been its water. In the 1800s, waterways were harnessed to move logs for a booming lumber company and to turn the waterwheel at a large paper mill. Not long after, the shipping industry served to economically enrich the county. Today, little towns with scenic coastal vistas offer outdoor cafes and hilly residential areas with Mediterranean appeal. Residents of Marin County value the region's water resources and use the latest technology to efficiently manage it.

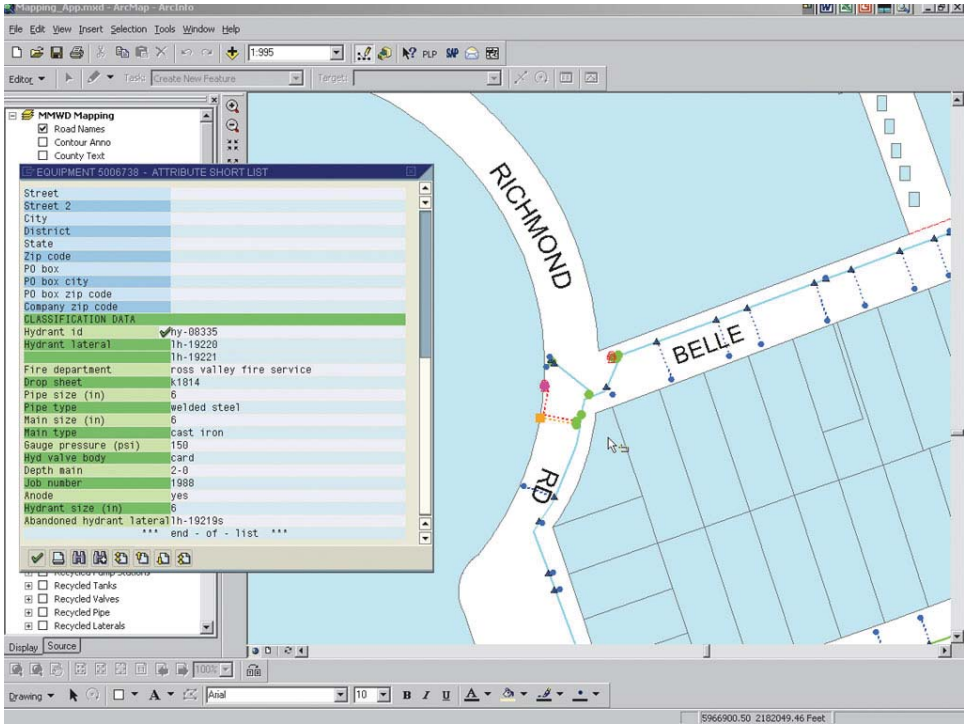
Marin Municipal Water District (MMWD) is the public agency that provides high-quality drinking water to approximately 185,000 people in a 147-square-mile area of Marin County. For the past 10 years, staff has been using GIS to update, inventory, and maintain water infrastructure data and to re-create paper maps used by MMWD personnel.

In 2001, MMWD implemented SAP and replaced most of its legacy systems. This included replacing its work order system that stored all water infrastructure attributes, such as pipe size and material type. MMWD, however, still needed to access its equipment attribute data, now located in its SAP database, using GIS. MMWD began integrating ArcInfo with SAP during the SAP implementation phase. Since early 2003, MMWD has been working with ESRI Business Partner Cybertech Systems, Inc. (Naperville, Illinois, and Trevose, Pennsylvania), to tune, update, and improve its GIS–SAP interface. Cybertech was chosen for its proven track record in ESRI–SAP integration and for high marks from clients. It brought an array of skill sets, as well as integration ideas, to the project.

Gavin McGhie, MMWD's GIS coordinator, says, "The combination of these two systems has created an extremely powerful tool that provides users access to SAP information via a user-friendly map-based interface. Strengths of SAP are that it controls business processes and rules and maintains data integrity and relationships. Thus, GIS efforts are focused on the spatial

aspect of the data. GIS allows users to browse a familiar-looking map; point to a feature; and, with the click of a button, obtain information about that feature from SAP."

McGhie explains, "Having ArcInfo integrated with SAP gives the staff access to a wide variety of information that previously required it to hunt and gather information from various locations within the MMWD offices. It is a definite time-saver."



The GIS-SAP interface gives users fast access to asset location data. Users search for locations by information, such as equipment numbers, addresses, parcel numbers, and GPS coordinates.

The GIS interface to SAP is especially useful to workers needing field information. Because the majority of the SAP work flow is related to location, workers can easily access SAP through intuitive GIS tools. Workers simply point to features on the map and GIS interfaces with SAP to quickly locate a diverse set of assets. With GIS, users can view relevant SAP asset data within a single window, thus making projects more manageable.

Interface Applications

MMWD GIS personnel created several timesaving applications by using the interface between GIS and SAP. For example, the engineering department can use a UNIX workstation GIS function to add an existing pipe, valve, or meter and then access SAP to add attribute information. Through ArcGIS access, users have an inquiry option, which simplifies gathering information, such as a pipe's length and diameter or the types of material used for certain kinds of equipment.

A Pipe Location Packet (PLP) application allows a user to select a set of service meters and/or fire lines in GIS and click a single button to prepare a PLP file for SAP. The user is then directed to open SAP and run a custom transaction that retrieves the file and creates a PLP based on the selected file's contents. This process previously took several hours or more, depending on the number of affected services. The application reduces the process to minutes.

A similar mailing label application helps users select a set of customers (by their service meter) and create a mailing label notification list. This is useful for notifying water customers about work being done in their area or possible water outages. Again, the process is reduced from hours to minutes.

Currently, field crews are equipped with laptops loaded with ArcReader and GIS data sets required for their work. This gives crews a dynamic map so they can zoom into a high level of detail. Field GIS applications are continually being designed to meet workers' needs. For example, field crews need access to data found in the SAP system, but it is unrealistic to carry the SAP database into the field. An option being considered to make this data available involves extracting data from SAP and linking it to GIS data manually on a scheduled basis. Another option is to offer remote access via a wireless connection to both GIS and SAP.

The GIS–SAP interface gives users fast access to asset location data. Users search for locations by information, such as known equipment numbers, addresses, cross streets, parcel numbers, and GPS coordinates. Once they locate their area of interest, they easily access a site's asset information both graphically on the map and by means of SAP attributes.

MMWD's current interface allows editing by using its legacy ArcInfo and new SAP systems.

Bon Tempe Lake is one of the Marin Municipal Water District reservoirs, part of the watershed that the MMWD manages for recreation. Mount Tamalpais, which is the major landmark for Marin County, is in the background.

Continuing Efforts

MMWD is in the process of migrating to ArcGIS software. After the data has been migrated and the new environment is stable, MMWD will move its mature editing environment to ArcGIS and take advantage of all the new functionality. The PLP and Mailing Label applications are already available in ArcGIS.

In the near future, MMWD plans to provide access to SAP work orders and notifications. Ideally, this will give field-workers the ability to remotely retrieve, create, modify, and close work orders from a map-based environment. This will require either wireless access or the ability to synchronize users' laptops when they return from the field. Additionally, MMWD plans to allow workers to select an area of interest and request a list of all work orders in that area for a given time period.

MMWD intends to begin developing ArcIMS Web applications initially for internal use and eventually to provide information to its customers. These applications will most likely require an interface with SAP. The Web application will enable customers to locate their residences by address or other search criteria, such as their customer number. Upon locating an area of interest, Web site visitors could see where their service meters are located and request

information, such as consumption information. They would also be able to determine in which Board Division they are located, their billing area, and so forth.

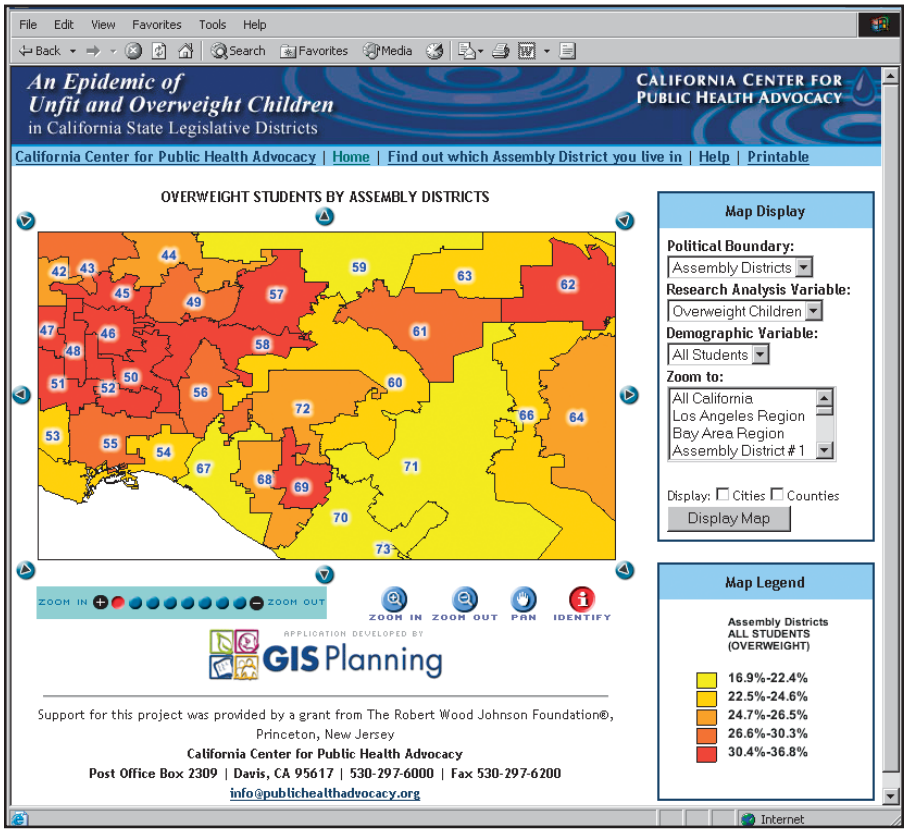
Currently, the interface is one way, from GIS to SAP. Eventually GIS maps will be accessible from within the SAP side of the interface. This means users will be able to view a piece of equipment in SAP and have the option to view a comprehensive map of the area around that equipment.

The result of integrating these two top-tier systems is an extremely powerful tool. Information will be easily shared among the various departments and will be distributed in a timelier manner, if not real time. SAP provides the backbone for running the business while GIS provides the spatial aspects needed to see the whole picture.

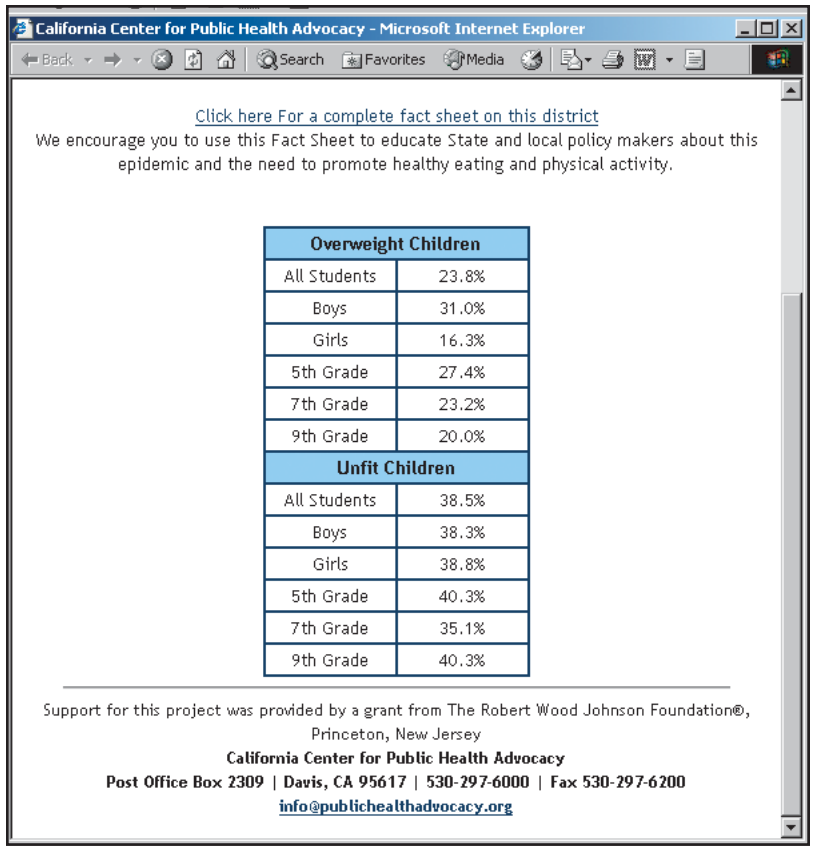
(Reprinted from the Fall 2004 issue of *ArcNews* magazine)

Mapping the Youth Obesity Crisis in California

The California Center for Public Health Advocacy (CCPHA) evaluated the health of California children. Its landmark study was published online and a mapping application at the CCPHA site makes this information more accessible. The study, *An Epidemic: Overweight and Unfit Children in California Assembly Districts,* analyzed two key indicators of health—fitness and body weight—in California's fifth, seventh, and ninth graders, and the data was organized by assembly and senate districts.



An ArcIMS application developed by GIS Planning graphically portrays the prevalence of overweight and unfit children in California and provides detailed information for each district.

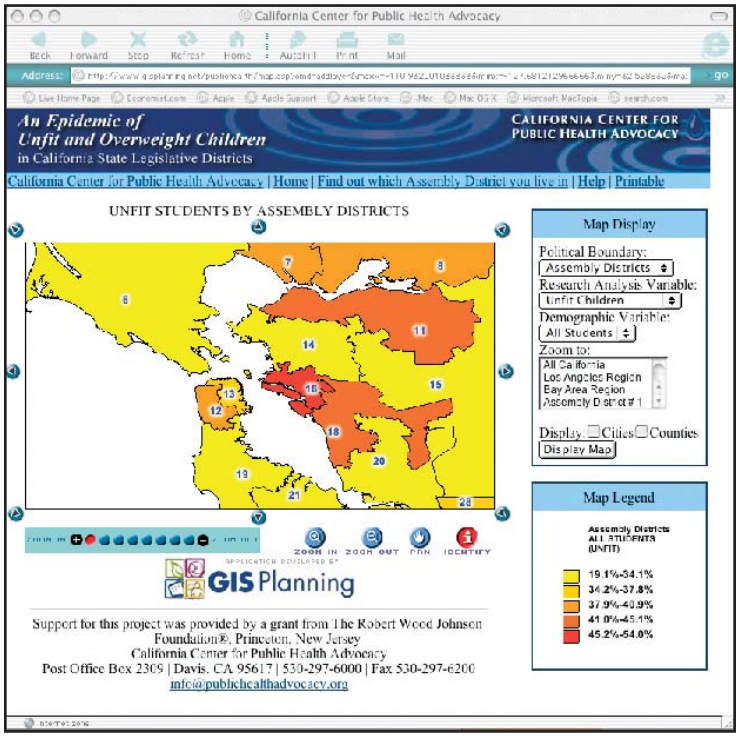


The study analyzed data from the 2001 California Physical Fitness Test. Based on recommendations from a CCPHA scientific panel consisting of eight nationally respected experts in physical education and nutrition, the study examined both aerobic capacity and body weight portions of the test. The study, funded by the Robert Wood Johnson Foundation, found that nearly 40 percent of the public school children tested in the state are unfit.

The statistics for weight were equally dismal: one student in four is overweight. While no assembly district in the state performed well, the analysis showed a shocking concentration of overweight and unfit children in certain regions of the state.

"While some districts have higher rates of overweight and unfit children than others—eight of the nine Assembly Districts with the highest percentages of both overweight and unfit children, for example, are located in Los Angeles County—for the first time we can show that the epidemic has spread to every corner of the state," said Dr. Harold Goldstein.

CCPHA hired ESRI business partner GIS Planning Inc. to develop an online mapping application to geographically display the findings of the study. GIS Planning used the ArcIMS application to graphically portray the prevalence of overweight and unfit children in the state. GIS mapping demonstrated a public health crisis throughout California. Providing this public health information via the Internet using GIS allowed efficient distribution of the information in a format that is easy to understand. The application can be viewed at www.gisplanning.net/publichealth/map.asp.



The site provides separate mapping for unfit and overweight children throughout the state.

In its recommendations, the CCPHA urges both the legislature and governor to take immediate and aggressive steps to ameliorate this epidemic by enforcing a state law mandating physical education for California public school students. In addition, State Bill 19 nutrition standards should be implemented at schools (K–12) and legislative hearings should be held to examine the impact of advertising on children.

"This study should be a wake-up call for everyone concerned about the health of California's children—from parents and teachers to public health experts and members of the legislature," said State Assembly Speaker Herb Wesson (D-Culver City). Given the levels of childhood obesity and physical inactivity recorded throughout the state, the implications of this study are staggering. Not only are pediatricians facing a rash of weight- and fitness-related diseases that were unknown in children a generation ago, these children are at higher risk of developing chronic diseases later in life.

To learn more about the application developed by GIS Planning Inc., visit www.gisplanning.com.

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Since 1969, ESRI has been giving customers around the world the power to think and plan geographically. The market leader in geographic information system (GIS) solutions, ESRI software is used in more than 300,000 organizations worldwide including each of the 200 largest cities in the United States, most national governments, more than two-thirds of Fortune 500 companies, and more than 5,000 colleges and universities. ESRI applications, running on more than one million desktops and thousands of Web and enterprise servers, provide the backbone for the world's mapping and spatial analysis. ESRI is the only vendor that provides complete technical solutions for desktop, mobile, server, and Internet platforms. Visit us at www.esri.com.

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