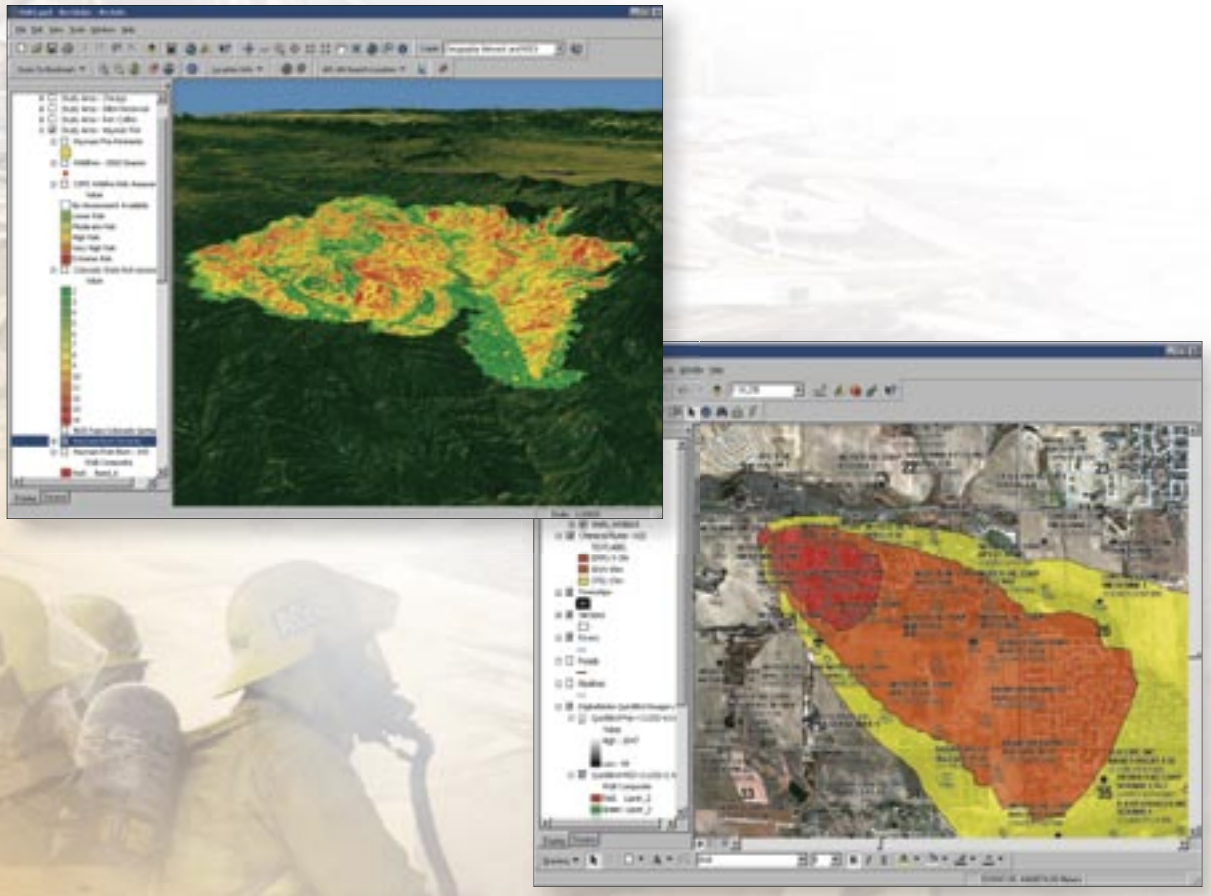
Mapping the Future of Public Safety

ESRI® GIS Software



ESRI®

GIS for Public Safety

Geographic Information for an Informed Response

Protecting citizens, property, and the environment are among the most important responsibilities of government agencies. Public safety agencies are the front line of defense for keeping the public and communities safe.

Both natural and man-made disasters cost billions of dollars annually. Businesses suffer from lost assets and productivity. Local, state, and national governments must clean up and repair damaged infrastructures. Nongovernmental organizations must put aside their primary missions to help rebuild communities.

The threat from disasters is growing worldwide. Forty of the 50 fastest growing cities in the world are located in earthquake zones. Some 10 million people in developing countries live under constant threat of floods. One billion people are highly vulnerable to disasters ranging from earthquakes to mud slides. Recovery from these tragic events can take years.

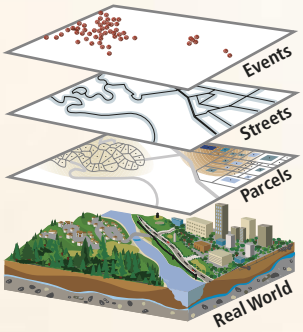
Reducing the loss of life and property from natural and human-caused emergencies requires planning and preparedness, which are closely tied to geographic information. Good planning begins by understanding where emergency events could occur, where community vulnerabilities exist, and where citizen safety is at risk. Once these locations are identified, government agencies can formulate prevention and mitigation requirements, response needs, and emergency preparedness requirements.

GIS helps public safety agencies by

- Preventing emergencies from occurring or reducing their consequences
- Providing first responders with the best information to make optimized safety decisions under stressful conditions
- Recovering from emergencies quickly and providing business continuity

What Is a GIS?

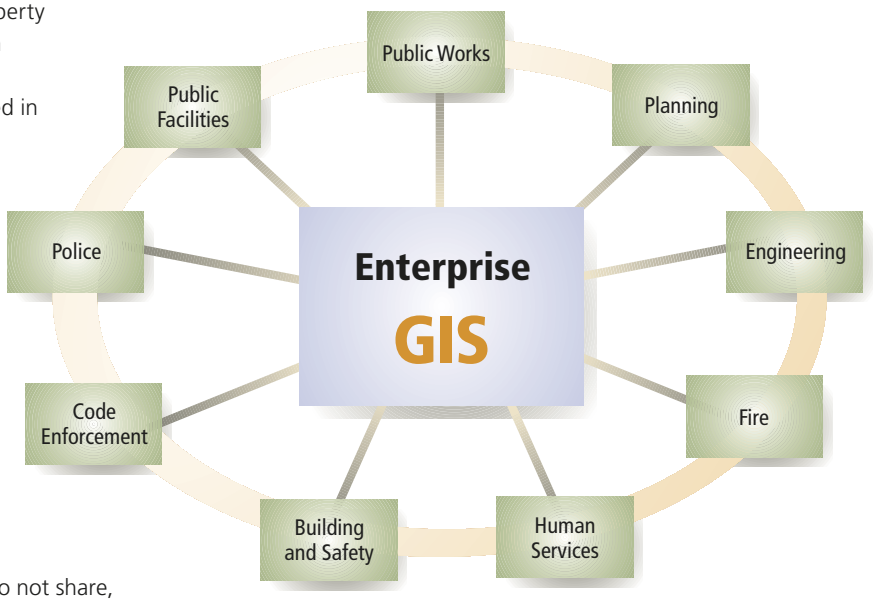
A geographic information system (GIS) combines layers of information about a place to give you a better understanding of that place. What layers of information you combine depends on your purpose—finding the best location for a new store, analyzing environmental damage, viewing similar crimes in a city to detect a pattern, and so on. Unlike with a paper map, where "what you see is what you get," a GIS map can combine many layers of information.



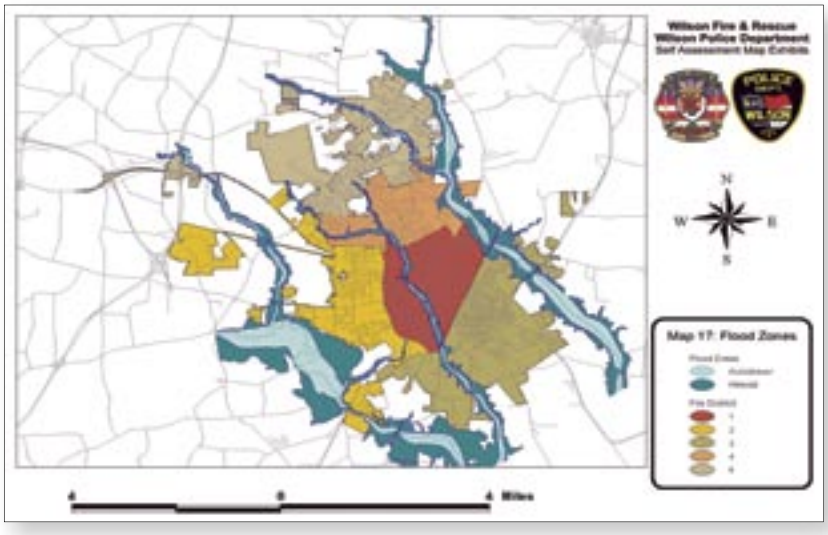
Enterprise GIS Benefits Public Safety

GIS has grown from a niche technology used by specialists to an integrated information framework used throughout an organization. Emergency management is one of the chief beneficiaries in an enterprise implementation of GIS. Enterprise GIS can manage valuable information on property ownership and occupancy, the transportation network, hazardous material locations, fire preplans, zoning, and other valuable data used in safeguarding communities.

The value of building an enterprise GIS and data warehouse for each community, as well as obtaining permissions and access to invaluable proprietary data sets, cannot be stressed enough. Gathering data to create an enterprise GIS to meet potential emergencies requires an immediate and concentrated effort. It is far easier to accomplish this task before an emergency than in its aftermath.



Even within local government entities, it is not unusual to find many departments that do not share, or share only parts, of their data. Extend this to the county, regional, state, and federal governments, and it becomes evident that there are thousands, if not hundreds of thousands, of information silos—all containing valuable information to emergency management.



The police and fire departments for the city of Wilson, North Carolina, worked together to develop this map to identify flood zones within their city.

"One of the greatest benefits of implementing a GIS program for the fire department was partnering with all departments in the city to share data throughout our enterprise. Long-term prevention and mitigation plans can now be developed to reduce both the potential and effect of an incident that may compromise our community."

–Don Oliver, Fire Chief
Wilson, North Carolina

"Wilson Police and Fire are using GIS to share and combine data to identify common 'hot spots' where a high volume of emergency incidents is being experienced as well as for developing an overall community safety strategy."

–John Powell, Police Chief, Wilson, North Carolina

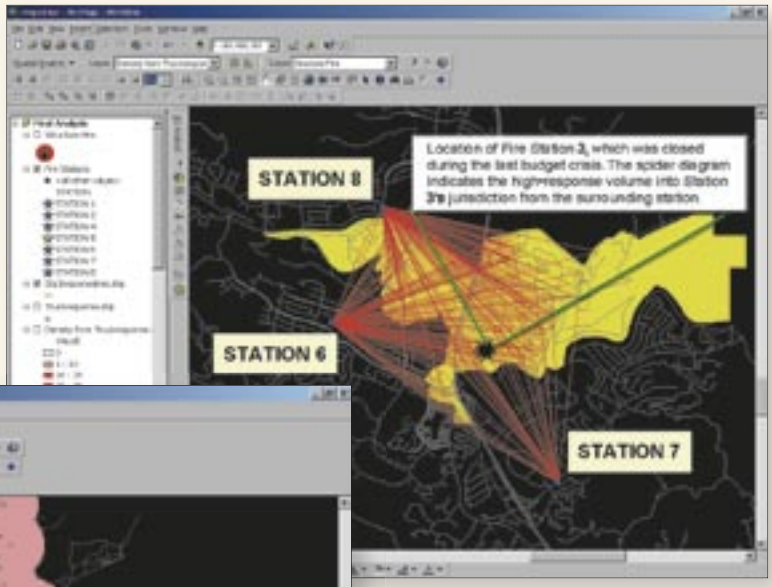
Evaluating Performance With GIS

Case Study–City of San Rafael, California

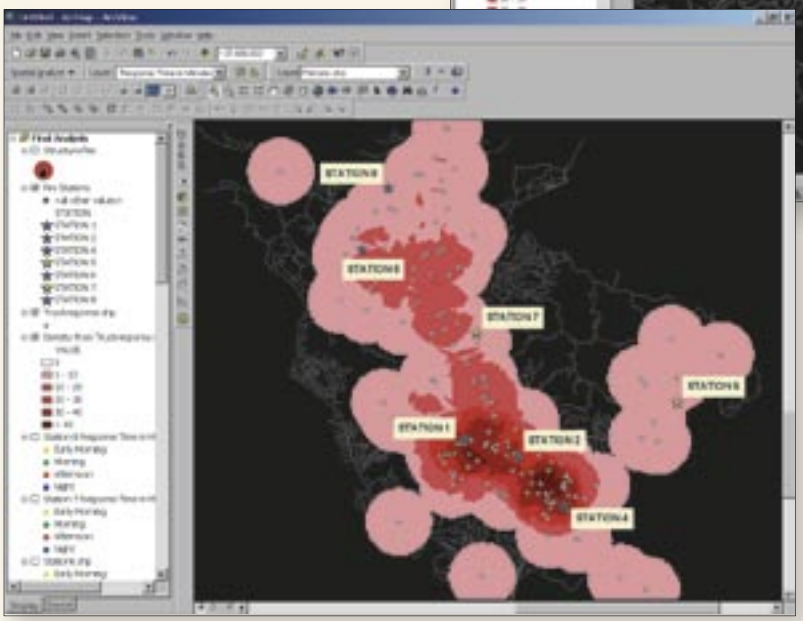
Fire Chief Robert E. Marcucci of the city of San Rafael, California, had a feeling that his ladder trucks might be located at the wrong stations. He also felt emergency response dispatch assignments should be reviewed for efficiency. A Standards of Cover Analysis, a self-assessment process that allows fire departments to focus on their strengths and weaknesses to improve levels of service, would help Marcucci determine if his intuitions were correct.

The San Rafael Fire Department asked the Marin County Fire Department to assist with GIS analysis to illustrate response patterns and land use comparisons. Marin County Fire Captain Timothy Walsh was assigned to assist with the GIS analysis. The San Rafael Fire Department imported its response data into a database. Using this data, more than 11,000 emergency responses were geocoded using ESRI® ArcGIS®.

The analysis substantiated Marcucci's suspicions. The ladder trucks were not correctly assigned to the appropriate stations, and the closure of fire stations during a previous budget crisis was having a detrimental effect on the emergency response performance of surrounding stations. Using ArcGIS, a map-based document was created that allowed Marcucci to successfully communicate his analysis and recommendations to the mayor and city manager.



The spider diagram illustrates the high-response volume for the area once served by Station 3, which was closed for budgetary reasons.



Mapping the locations of stations with ladder trucks against the response density reveals that ladder trucks should be located at Station 1, 2, or 4, rather than their current locations at Stations 5 and 7.

GIS for Fire Departments

Fire departments are responsible for protecting lives and property, but they have limited resources. Consequently, it is critical that resources are deployed effectively and efficiently. Optimal deployment is influenced by factors such as fire demand, effective firefighting force size, type of occupancy, historical occurrence of fires, and response time.

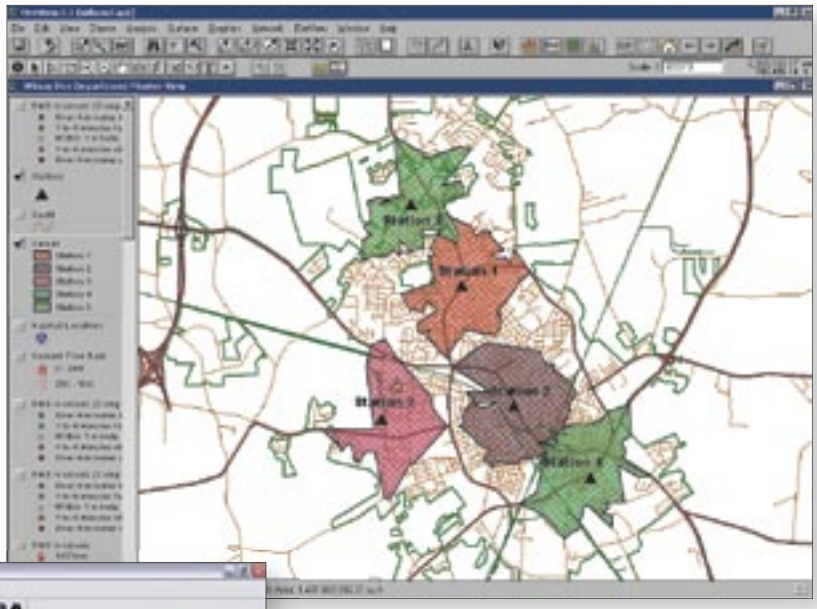
Traditional planning methods require numerous maps, reports, tables, and historical records that are often maintained in different locations and formats. Assembling these data sources and translating them into a useful format requires time and effort.

"Utilizing GIS technology allows us to create scenarios that can be used to support policy discussions with governing boards as well as explain public policy to the citizens."

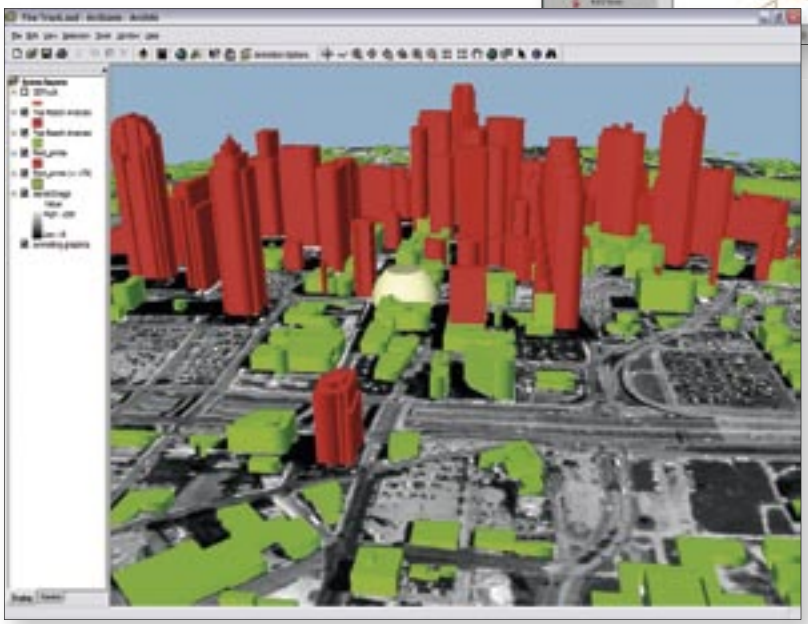
–Ronny J. Coleman
President, Commission on Fire Accreditation International

When complete, the resulting deployment plans are often implemented and then shelved. With GIS, fire plans can be continuously monitored, updated, and adjusted. GIS transforms fire planning from a static document to an ongoing dynamic process.

Keeping firefighters safe is a critical objective for all fire departments. GIS provides the tools to work with tactical, location-based information such as floor plans, utility control points, prefire plans, hazardous material contents and locations, surrounding exposures, aerial imagery, and hydrant locations. Access to this information while en route or on scene allows firefighters to deploy more quickly, effectively, and, most important, safely.



Calculating response times allows fire departments to determine optimal station locations.



This model, created using the ArcGIS 3D Analyst extension, identifies which buildings can be evacuated using a ladder truck (in green). The dome shows the reach of the ladder truck.

Fire departments use GIS for

- Fire deployment analysis
- Incident analysis
- Critical response information
- Map books
- Incident management
- Resource allocation
- Fire prevention
- Code enforcement

Preventing Catastrophe

Case Study–Perry Park, Colorado

Perry Park is a community of nearly 600 homes located in the Rocky Mountain foothills between Denver and Colorado Springs, Colorado. Most homes are located in hilly, forested terrain, surrounded by Ponderosa pines, Gambel oaks, Rocky Mountain junipers, and Douglas firs.

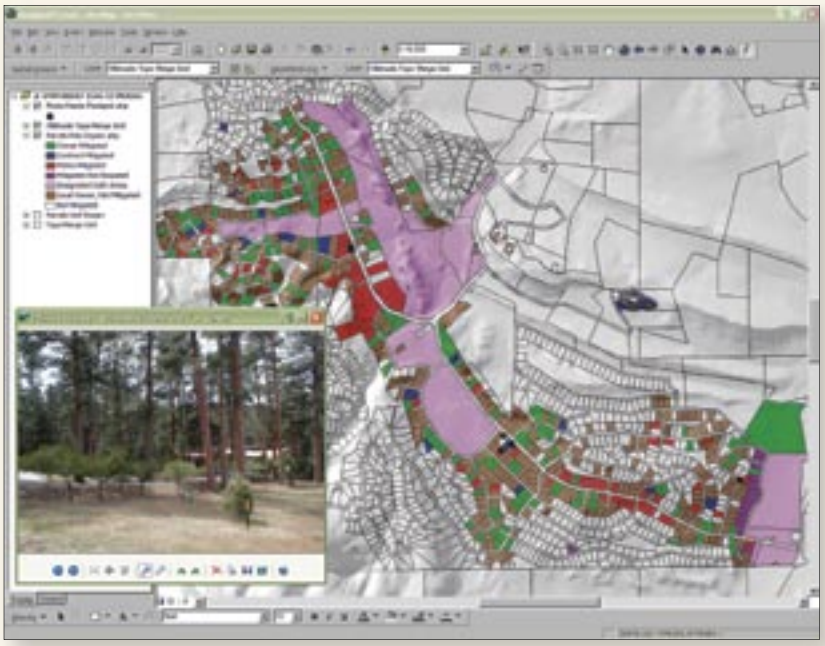
The Pike National Forest borders Perry Park to the west. Aware of the danger of catastrophic wildfire, the board of directors of the Perry Park Metropolitan District began a wildfire hazard mitigation program. The Board implemented programs to identify home owners' values, concerns, and perceptions. GIS provides critical tools to catalog home owner response, identify areas of concern, and plan and monitor mitigation activities.

In 2002 Perry Park was designated a Firewise Community under the sponsorship of the Firewise Communities Program. Using ArcView® software, parcel and ownership data, infrastructure maps, aerial photography, and digital elevation model data, the community was mapped into four regions for hazard and planned vegetation management.

A Typical Residence in the Rural Community of Perry Park, Colorado

Perry Park project leaders raised awareness of the project by conducting a survey of residents. The survey identified home owners' values relating to the environment and their awareness of the fire hazard problem. Residents felt there was a need for preventive action programs to protect community values such as wildlife habitat while maintaining a "natural looking" landscape and privacy between the houses. Although many respondents felt that cutting brush was against their environmental philosophy, they learned that proper treatment would add value to their quality of life.

Perry Park's GIS-based Firewise planning and mitigation efforts have now been incorporated into the countywide emergency response plan. Key Perry Park residents and their GIS program are helping lead the development of public safety plans in rural front range Colorado communities.



These mitigation strategies for Perry Park were developed by the Firewise Communities Program using ArcGIS.

GIS for Wildfire

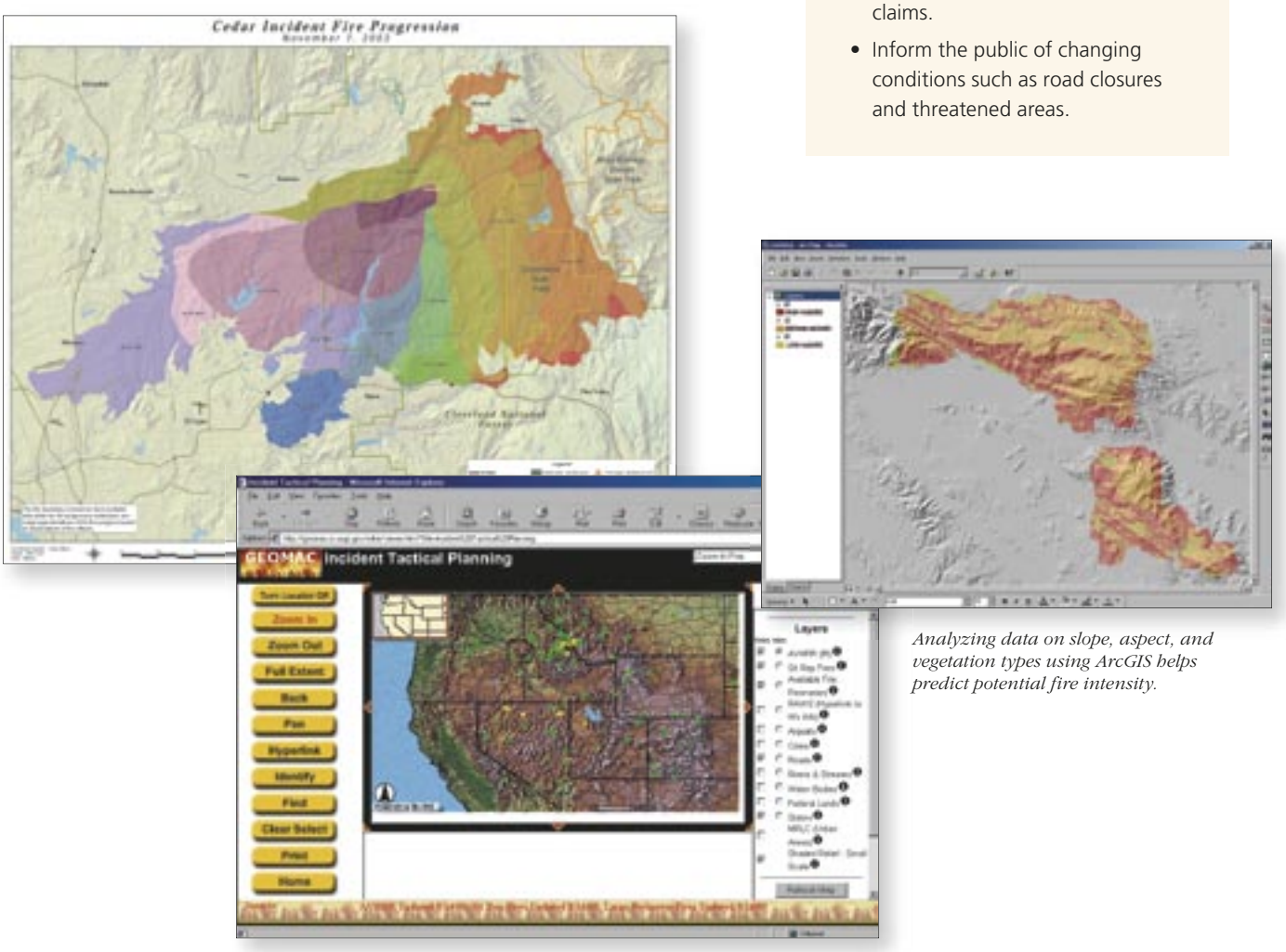
Wildfire agencies must prepare for, as well as respond to, wildfires. Fire prevention programs, prescribed fires, and other programs must be planned and implemented. The data required for these programs includes

- Vegetation types
- Elevation
- Aspects exposed to direct sunlight
- Locations of natural resources such as habitat, endangered plants and animals, and cultural values
- Developed areas containing homes, infrastructure, and other values

GIS provides tools that integrate and analyze data to assist fire managers in determining fire hazard areas and identify values at risk near those areas. These analyses aid in delineating prescribed burn areas and urban interface areas that will require fire protection efforts. When wildfires occur, GIS plays a vital role by assisting agencies in determining appropriate suppression tactics and strategies.

Wildfire agencies use GIS to

- Map fire perimeters and progression.
- Access current status of control efforts.
- Identify key fire protection priorities.
- Assign fire management resources for incident operations support.
- Identify where fires have burned intensely and what rehabilitation will be appropriate.
- Determine damage to developed property and anticipate insurance claims.
- Inform the public of changing conditions such as road closures and threatened areas.



Analyzing data on slope, aspect, and vegetation types using ArcGIS helps predict potential fire intensity.

Geospatial Multi-Agency Coordination (GeoMAC) Group uses ArcIMS to track and prioritize large wildfires throughout the western United States.

Meeting Mandates More Effectively

Case Study–City of Wilson, North Carolina

The Emergency Planning and Community Right-to-Know Act (EPCRA) was enacted in 1986 to help local communities protect public health, safety, and the environment from chemical hazards.

In the city of Wilson, North Carolina, facilities covered by EPCRA must report the amount of stored chemicals, property of chemicals, and emergency contact details by March 1 of every year. This information is submitted to the State Emergency Response Commission, a local emergency planning committee, and the fire department with jurisdiction over the facility.

Currently, the entire process for submitting reports is paper based. Company records are physically stored in each facility. In a chemical emergency, when every second counts, this manual system can be time-consuming.

Consequently, a Web-based system was designed to give emergency planners a full suite of tools to make informed decisions using a simple interface linking GIS, forms, and Material Safety Data Sheets (MSDS). The system, developed using ArcIMS®, allows chemical storage facilities in the city of Wilson to submit and revise these forms containing information about who to contact and what chemicals are stored on the premises.

This data is updated in the system and information made available to users through a secure Web site. Users map all or any chemical facilities and critical infrastructure within the given area. Links to the MSDS database provide users with complete response measures for the chemicals stored at each facility.

The application is uniquely able to serve the needs of private chemical companies and public emergency management agencies. Facilities can enter inventories via the Web without having to install software. With this system, data will only have to be entered once, and it can be edited.

"The benefits of this system (when used as a response tool) will greatly enhance our response capabilities," said Gordon Deno, Wilson County Emergency Management director. "Responders will be able to access facility information, live, online. The information provided within the system will allow responders to fully assess the situation prior to making any entries."

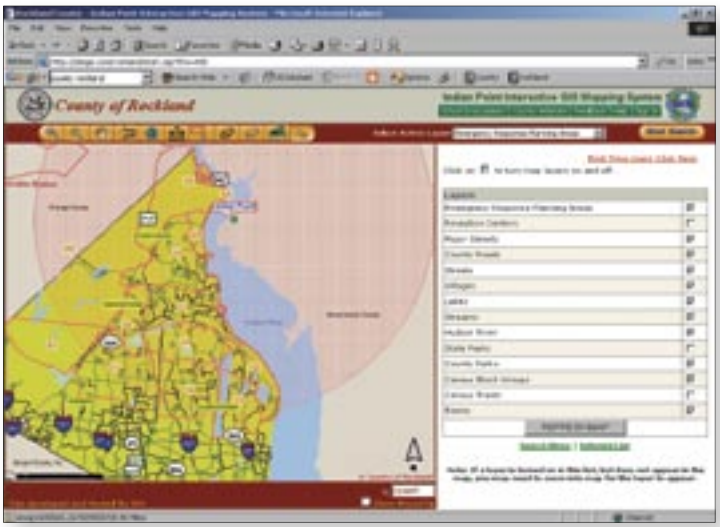
"The data is gathered without requiring any additional staff time from our department. The current, up-to-date information is provided by the facilities without having to be reentered by our personnel, reducing the possibility of errors," said Don Oliver, fire chief for the city of Wilson.

One-stop online reporting eliminates paper documents, provides greater access to these documents, and allows more frequent reporting for some facilities.

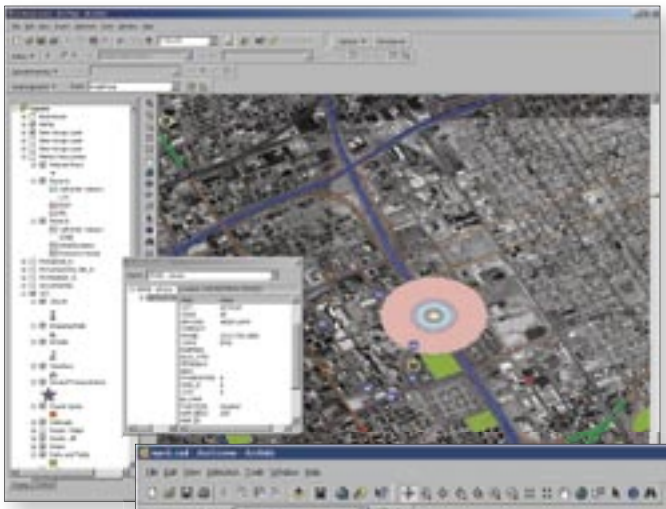
GIS for Disaster and Emergency Management

Emergency management professionals are responsible for assessing risks and hazards and identifying potential emergencies and disasters. Emergency operations personnel recommend appropriate prevention or mitigation strategies that can reduce the impact of potential emergencies.

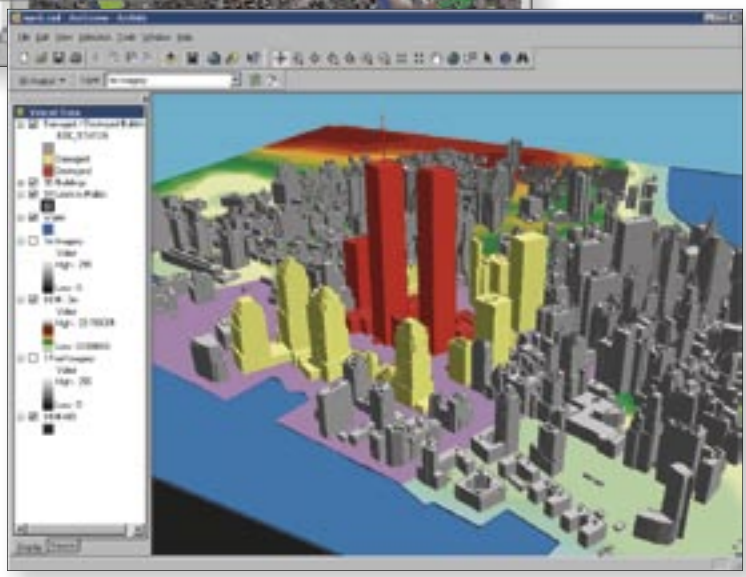
Large, complex emergencies often affect multiple departments or multiple agencies and require data to be collected and assembled from a variety of locations quickly under adverse conditions. Part of the Emergency Operations Center's (EOC) role is understanding the details of the emergency, ordering the required response resources, coordinating with adjoining agencies (federal, state, and local), and determining the immediate actions necessary to contain the incident.



Real-Time Flood Monitoring Using GIS Over the Internet



By modeling a possible disaster at a nuclear power plant, emergency managers can identify critical infrastructure and facilities that might be affected.



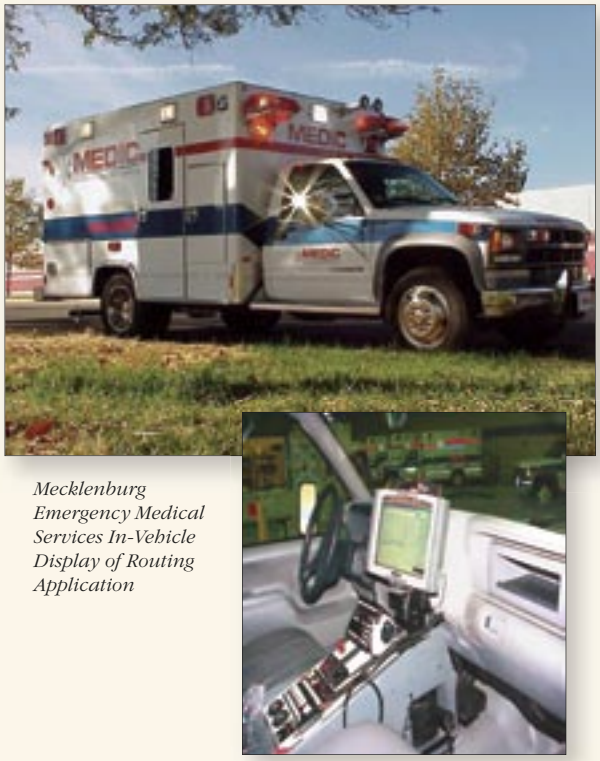
This three-dimensional model shows buildings that were damaged or destroyed in the attack on the World Trade Center on September 11, 2001.

Manage disasters and emergencies with GIS by

- Assessing the locations of risks and hazards in relation to populations, property, and natural resources
- Integrating data and understanding the scope of an emergency to manage an incident
- Recommending preventive and mitigating solutions
- Determining how and where scarce resources should be assigned
- Prioritizing for search and rescue tasks
- Identifying staging area locations, operational branches and divisions, and other important incident management needs
- Assessing short- and long-term recovery operations

Improving Response

Case Study–Mecklenburg County, North Carolina



Mecklenburg Emergency Medical Services In-Vehicle Display of Routing Application

Mecklenburg Emergency Medical Services Agency, better known as MEDIC, provides paramedic-level ambulance service to all of Mecklenburg County including Charlotte, North Carolina. Because the Charlotte–Mecklenburg community is the seat of regional business and transportation, the metropolitan population approaches one million people living, working, and commuting in the city of Charlotte and Mecklenburg County during business hours of the week.

Paramedics and emergency medical technicians—and those who support them—process and respond to more than 70,000 service requests each year. To help ensure rapid response times, ambulances and field crews are frequently moved around the county to better position them to respond to emergency calls.

Although this is an effective way to serve patients, it also creates a navigational challenge for emergency medical service professionals who are constantly changing location. Originally, map books and directions provided over the radio and personal knowledge were used to guide field crews to emergency calls.

Now, MEDIC personnel use mobile computers, ESRI GIS software, and global positioning system (GPS) to get to an incident. Dispatch, status, and routing information is provided. The vehicle's location is constantly updated on a map, and the map scrolls as the vehicle is driven through the county. Location information is communicated to the dispatch system at intervals of between four and 300 seconds based on vehicle status. The interval length is determined by a vehicle's current activity—shorter when responding to a call and longer while waiting at the hospital.

When an ambulance is dispatched to a call, the system instantly displays critical information about the call as well as suggests a route that is based on shortest travel time. The user responds to dispatch by simply touching an on-screen button that indicates they are en route to the call. The route is displayed on the map as a heavy green line allowing paramedics to concentrate on driving safely instead of figuring out how to get to the incident.

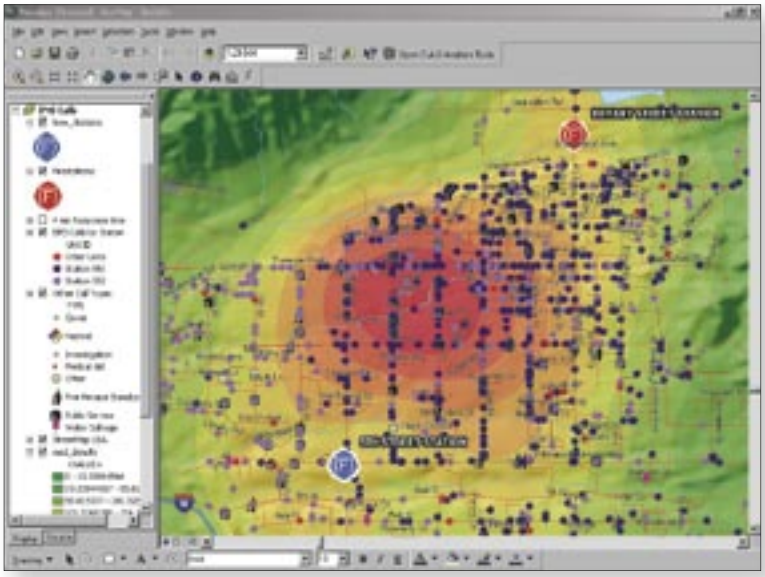
After completing evaluation and patient care at the scene, paramedics touch the Depart Scene button, choose a hospital from a list, and the system routes them to that hospital, updates the computer-aided design (CAD) system, and notifies the dispatcher. This system has reduced overall response times by 15 percent.

Automated vehicle location using onboard GPS allows Mecklenburg Emergency Medical Services to quickly respond to an incident.

GIS for E-911 and Resource Tracking

E-911 and CAD systems are responsible for receiving, locating, and dispatching the correct public safety personnel to an emergency call. Although ESRI does not build E-911 or CAD applications, ESRI business partners specialize in CAD and E-911 applications that provide incident location display, maintain public safety answering point boundaries, maintain E-911 street centerline files, and other critical operations. CAD systems that utilize GIS technology benefit the entire agency. For example, when geographic data in the CAD system is updated with new addresses or new streets, the updated street file can be exported and shared with other departments.

Location-based information provided through automated vehicle location (AVL) equipment placed within vehicles, aircraft, and watercraft can be used by a GIS to determine the closest source of aid as well as apprising dispatchers of current conditions such as whether the vehicle is stopped or moving or whether an air bag has been deployed. During complex emergencies, incident commanders can monitor the location of resources and move them to maximize their effectiveness.



Density Analysis of Emergency Medical Service Calls for the City of Yucaipa, California

Emergency Medical Response

Responding quickly to medical emergencies depends on accurately locating the incident. GIS plays a critical role in determining the quickest route. As emergency calls are received, the address information is geocoded and displayed on a map. AVL capability, coupled with GIS, allows dispatchers to quickly determine which available unit is closest to the incident and route that unit to a hospital or trauma center using the shortest or quickest route.

GIS can also be used to determine the pattern, type, and concentration of incidents. Displaying and analyzing information, such as the type of incident, time of the call, location, and other attributes, allows managers to see trends, workload volumes, and related demographic information. With this information, they can optimize the distribution of resources.

GIS is useful not only when responding to individual calls, but it can also help spot clusters of disease outbreaks that could develop into epidemics. Mapping occurrences can show how a disease is spreading so mitigation and response activities can be focused.

GIS assists E-911 and resource tracking by

- Quickly locating and mapping emergency call locations
- Contributing to the maintenance of street centerline files
- Displaying the current locations of public safety vehicles for efficient dispatch
- Displaying public safety resource locations for incident management and command and control

GIS aids emergency medical response by

- Identifying emergency call locations
- Providing dispatchers with closest available unit information
- Determining the shortest route to the call and appropriate medical facilities
- Analyzing incident volumes and trends for staffing purposes
- Tracking disease outbreaks

GIS for Community Safety and Security

GIS can assist with

- Creating and analyzing community evacuation routes and shelters
- Identifying vulnerabilities associated with public buildings and venues that host large public assemblies
- Identifying critical infrastructure vulnerabilities (water valves, pipeline valves, bridges, freeway overpasses)
- Locating open areas suitable for emergency equipment staging and incident management command posts
- Evaluating emergency resources in terms of adequate and timely response
- Inventorying hazardous material locations and developing related contingency plans

Providing for the safety and security of communities is one of the primary responsibilities of any government. Recent world events have caused a heightened awareness of the importance of this responsibility and underlined the need for understanding the systems and infrastructure that contribute to community safety. This entails rethinking policies, planning, and the allocation of resources as well as developing partnership strategies among federal, state, and local agencies and the private sector. Today's public safety professional must prepare for more than natural disasters.

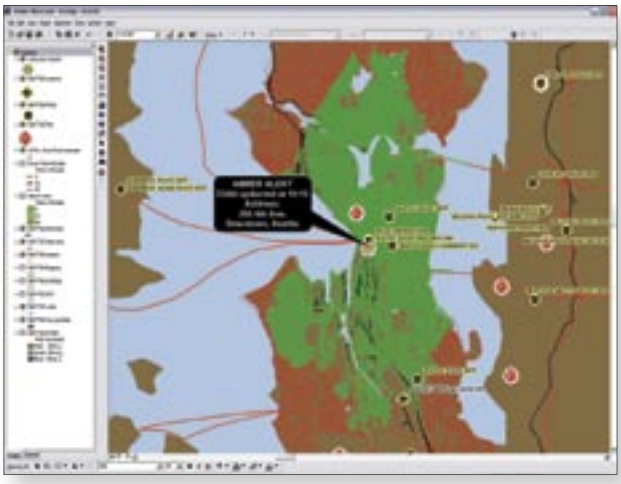
Homeland security is focused on three primary objectives. These objectives are protecting life, property, and critical infrastructure. Homeland security efforts require a multitude of critical tasks that incorporate both short- and long-range planning including risk assessment, mitigation, preparedness, response, and recovery. Technology and information are crucial in these efforts.

All emergencies, whether caused by nature or people, begin locally and elevate to regional, state, or national levels depending on severity, complexity, size, and nature of the event. During these events, emergency managers need the right information at the right time to deploy resources, implement evacuation plans, establish medical aid, and manage events as they unfold.

GIS can be used to develop a community's emergency response plan by identifying the location of schools, medical centers, staging areas, and evacuation routes. Analysis can identify transportation choke points near bridges or overpasses. During an emergency, GIS can be used to route response vehicles and quickly identify critical infrastructures such as water storage/treatment facilities, communications networks, electric generation facilities, refineries, and more.

Specialized Applications

Specialized GIS emergency management applications developed by ESRI business partners address specific public safety needs.



This drive-time analysis was performed around the reported site of a child abduction as part of an Amber Alert notification.

Emergency event modeling uses GIS to model and display potential terrorist events or emergencies such as earthquakes, extreme weather, chemical spills, and explosions. These modeling programs use GIS when calculating damages and injuries and assessing the overall consequences of a particular event.

Emergency command and control applications are ideal for identifying emergency event locations, dispatching resources, and locating staging areas or incident command posts. When a complex emergency occurs, detailed GIS data and imagery can be used to aid response, search and rescue, and recovery efforts.

Resource tracking applications use GIS to track and display actual emergency response units with GPS. GIS archives resource movements for subsequent analysis and replay.

Emergency notification applications provide a mapping interface that allows the user to geographically select a notification area and cross-reference it with E-911 data or telephone data to contact each household or business in the notification area with a recorded message.

GIS for the Emergency Operations Center

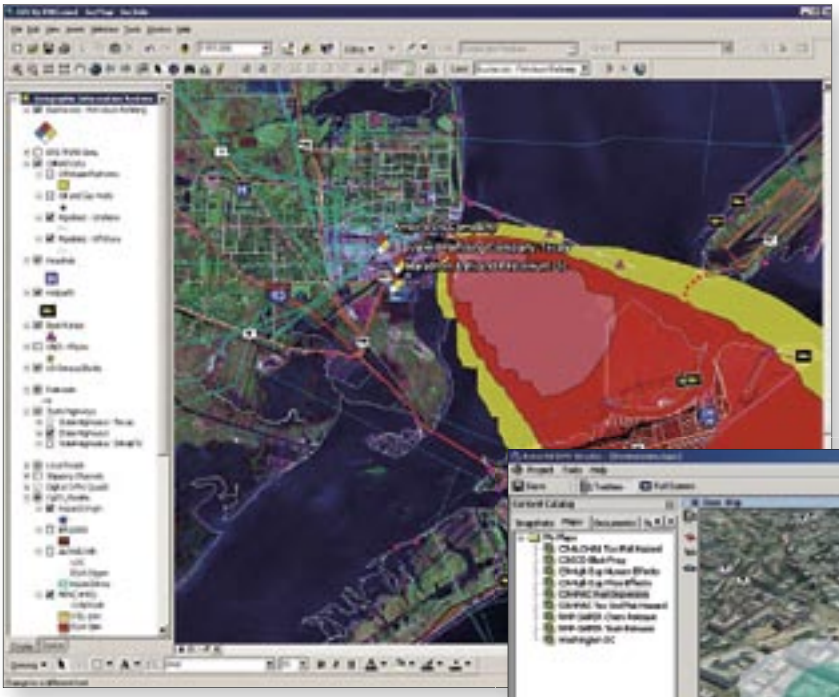
An Emergency Operations Center provides a central point of control and coordination during major events and emergency situations. Command center personnel must synthesize information and make rapid decisions as events unfold in real time. It is essential that personnel at an EOC share a common operating perspective.

GIS technology supplies EOC personnel with this perspective. Data and information sources can be integrated, queried together, and easily accessed from one environment so that personnel have up-to-date information on the status of assets, incidents, and resources.

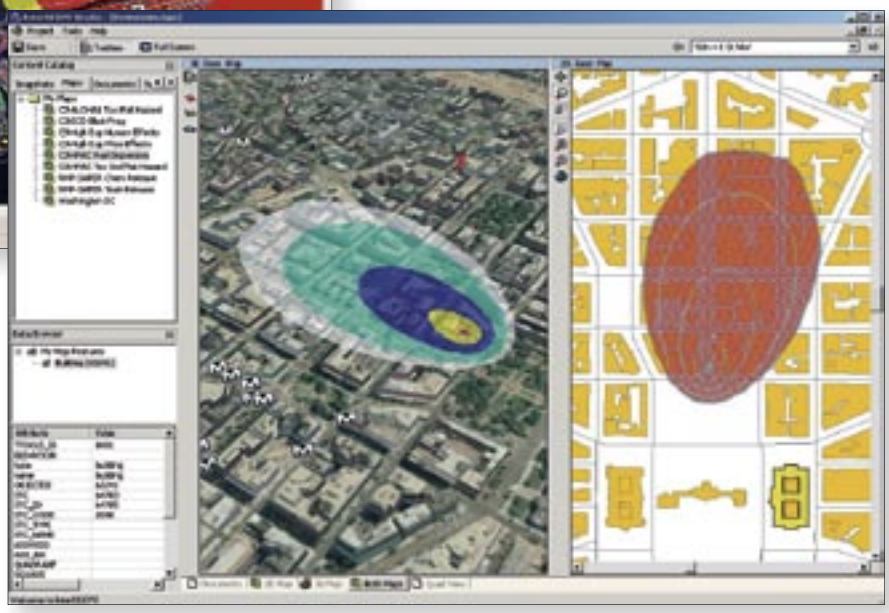
Through modeling potential or evolving events, such as chemical spills, explosions, earthquakes, fires, or floods, GIS technology can help emergency managers visualize the extent and impact of events. This information allows agencies to anticipate the effects of these events on populations and damage to infrastructure so that appropriate response efforts can be mounted or realistic training exercises devised.

GIS aids Emergency Operations Centers by

- Providing tools for effective collaboration
- Creating a common operating picture for decision makers and emergency managers
- Integrating complex data into an understandable map display
- Providing real-time asset management
- Modeling potential or ongoing emergency events
- Creating realistic training exercises

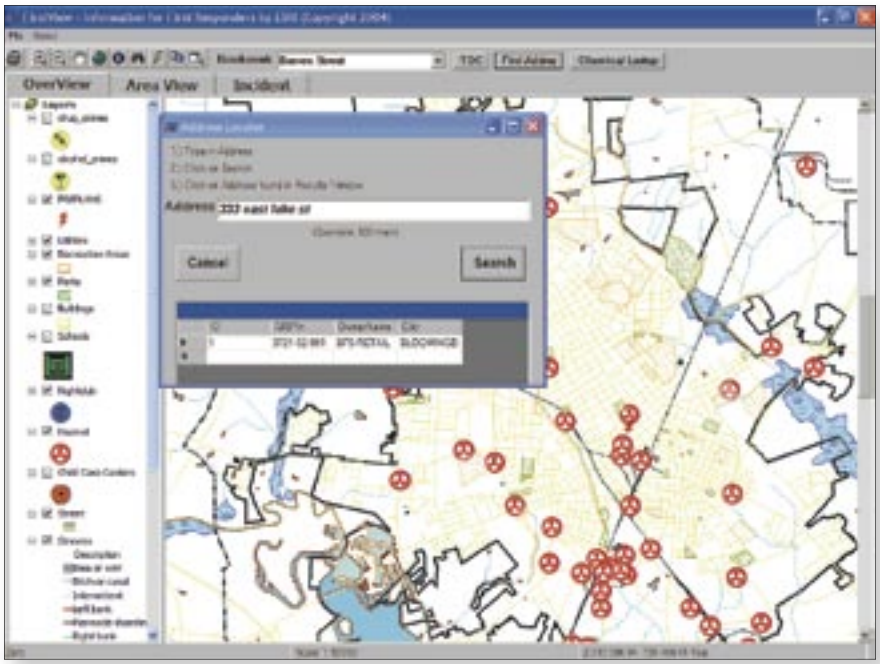


Modeling a Chemical Plume Over a Metropolitan Area



Managing Emergency Events Using Two- and Three-Dimensional Modeling in GIS

Mobile GIS for Public Safety



Custom ArcReader application for first responders showing how the free ArcReaderControl available through the ArcGIS Publisher extension can be utilized to develop a lightweight viewer with limited custom functionality.

Public safety and communications personnel have long believed that the best response to a call is an informed response. GIS puts lifesaving information into the hands of first responders while they are en route to a call. GIS also provides chief officers, supervisors, and managers current information that allows them to understand where responding agencies are in relation to the incident, its perimeter, and other potential hazards.

Responders using GIS with onboard mobile computers can access critical information such as local street maps, floor plans, imagery, and information about facilities storing hazardous materials. GIS helps responders determine the quickest or shortest path to an emergency call and track GPS-equipped vehicles.

Supplying incident location information en route gives responders a head start on response planning and saves valuable time that can reduce property loss and assist in saving lives. Mobile ruggedized computers are being used for emergency perimeter mapping, damage assessment, and incident action plan mapping.

Mobile GIS benefits include

- Access to incident location information such as floor plans, hazardous material locations, and other critical incident data
- Ability to calculate the shortest or quickest route to the incident
- Access to information concerning areas near the incident
- Access to comprehensive geographic information and other data necessary to manage complex emergencies

Mobile GIS Using Trimble GeoExplorer With ArcPad for Integrated GPS/GIS Data Collection and Data Maintenance

Creating and Editing Polygons in the Field Using a Wireless Web-Based Application and ArcPad on an HP® iPAQ™

Acquiring and Integrating Data

ESRI GIS solutions offer the ability to incorporate a wealth of data sources from inside and outside your organization.

Do-It-Yourself

- Digitizing
- Key Entry
- GPS
- Computer-Aided Design
- Scanning
- Computer-Aided Dispatch

Geography Network

Government Sources

- Federal Agencies
- State Agencies
- Councils of Government
- State Clearinghouses
- Local Government Agencies

Data is available from federal and state agencies, state clearinghouses, councils of government, and local government agencies. Much of this data can be obtained at low or no cost or through data sharing agreements with other jurisdictions.

Another often overlooked information source is the legacy data created by an organization over the years. These existing data sets can be joined with others for use outside the specific department in which they were created. For example, by combining parcel data from planning with building footprints and records from the utility departments, emergency shutoff valves can be located before arriving on scene.

Geography Network

The Geography Network℠ is a global community of government and commercial data providers who are committed to making geographic content easily accessible. This Internet portal allows people to publish, share, and use geographic data and services on the Web. It is available to private, public, and commercial users; data publishers; service providers; and developers around the world. Content may be provided in the form of data, maps, or more advanced services and solutions. Those interested in economic development data can access the Geography Network to find data about streets, demographics, boundaries, points of interest, and business listings.

geodata.gov

geodata.gov, part of the Geospatial One-Stop initiative to enhance government efficiency, is a Web-based portal for one-stop access to maps, data, and other geospatial services that will simplify the ability of all levels of government to find geospatial data and information. geodata.gov includes a Disaster Response and Assessment topics page that provides a listing of the most relevant metadata records of information and services relating to the four pillars of disaster management—preparedness, response, recovery, and mitigation.

Graphics to Geographics

Incorporate and enhance existing data collected as CAD drawings.

Make maps that are more than just pretty pictures—add spatial intelligence to maps created as CAD files. ArcGIS can use CAD data without conversion so land records kept in CAD can be fully integrated with ArcGIS. ArcGIS supports AutoCAD® drawing files (.dwg) up to AutoCAD 2000 and all ASCII, binary, and drawing interchange files (.dxf) as well as MicroStation® design files (.dgn).

DWG™, DXF™, and DGN™ files can be added to a GIS map containing other types of data. CAD data will be symbolized as the data was originally defined in the CAD file. CAD data can also be converted and its symbology modified. When converting data from CAD files, ArcGIS can impose higher data quality standards by checking CAD attributes against the business rules for a GIS layer. Once converted, GIS data automation tools can clean data and fix geometric errors such as unclosed polygons and unconnected lines.

The return on investments made in CAD data can be maximized by sharing data in DWG, DXF, and DGN formats across an Intranet or the Internet using ArcIMS. The ArcMap™ Server for ArcIMS allows files created in the ArcGIS ArcMap application or ArcGIS Publisher to be shared over the Internet using ArcIMS.

The ESRI Family of GIS Solutions

ESRI has solutions that can be deployed on the desktop, on the Web, or across the enterprise.

ArcGIS is an integrated collection of GIS software products for building a complete GIS for your organization. The ArcGIS framework enables you to deploy GIS functionality and business logic wherever it is needed—in desktops, servers (including the Web), or mobile devices. This architecture, coupled with the geodatabase, gives you the tools to assemble intelligent geographic information systems. The ArcGIS family of products includes desktop GIS, server GIS, embedded GIS, and mobile GIS.

Desktop GIS

ArcGIS Desktop refers to ArcReader™, ArcView, ArcEditor™, and ArcInfo®—a family of scalable software products. ArcGIS Desktop software products allow you to author, analyze, map, manage, share, and publish geographic information. Although licensed separately, ArcView, ArcEditor, and ArcInfo share the same core applications, user interface, and development environment. Each product provides additional GIS functionality, which is enabled as you move from ArcReader to ArcView to ArcEditor to ArcInfo. This dramatically increases usability and interoperability while retaining flexible end user deployments.

ArcReader
ArcReader is a free, easy-to-use product that allows anyone to view, explore, and print published map files (PMFs). ArcReader was designed for viewing and sharing maps that access a wide variety of dynamic geographic data. Anyone with ArcReader can now access high-quality maps authored by a higher level ArcGIS Desktop product.

ArcView
ArcView is the world's most popular desktop mapping and GIS software. ArcView includes all the functionality of ArcReader and provides geographic data visualization, query, analysis, and integration capabilities along with the ability to create and edit geographic data.

ArcEditor
ArcEditor includes all the functionality of ArcView and adds the power to create and edit data in a geodatabase. Additional functionality includes support for multiuser editing, versioning, feature-linked annotation, and advanced topologic editing.

ArcInfo
ArcInfo is the complete GIS data creation, update, query, mapping, and analysis system. Within the ArcGIS software family, ArcInfo is the top of the line. It includes all the functionality of ArcEditor and adds the advanced geoprocessing capabilities that make ArcInfo the de facto standard for GIS.

ArcIMS

Server GIS

The ESRI server GIS software products allow GIS and data services to be hosted in a server-based environment. The centralization of data management and application support, combined with adherence to information technology standards, makes the server GIS software products the key to broad use of geospatial technology within enterprise information systems. ArcGIS offers three server software products—ArcSDE®, ArcIMS, and ArcGIS Server.

ArcSDE
ArcSDE is an advanced spatial data access server, providing a gateway for storing, managing, and using spatial data in a DBMS for multiple client applications (e.g., ArcIMS, ArcGIS Server, or ArcGIS Desktop).

ArcIMS
ArcIMS is a scalable Internet Map Server. It is widely used for GIS Web publishing to deliver maps, data, and metadata to many users on the Web. For example, ArcIMS provides browser-based access to many GIS catalog portals that enable users to publish and share geographic knowledge with other users.

ArcGIS Server
ArcGIS Server is a comprehensive GIS toolkit for enterprise and Web application developers. It is used to build distributed and multitier enterprise information systems.

Embedded GIS

ArcGIS provides developer products that allow you to build custom desktop GIS applications or embed GIS functionality in existing applications.

ArcGIS Engine

ArcGIS Engine is a comprehensive set of core software components, tools, and resources packaged together for developers to build custom GIS and mapping applications. ArcGIS Engine can be used to build specific GIS applications or embed GIS functionality into other applications, which can then be easily deployed throughout an organization. Developers build ArcGIS Engine applications using standard frameworks including Visual Basic®, .NET, and Java.

Mobile GIS

ArcGIS technology can be deployed on a range of mobile systems from lightweight devices to PDAs, laptops, and Tablet PCs. Taking GIS to the field typically relies heavily on application customization to simplify mobile work tasks as well as wireless access to real-time data feeds from central GIS Web servers such as sites providing ArcIMS and ArcGIS Server map and data services.

ArcPad

ArcPad® is software for mobile GIS and field mapping applications. ArcPad provides mapping, GIS, and GPS integration to field users via handheld and pocket PC devices. Data collection with ArcPad is fast and easy and improves field-based data validation and availability.

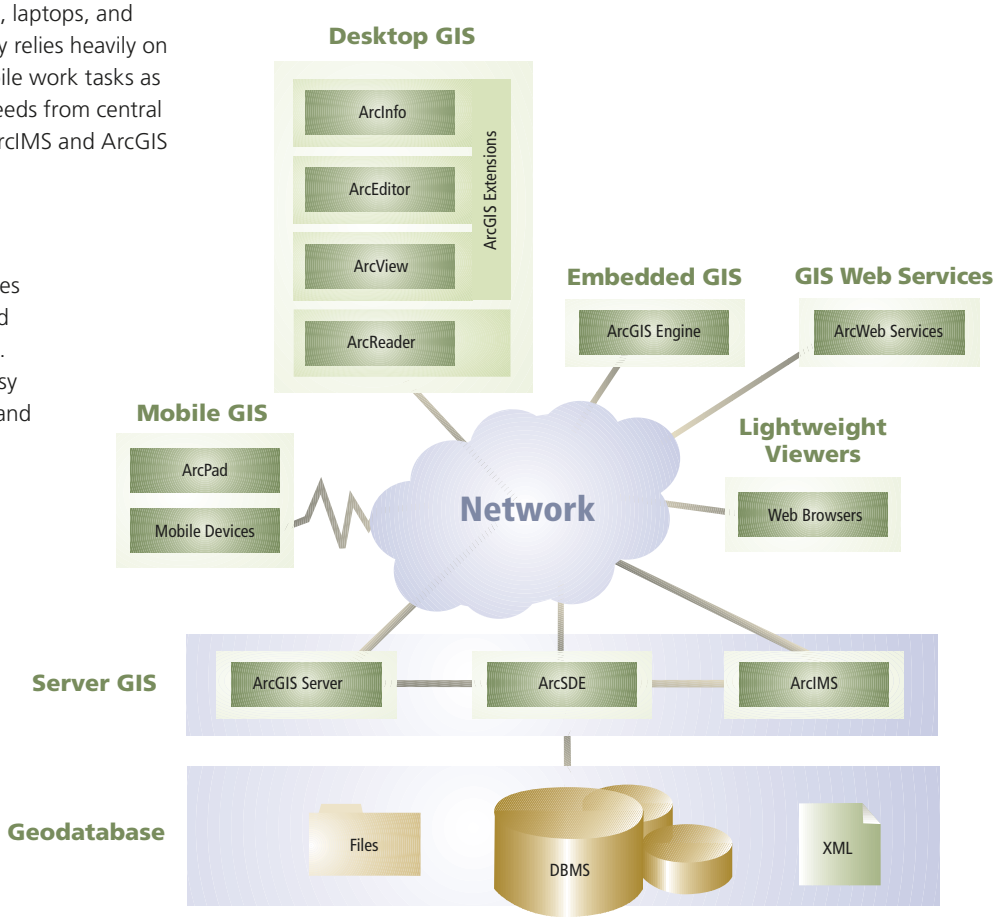
ArcPad

GIS Web Services

GIS Web services give a diverse user community access to geospatial content. They offer a cost-effective way to include mapping and location services in Web-enabled applications.

ArcWeb Services

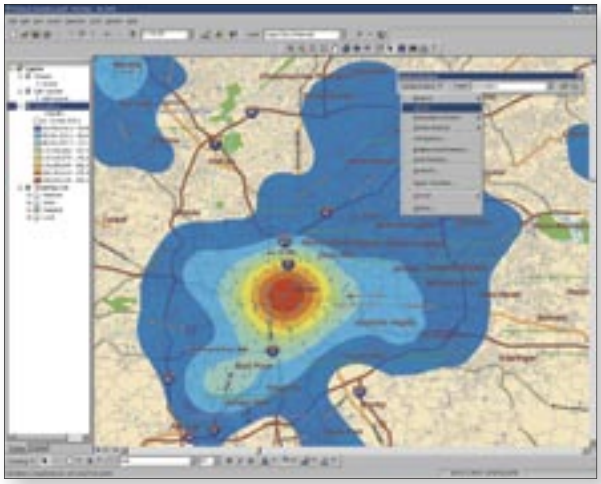
ESRI's ArcWeb℠ Services provide access to both GIS content and capabilities—on demand when needed—and eliminate the overhead of purchasing and maintaining large data sets. An ArcWeb Services subscription provides you with instant access to imagery and aerial photos, real-time weather and traffic incidents, extensive demographic data, and much more. You can use ArcWeb Services in ArcGIS, or you can use them to build unique Web-based applications.



ESRI products work in an integrated and flexible manner. They provide just the right software for your needs today and can be scaled to meet future needs.

ArcGIS Extensions

These optional extensions dramatically extend functional capabilities of ArcView, ArcEditor, and ArcInfo.



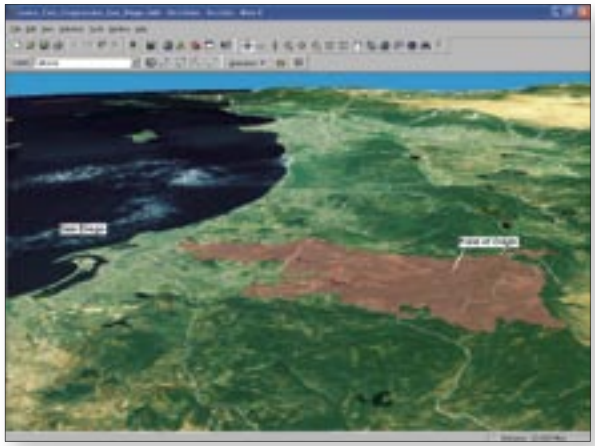
ArcGIS Spatial Analyst

ArcGIS Spatial Analyst

Take advantage of the broad range of powerful spatial modeling and analysis features available with ArcGIS Spatial Analyst. Create, query, map, and analyze cell-based raster data; perform integrated raster/vector analysis; derive new information from existing data; query information across multiple data layers; and fully integrate cell-based raster data with traditional vector data sources.

ArcGIS 3D Analyst

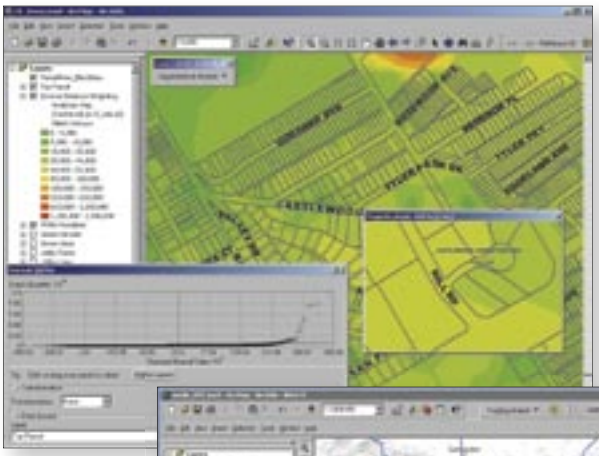
Use the advanced tools provided by ArcGIS 3D Analyst™ for three-dimensional visualization, analysis, animation, and surface generation. Unique features of ArcGIS 3D Analyst include support for triangulated irregular networks and simple three-dimensional vector geometry as well as interactive perspective viewing.



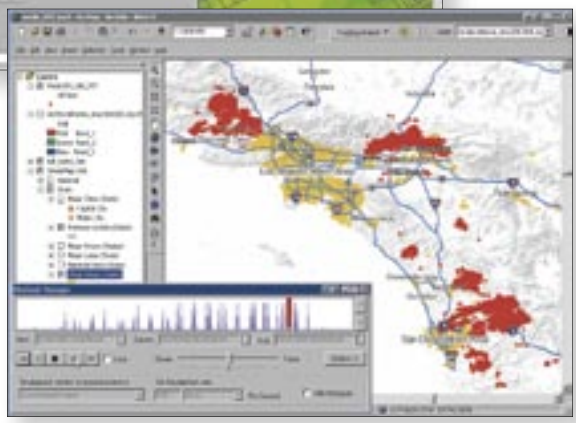
ArcGIS 3D Analyst

ArcGIS Geostatistical Analyst

This powerful suite of tools for spatial data exploration and optimal surface generation uses sophisticated statistical methods. With ArcGIS Geostatistical Analyst, you can create a surface from limited data measurements in situations in which extensive data collection is impractical or impossible.



ArcGIS Geostatistical Analyst



ArcGIS Tracking Analyst

ArcGIS Tracking Analyst

ArcGIS Tracking Analyst provides capabilities for the visualization and analysis of time-related data by defining "temporal events" that consist of the following information: time—the date and time of the event, position—the geographic location of the event, and attributes—object specific characteristics and properties. The extension allows users to view and analyze existing temporal data, which can be set up with future time windows (for mission planning) or past time windows (for historical data analysis).

ArcGIS Network Analyst

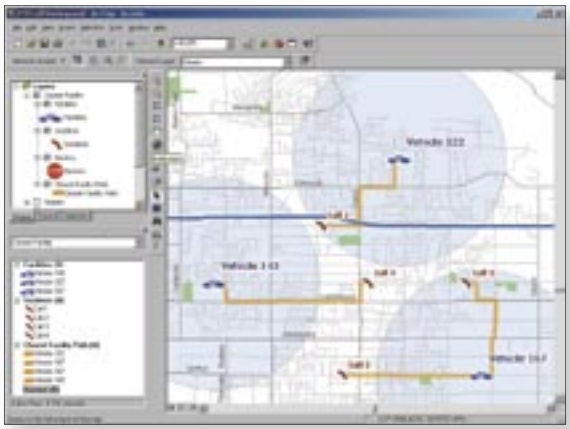
ArcGIS Network Analyst enhances the overall ArcGIS suite of products by adding routing, service area analysis, and the ability to create and manage network data sets. ArcGIS Network Analyst is a sophisticated visualization and analysis tool that can be used for simple or complex applications. ArcGIS Network Analyst is designed for users who need the logical network for their routing and network analysis requirements in modeling realistic network conditions and scenarios. Tools to create and manage sophisticated network data sets and to generate solutions for routing problems, such as path, tour, service area, and closest facility, are provided within ArcGIS Network Analyst.

ArcGIS Data Interoperability

ArcGIS Data Interoperability eliminates barriers for data sharing by providing state-of-the-art direct data access, complex data transformation, and import/export capabilities. This extension enables ArcGIS Desktop users to easily use and distribute data in many formats.

ArcGIS Publisher

ArcGIS Publisher converts ArcGIS map documents to published map files. PMFs are viewable through ArcGIS Desktop products including ArcReader, a free, downloadable product from ESRI. PMFs contain instructions about the location and symbology of data layers (rendering rules, scale dependencies, etc.) so you can quickly, easily, and securely share dynamic electronic maps



ArcGIS Network Analyst

locally, over networks, or via the Internet. ArcGIS Publisher also enables you to easily package PMFs together with their map data, if desired. Developers can use ArcGIS Publisher extension's ArcReaderControl to create and distribute royalty free, customized ArcReader applications.

ArcScan for ArcGIS

ArcScan™ for ArcGIS provides a powerful and easy-to-use set of tools for raster to vector conversion. These tools enable the creation of line and/or polygon vector features directly from raster images by interactively tracing the image. ArcScan also provides batch vectorization capabilities to create vector features from a selected area or the entire image. Simple raster editing tools are also provided to erase or fill in areas of the raster prior to performing batch conversion to increase efficiency and minimize postprocessing.

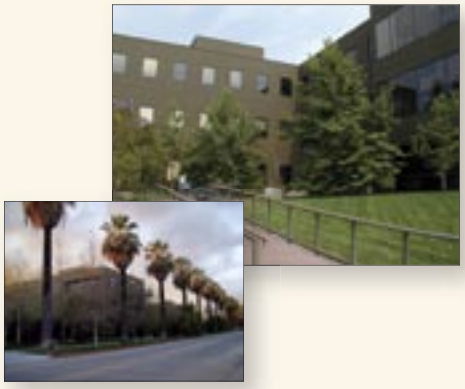
ESRI

Bringing GIS to the World

ESRI has been the world leader in the GIS software industry for more than 35 years. As the leader in GIS technology, ESRI offers innovative solutions for the desktop, Internet, and field that will help you create, visualize, analyze, and present information more clearly so that you can make better decisions.

Working with location information, ESRI's GIS software and solutions give you the power to solve the problems you encounter every day. Organizations around the world, as well as local, state, and federal government agencies, are using ESRI GIS software to make smart and timely decisions. ESRI provides powerful GIS solutions to more than 300,000 clients in more than 220 countries. In fact, ESRI leads the industry in providing mapping technology that meets today's global needs.

ESRI has continued to make major investments in the development and implementation of open GIS standards and interoperability to meet the needs of users for a distributed, multipurpose GIS that works in the larger information technology community. The goal is to create one infrastructure that works everywhere—across all platforms and technologies and on all types of devices. ESRI GIS solutions help unlock the spatial component of your data and allow you to see your organization's information from a new perspective.



ESRI's goal is to create one infrastructure that works everywhere—across all platforms and technologies and on all types of devices.

www.esri.com/publicsafety

For more than 35 years ESRI has been helping people manage and analyze geographic information. ESRI offers a framework for implementing GIS technology in any organization with a seamless link from personal GIS on the desktop to enterprisewide GIS client/server and data management systems. ESRI GIS solutions are flexible and can be customized to meet the needs of our users. ESRI is a full-service GIS company, ready to help you begin, grow, and build success with GIS.

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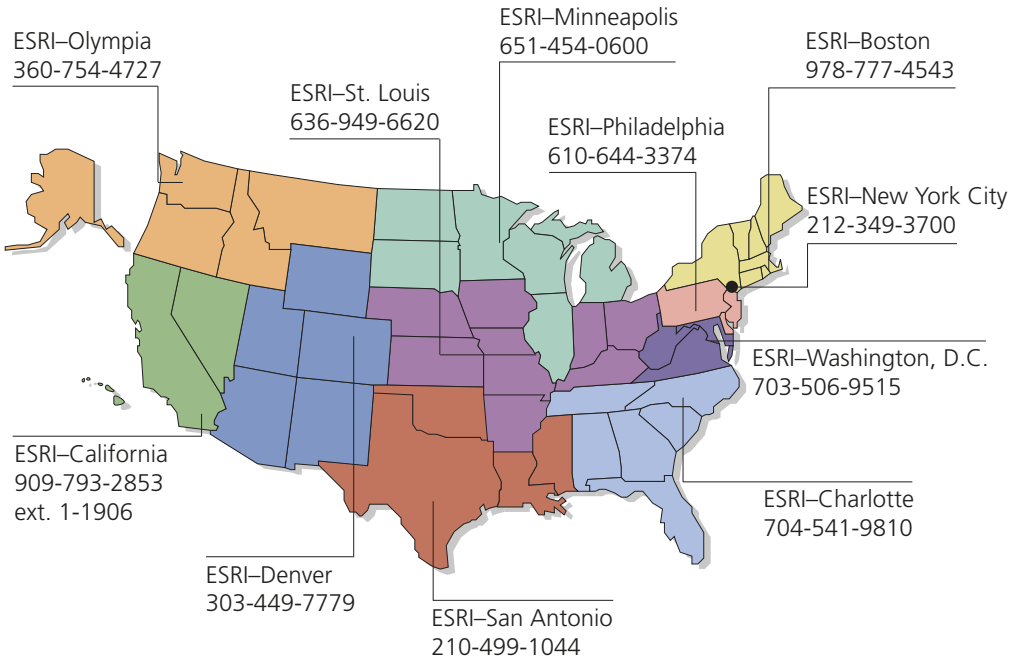

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