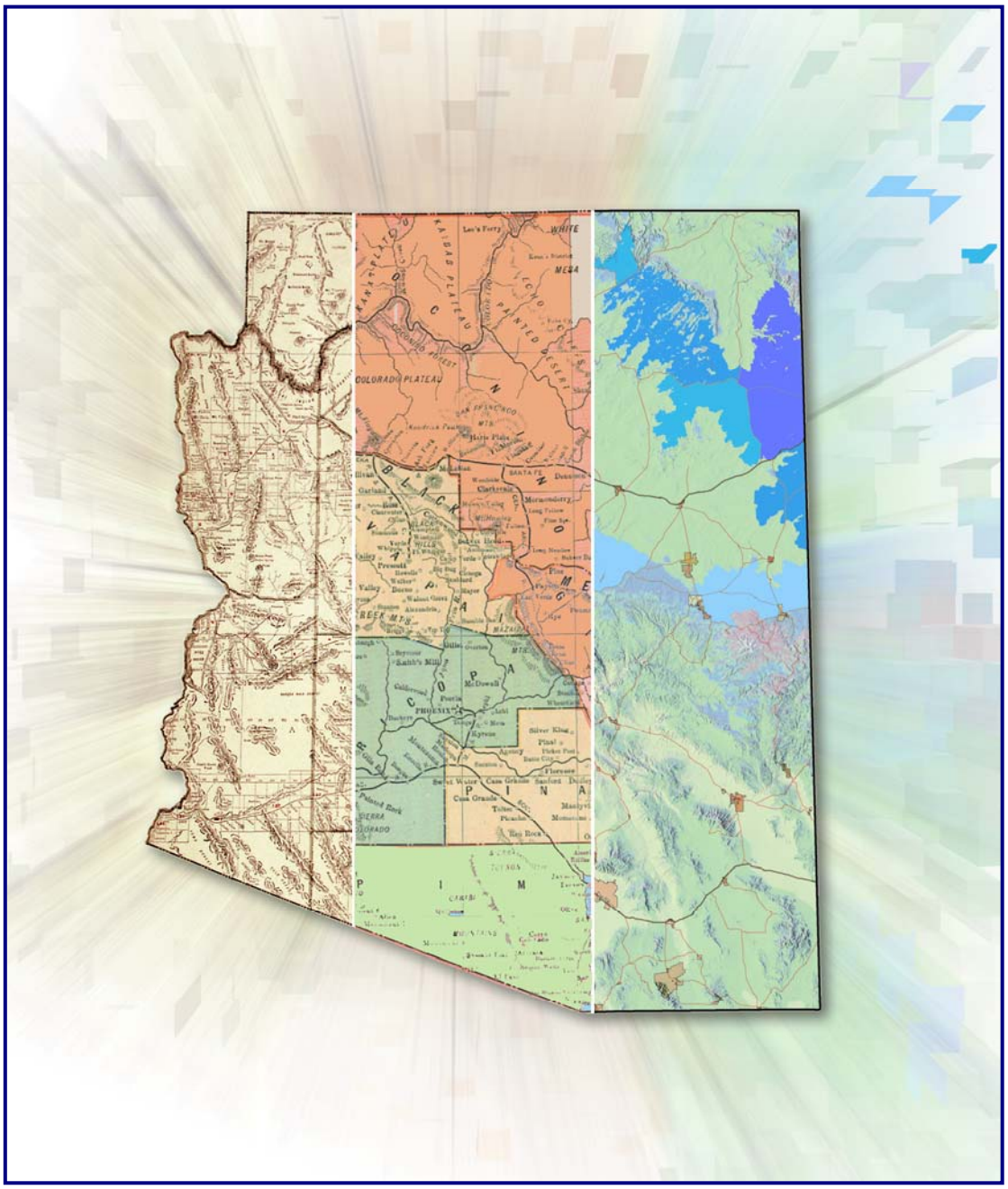
MAPPING ARIZONA



2005 Report on Geographic Information Systems

Arizona Geographic Information Council

The creation of this report is a result of input received from local stakeholders throughout Arizona. Grant funding from the Federal Emergency Management Agency (FEMA) allowed the development of a statewide data resources survey and related workshops that identified an ongoing need for educational materials related to Arizona Geographic Information Systems (GIS), resources, and capabilities. This document has been included as a portion of the final grant report to FEMA and is being provided to workshop participants and others.

Mapping Arizona gives workshop participants the current state of GIS development in Arizona. This includes spatial information infrastructure, organizational requirements and the coordination needed to allow GIS to be fully implemented for bio-terrorism planning and other first-response needs in Arizona.

Mapping Arizona may be used by workshop participants and others to help explain what GIS is and how it is being used in Arizona. In this way, *Mapping Arizona* can provide a useful tool in communicating with decision-makers on how GIS can be used to better meet health services and bio-terrorism planning, homeland security, wildfire management, critical infrastructure mapping, first-responder, and other Arizona business needs.

CONTENTS

This document is available in electronic format for viewing and download through the Arizona Geographic Information Council web site at *agic.az.gov* or by contacting the Arizona State Cartographer's Office at (602) 542-4060

December 1, 2004

This report, MAPPING ARIZONA, offers an overview of ongoing work by dedicated professionals from across our state. Using Geographic Information Systems (GIS) technology, they are creating a valuable resource that benefits the public, government agencies, and Arizona business.

The growing volume of shared geospatial data enables us to make smarter decisions that affect the lives of every Arizona citizen. Through the use of GIS technology we are able to deliver governmental services with increased efficiency, plan for our infrastructure needs, better care for our environment, and protect our citizens more effectively. The benefits of GIS are just beginning to be realized. GIS is being used to support homeland security, emergency and disaster response, wildfire management, and the day-to-day operations of many organizations.

As shown in this report, the Arizona Geographic Information Council (AGIC) has achieved much already. In the future, GIS will do more to serve the needs of a rapidly growing Arizona. We are proud to report what has been accomplished for our state and we are excited about the future.

Sharon Nicholson, President
Arizona Geographic Information Council
Arizona Department of Public Safety

Gene Trobia, State Cartographer
Arizona Geographic Information Council
Arizona State Cartographer's Office

part one:

INTRODUCTION

The Arizona Geographic Information Council (AGIC) was established by Governor's Executive Order as Arizona's primary forum and oversight group for geographic information issues and coordination.

Geographic Information Systems (GIS) is a combination of computer hardware and software that links geographic (map) information with descriptive (database) information to create a powerful analytical tool. GIS enables government to make better, faster, more intelligent decisions in a cost-effective manner.

In combination with modern computerized analysis and communication technology, GIS can provide a means to address many complex issues that face government and private organizations alike. GIS has emerged as an important technology, information, integration, and analysis resource for the State of Arizona.

Through cooperation and partnerships, AGIC facilitates the acquisition, exchange, and management of geographic data, information, and technology for the State of Arizona to benefit state agencies, the Arizona GIS community, and Arizona citizens.

This report is divided into five major sections: Introduction, GIS In Action, AGIC Overview, AGIC Initiatives, and Appendix.

- ***INTRODUCTION*** provides a brief overview of this document, its contents and purpose. It also offers some insight into the various Arizona organizations that play key roles in the efforts to improve the use of GIS technology.

- ***GIS IN ACTION*** offers a look at GIS technology, how it works and how it is being used daily around Arizona to solve complex problems and improve the lives of Arizona citizens.

- ***AGIC OVERVIEW*** explains the history of the Arizona Geographic Information Council (AGIC), reviews AGIC accomplishments to date, and offers a look ahead at what's to come. It outlines the council composition, mission, and how AGIC serves Arizona.

- ***AGIC INITIATIVES*** describes AGIC's plans and what members are doing to accomplish six major initiatives:

  - *Core Data Resources*
  - *Arizona Preparedness*
  - *AGIC GeoData Portal*
  - *The Arizona Map*
  - *Arizona Height Modernization*
  - *Education and Outreach*

- The ***APPENDIX*** includes additional information about AGIC committees and contacts, and acknowledgements for this report.

GIS ORGANIZATIONS

ARIZONA GEOGRAPHIC INFORMATION COUNCIL

The Arizona Geographic Information Council (AGIC) is Arizona's primary forum and oversight group for Geographic Information Systems (GIS) and geographic data and technology issues and coordination.

AGIC was established by Executive Order in 1988 and is managed by a 34-member executive management board that is composed of representatives from federal, state, and local governments, regional consortia, universities, and the private sector.

ARIZONA LAND RESOURCE INFORMATION SYSTEM

The Arizona Land Resource Information System (ALRIS) was established by the Arizona State Legislature in 1982 and is managed by the Administration and Resource Analysis Division of the Arizona State Land Department.

ALRIS supports the statewide use of GIS by developing and managing GIS hardware and software and providing education and consultation to public agencies in the use of GIS technology. In order to decrease total costs for GIS in Arizona, the ALRIS program creates and maintains key data sets commonly used by public agencies and acts as a clearinghouse for digital spatial data in Arizona.

STATE CARTOGRAPHER'S OFFICE

The State Cartographer's Office (SCO), located within the Arizona State Land Department, serves the Arizona GIS community by coordinating GIS standards and policies, coordinating the development of common projects, developing web-based information services, establishing a clearinghouse of information about data resources, improving access to GIS databases, and providing support for the Arizona Geographic Information Council.

part two:

GIS IN ACTION

In recent years, Arizona organizations have become increasingly aware of the value of geographic information in performing many of their routine functions. Existing databases already contain a wealth of data that is geographic in nature: from street addresses and highway milepost markers to aerial photography, boundaries, elevation, and GPS coordinates.

Enhancing these systems to allow faster searching, clearer map display, and better analysis will improve decision-making for the highly complex tasks Arizona decision-makers face each day.

Geographic Information System (GIS) technology allows all levels of government, as well as private organizations and the general public, to utilize the geographic nature of existing data. Today, GIS is being used successfully by hundreds of Arizona organizations in diverse areas such as emergency response, homeland security, infrastructure and economic management, wildfire management and response, drought planning, industrial permitting, demographic analysis, regional planning, and public health.

This section offers a brief look at GIS technology and how it works to bring together and display diverse data for analysis, decision-making, and response.

The following pages include samples of GIS-related solutions from throughout Arizona. These are only a few of the wide-ranging examples available.

Consider these illustrations in the context of overall government and business operations in the state, and it will be easy to see that Arizona is beginning to reap the benefits of GIS technology.

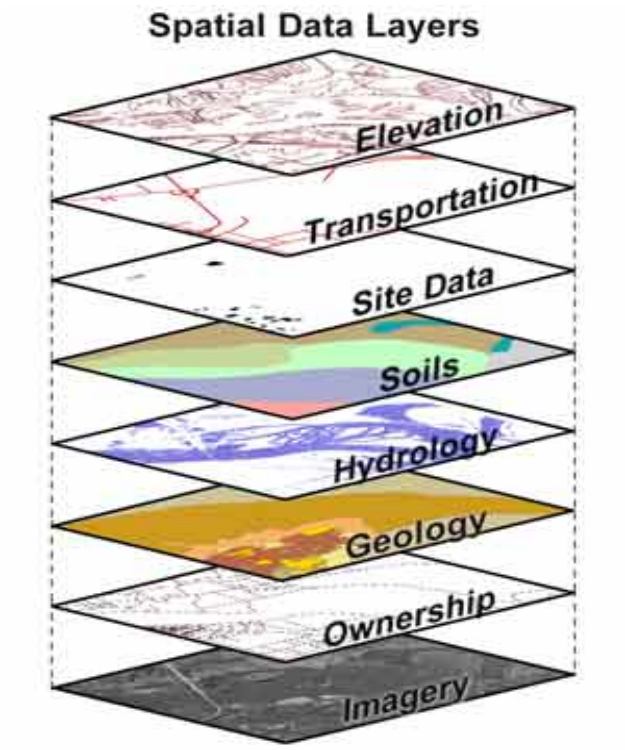
AGIC Arizona Geographic Information Council

GIS Technology

A Geographic Information System (GIS) is a powerful collection of computer software and hardware that links geographic information (where things are) with descriptive information (what things are).

With a GIS, data with location information, such as an address or longitude and latitude, can be viewed, analyzed, and displayed as a digital map. The strength of GIS is its flexibility to quickly combine and layer geographic information to create "intelligent digital maps" that are much more powerful than simple location maps. They are analytical tools.

Unlike a flat paper map, a GIS can combine many layers of information to create a custom map "on the fly". For example, using the layering concept, a GIS can combine a land ownership layer, a surface water layer, and an elevation layer to electronically map land parcels and owners that may be at risk of flooding.



A standard Geographic Information System (GIS) is built from layers of data that can be turned on or off "on the fly" to quickly create a custom map for a particular application.

Another example is the use of GIS for emergency E911 response. Using a street layer with an address and telephone database, a location can be identified and emergency personnel can be dispatched using the shortest possible route.

Virtually any manmade or natural feature that has a location can be stored, viewed, and analyzed within a GIS. The technology can be used for a wide variety of problem solving, such as protection of our natural resources, more efficient business management, better planning, and faster response to emergencies.

The underlying principle of layering and analyzing geospatial data using GIS has remained the same since its inception. However, the technology upon which GIS is built is changing rapidly. Applications that once required expensive mainframe computers can now be accomplished on stand-alone computer workstations and Internet servers.

As Internet technology has improved efficiency in other industries, it is now having an important impact on how GIS is being applied to everyday issues. Geographic data can be accessed, analyzed, and shared more quickly with common software. It can be distributed throughout a department or across the state at amazing speed. It can be sent through a high-speed network, a phone line, a satellite receiver, or a standard cellular phone.

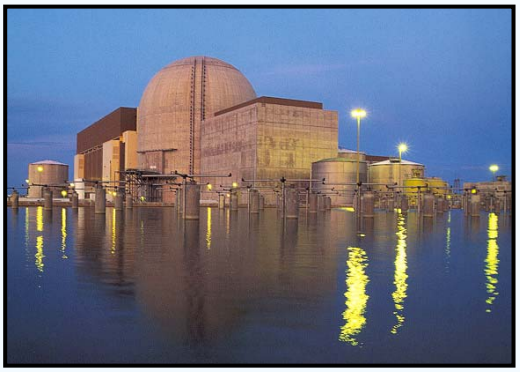
Geographic Information Systems technology is a tool that enables government to make better, faster and more comprehensive decisions in an effective manner. In combination with modern computerized analysis and communication technologies, GIS can provide a means to address many complex issues that face governmental organizations.

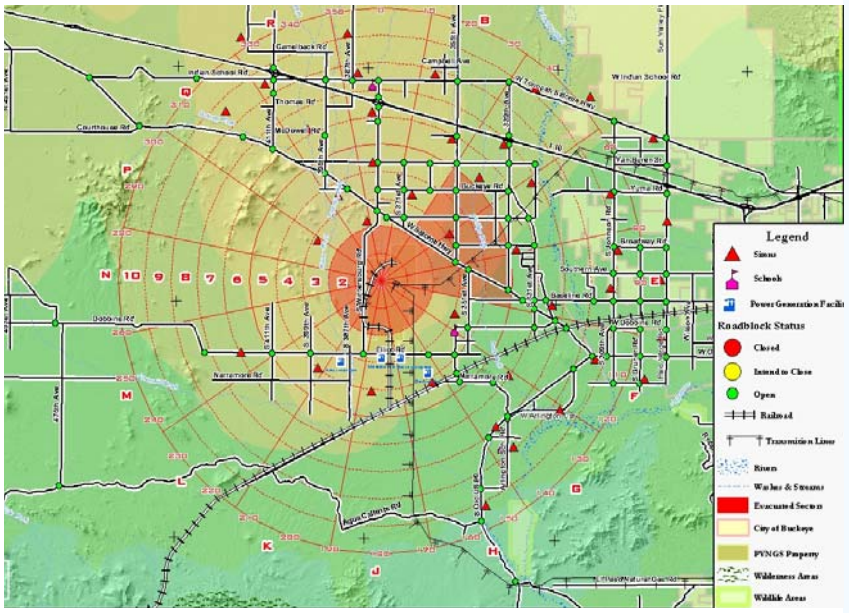
GIS has emerged as an important communication, coordination and analysis resource for the state of Arizona.

Maintaining Safe Nuclear Power

County Government

Maricopa County Department of Emergency Management





Problem: The Palo Verde Nuclear Generating Station (PVNGS) plays a major role in power production in the Western United States. Located just west of Phoenix, Arizona, Palo Verde can generate more megawatts of energy per year than any other power production facility in the country. Although Palo Verde is considered one of the safest nuclear power plants ever built, precautions still must be taken to protect the public in the unlikely event of a radiological release caused by equipment failure or a terrorist threat.

Solution: GIS is used extensively as a tool to understand and visualize all aspects of emergency planning and response at PVNGS. The GIS answers many of the most difficult questions: Who lives near the plant? What areas should be evacuated? How can people be contacted? What critical infrastructure could be affected? Where should roadblocks be placed to prevent people from entering evacuated areas?

GIS provides these and many other answers in near real time so planners and responders can make critical response decisions quickly and accurately. The information is shared among many layers of government and with multiple responding organizations.

Outcome: GIS has enabled Maricopa County Emergency Management to quickly and accurately provide decision makers with valuable information. This has facilitated a more effective and timely government response to any emergency event that may occur at Palo Verde Nuclear Generating Station.

Overview

People all over the Western United States benefit from the power generated at Palo Verde Nuclear Generating Station (PVNGS). As urban growth moves closer to the plant, it is imperative that we keep the population safe and informed about events at the generating station.

The Maricopa County Department of Emergency Management began using Geographic Information Systems (GIS) several years ago in response to efforts in the County Emergency Operations Center (EOC). Each person in the EOC has a custom built set of GIS tools that will render maps and data detailing an emergency situation. For instance, if an evacuation is recommended, the intelligence officer uses his GIS to define the evacuation area and get a census of how many people will need to be moved. Based on this information, the Department of Transportation will use their GIS to determine roadblock locations and the Sheriff's office will place responding officers. In addition, people living near the plant who have requested special assistance are identified and contacted. All of this input is captured in the central database and displayed on a screen in front of the EOC so everyone can get a view of the big picture. Finally, a snapshot of this data is sent out to the Internet for public use and a digital version is sent to other responding agencies that may not have GIS capabilities.

This system has now been expanded for use by other agencies outside of the EOC through technology sharing agreements. The Arizona Radiation Regulatory Agency (ARRA) establishes a presence near the plant and sends field teams out to collect radiological data. They have begun to use GIS to display the results of their field team surveys on a GIS map. These results are then sent to their Technical Operations Center and to the County EOC for display.

AGIC Arizona Geographic Information Council

Identifying Wildfire Hazards

State and Local Government

Arizona State Land Department

The Aspen Fire rages through the Catalina Mountains near Tucson in June 2003.

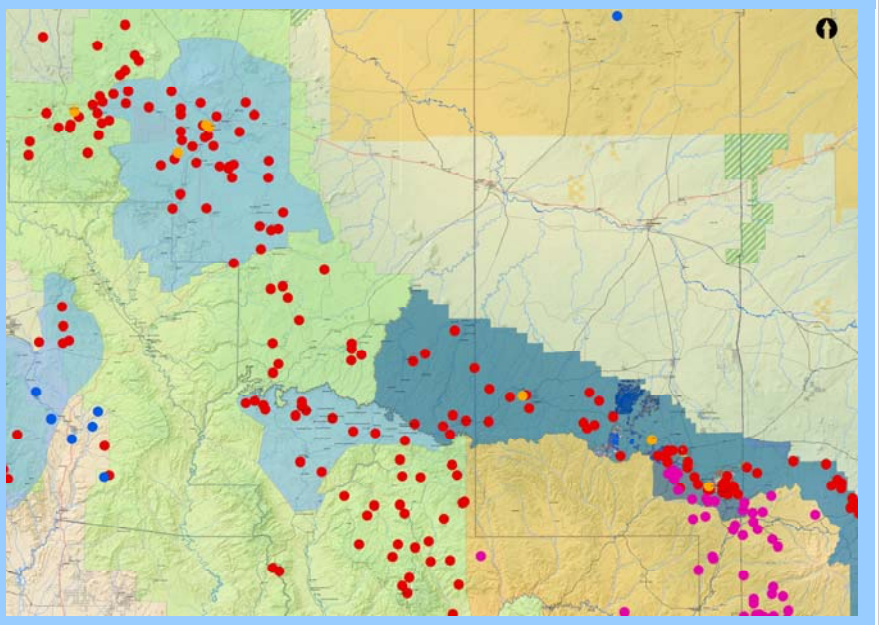
Problem: Wildland fire protection planning, response, and restoration all require coordination between government agencies, community organizations, and private citizens. Since wildland fire does not respect ownership boundaries, this coordination has implications across land ownership and geographic borders. Data from diverse sources need to be collected and analyzed collectively to allow for the best possible decision-making.

Solution: The Mapping and Assessment Subcommittee of the Arizona Governor's Forest Health Council has begun the process of bringing geographic information together from diverse statewide sources. The Arizona State Land Department's Forestry Division has begun development of the ARIZONA FIRE MAP project. (FIRE Stands for Fuels Information, Restoration, and Education). This project's goal is the creation of an Internet Map Service that will share geographic information about past, present, and future fuel treatment activities.

Outcome: The Mapping and Assessment group is actively identifying data sources and standards. The AZ FIRE MAP project is currently under development by staff from the Arizona State Land Department Forestry Division, the Arizona State Cartographer's Office, and others

Project Contact:

Glen Buettner – (602) 364-1546
Arizona State Cartographer's Office
Arizona FIRE MAP Project



Hundreds of projects are underway to identify and treat hazardous forest fuels.

Overview

Wildland fire and its devastating effects are a major concern for much of Arizona. There is growing interest to consolidate information regarding forest health and fire history with fuel treatment data and other related information in a centralized location for access by state, regional, and local decision-makers. The Arizona legislature recognized this in the new Arizona Healthy Forest Bill, and the State Forester has recently been tasked by the Governor's Office to begin statewide mapping in accordance with the changes to state statute.

The State Land Department Forestry Division and the Arizona State Cartographer's Office, along with other partners, have begun the ARIZONA FIRE MAP Project. (FIRE MAP stands for Fuels Information, Restoration, and Education – Mapping and Assessment Program). Developed as a result of work by the Governor's Forest Health Council / Mapping and Assessment Subcommittee, the AZ FIRE MAP project will bring together statewide data from federal, tribal, state, and local agencies into a centralized Geographic Information System (GIS), and allow interested parties to access various map products and reports over the Internet.

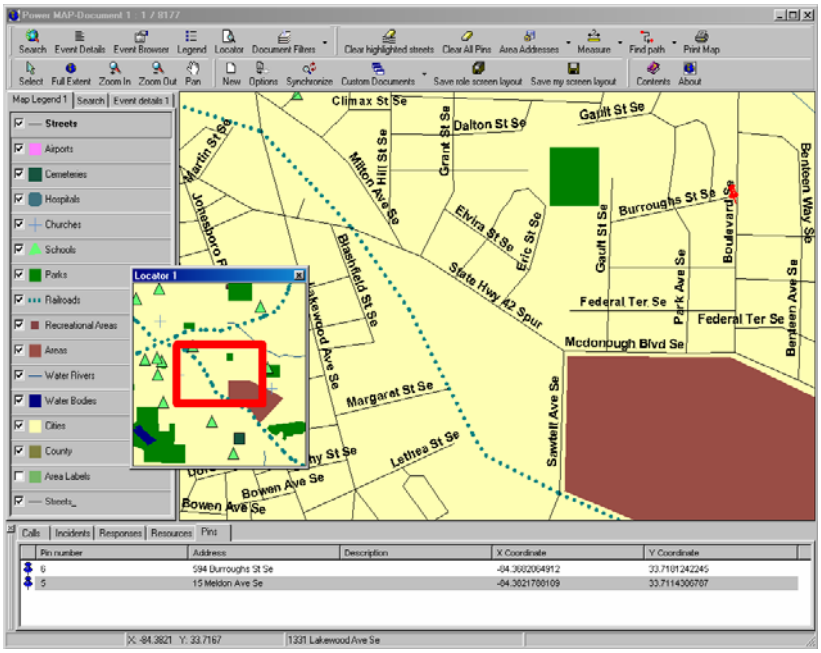
Short-term funding from Arizona's Department of Emergency Management will allow Land Department GIS staff to partner with staff from the University of Arizona's Center for Remote Sensing, and other contractors, to collect data and develop an Internet Mapping Service application.

The ARIZONA FIRE MAP project is dedicated to helping communities and organizations throughout the state create maps to more effectively plan fuels treatments and defensible space projects, and to facilitate state and regional-level planning and decision-making.

Responding to Emergency

Regional Government

Maricopa Region 911



Problem: Though cell phones are on their way to outnumbering landline phones, currently there is no ability to identify the location of a 911 caller on a cell phone.

Solution: The Maricopa Region 911 office will be implementing Geographic Information System (GIS) based maps for the Maricopa Region to assist 911 call takers in identifying the location of cellular 911 calls.

Cell phone companies that service the Maricopa Region will be required to upgrade their equipment to provide general location information. The location information provided by the cell phone companies will be used in conjunction with the GIS layers to determine the location of the emergency.

Outcome: Currently the 911 operators find GIS maps to be a great resource in locating landline (home phone) calls. The assistance of GIS departments across the region will ensure that the 911 operators will have the very best GIS maps available.

It is expected that the information provided by the cell phone companies, along with detailed base map information provided in the GIS system, will allow the locations to be determined accurately and allow emergency personnel to respond quickly. Ultimately, the system will save lives.

Overview

Currently, if you call 911 from your home phone, the operator is provided with your address and will confirm the information prior to sending units to your house for an emergency. If you call 911 from your cell phone, even if you are at home, the 911 operator will not know your location and will need to ask.

In order to identify the location of cellular 911 calls, the Maricopa Region 911 office is currently in the process of providing a Geographic Information System (GIS) map to every 911 call taker across the region. The GIS maps will show the location of both wireless (cell phone) and landline (home phone) calls. The primary need for the map resides in the ability to locate a 911 call placed from a cell phone.

Wireless providers (cell phone companies) are being required to upgrade their equipment in order to provide their customer's location in the event of an emergency. The equipment they install will not pinpoint the exact location of a cellular call, but will narrow the location down to about 300 meters, or approximately 1000 feet. Because of the less than precise location provided by the cell phone companies, the maps provided to the 911 call takers will have a variety of landmarks to reference: streets, addresses, shopping centers, post offices, and many other layers. This detailed information will allow the 911 operators to ask a caller if they are on a particular street, across from a post office, near a school, fire station, or other point of reference.

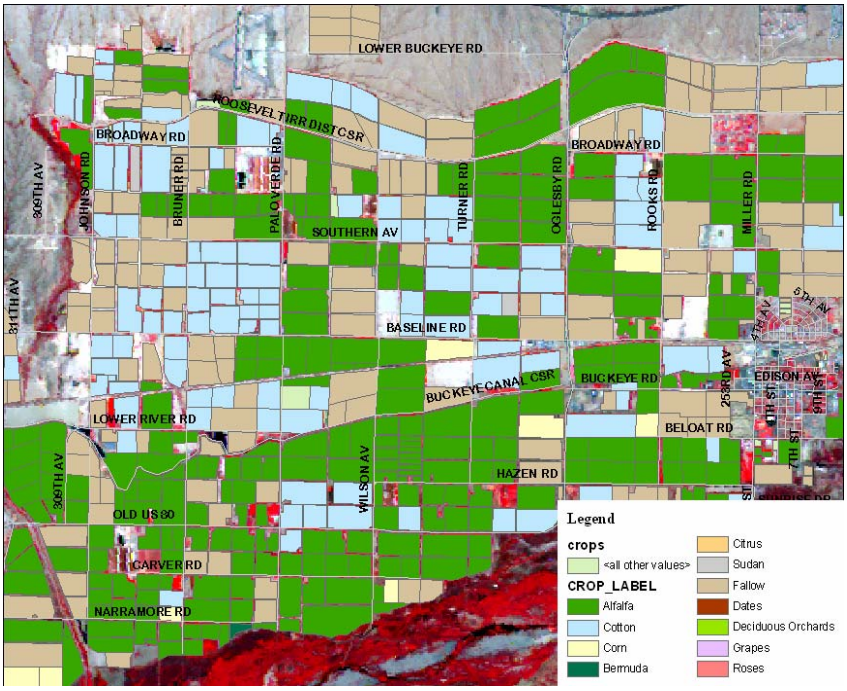
The GIS maps were fully implemented by July 2004 for over 200 operator positions across the region. The wireless companies that service the Maricopa Region have been requested to update their equipment in order to provide location information by the first quarter of 2005.

AGIC Arizona Geographic Information Council

Monitoring Water Needs

State Government

Arizona Department of Water Resources



Arizona Department of Water Resources

Problem: Water budgets provide critical information about the supply and demand of water by the municipal, industrial and agricultural sectors, as well as information about changes in groundwater storage and water available for a community's growth. Vital to improving the Arizona Department of Water Resources (ADWR) water budget estimates is the collection of the best possible data on groundwater and water use. This will enable better water budget estimates and ultimately more efficient use of our state's available water resources.

Solution: Through the use of remote sensing and Geographic Information Systems (GIS) technologies. ADWR is now able to classify crops and determine acreage to better estimate agricultural water use. The improved information allows the Department to create better water budget and groundwater flow models, and limits the expense of fieldwork.

In the Phoenix Active Management Area (AMA) the Department is now using color and multispectral satellite imagery along with limited field data collection to determine accurate water consumption rates.

Outcome: The Department now has accurate data that can be used to build better water budgets, support real-time and strategic decision making, create annual hydrology reports, support groundwater models, and support Assured Water Supply, Recharge, and other Department programs.

Overview

The Arizona Department of Water Resources and its partners throughout the State have conducted groundwater-monitoring activities for decades. As part of the dialog with the Governor's Water Management Commission it has become apparent that there is need and support for an increased level of monitoring of hydrologic conditions in the Phoenix Active Management Area (AMA) and other areas.

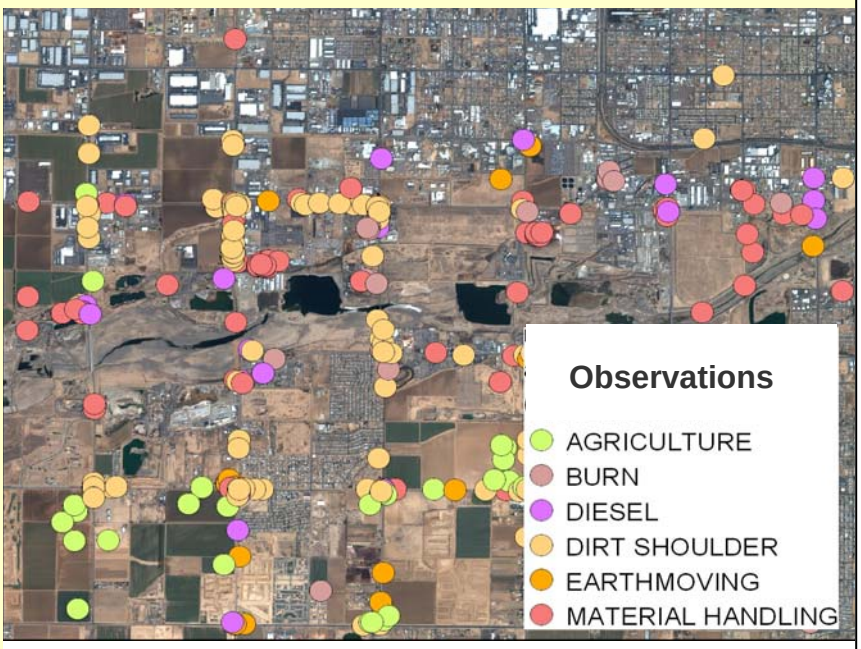
This program is not to be limited to collection of groundwater data alone, as has been the case in the past, but includes the collection of surface water data, subsidence data, gravimetric data and water use data. Because agriculture irrigation accounts for the majority of water use in the Phoenix AMA it is pertinent that we have an accurate estimate of crop type and acreage. This basic information will help develop water use estimates as an important component of the overall water budget. The Department will have the ability to construct more timely and more accurate water budgets and to monitor the hydrologic behavior of the AMA more completely.

Geographic Information Systems (GIS), in conjunction with satellite imagery and fieldwork, is enabling the Department of Water Resources to make better estimates of water usage and availability, and to put our state's water resources to more efficient use.

Fighting Air Pollution

State Government

Arizona Department of Environmental Quality



Problem: The Arizona Department of Environmental Quality (ADEQ) and Maricopa County Environmental Services Department (MCESD) needed a way to relate known dust-producing activities with the resulting areas of high dust concentration measurements. A large number of field observations, recorded over a six-month period, would need to be recorded in a format that would easily identify the location and type of activity observed in the Salt River Study Area.

Solution: Using GIS and high-resolution satellite images, field pages were developed for the study area. Each page contained an image overlaid with a grid, and space to record event information, date, time, etc. Observations were categorized into 12 different dust-producing activities. Each observation was assigned a coordinate taken from the field page, and all observations were compiled into a master file. The total set of all observations was then projected using ESRI's ArcMap and placed over a satellite image of the entire study area. Each dust-producing activity was assigned a specific color, which helped to identify "hotspots" and the most prevalent dust-producing activities.

Outcome: The study was undertaken to identify locations within the study area that had potential dust pollution problems. GIS was used to extract field data and spatially evaluate and identify problem areas for further follow-up, and in developing an Emissions Inventory (EI) of the study area.

Project Team:

TS Summers, JC Mattan and Darlene Jenkins
Air Quality GIS Team
Dena Konopka, and Janet Darcey
Maricopa County Environmental Services Dept.
Arizona Department of Environmental Quality (ADEQ) and Maricopa County Environmental Services Department (MCESD).

Overview

Dust pollution concentrations in a 32 square-mile region of metropolitan Phoenix are the highest in the area. The Arizona Department of Environmental Quality (ADEQ) and the Maricopa County Environmental Services Department (MCESD) conducted an intensive study of pollution sources and developed an inventory of emissions in an attempt to identify causes of the elevated concentrations and to help identify appropriate controls.

The field study was conducted June 1 through December 31, 2002 to identify the locations and types of activities producing dust in the Salt River PM10 Study Area. The field study consisted of two teams driving through the study area every three days documenting observations of airborne dust and the apparent source. One team surveyed in the morning and the other team surveyed in the afternoon.

The challenge was to record accurate location and related observations for each event. The solution was to use ESRI's ArcMap and create convenient sized field pages with satellite images divided into 1,000-meter squares. Air Quality's GIS Project Manager developed 107 field pages for the entire study area and delivered them on CD to each field team.

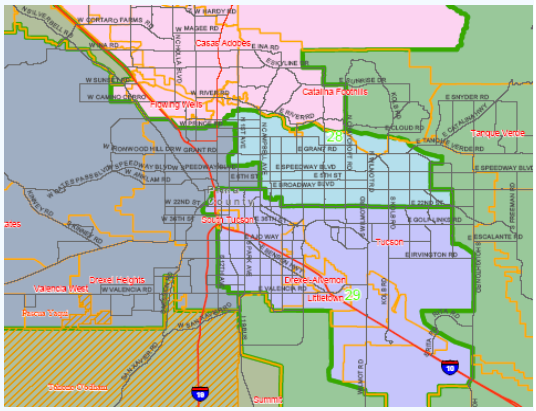
The field teams recorded the location and type of observed dust each day on the provided field pages as snapshots of observed pollution. Each page was given to GIS technicians who extracted the event coordinate and recorded it on a spreadsheet. When all the events were identified and the spreadsheet was completed for the entire project, it was projected in ArcGIS and displayed spatially on top of the satellite image. The new ArcMap product with field observations clearly identified "fugitive dust" problem areas.

GIS and High Resolution Satellite Images played an integral part in developing and mapping the Salt River PM10 Study. GIS was used in developing all base maps, modeling grids, elevation data and locating all dust sources. This study, which is just one of several conducted in the entire Salt River area, shows how important GIS and imagery have become to environmental study.

Determining Legislative Districts

Maricopa County Elections Department

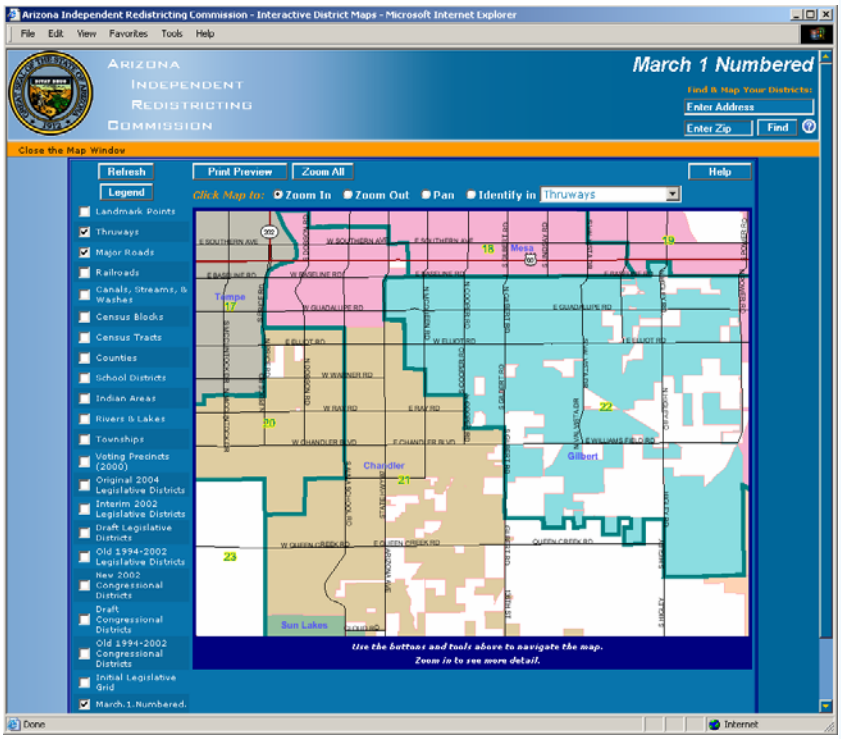
State and County Government



Problem: The creation and update of legislative districts has become a very complex, citizen driven, map intensive process. Multiple district alternatives must be made available for review by citizens and interested groups. Often the proposed district boundaries must be analyzed in relationship to other geographic and demographic data. Done manually, this is an extremely burdensome task.

Solution: The Maricopa County Elections Department has created several noteworthy Geographic Information Systems (GIS) applications to assist in heir mission of administering elections for the county. Two examples are the Arizona Independent Redistricting Commission (IRC) internet map viewer and "ArcVRAS", the Department's ArcView GIS-based application for editing the streets and boundary tables of the Voter Registration and Administration System (VRAS).

Outcome: Geographic Information Systems (GIS) has enabled the Maricopa County Elections Department to streamline the redistricting process. The IRC web application is being used extensively and the "ArcVRAS" application has saved thousands of man hours of work since it was rolled out in late 1999. It has also significantly reduced the number of boundary coding errors within the elections process.



The Independent Redistricting Commission Website has generated over three million map images since its inception in 2001.

Overview

The Independent Redistricting Commission (IRC) is charged with the redistricting of Arizona's Congressional and Legislative Districts in a new citizen driven, open process.

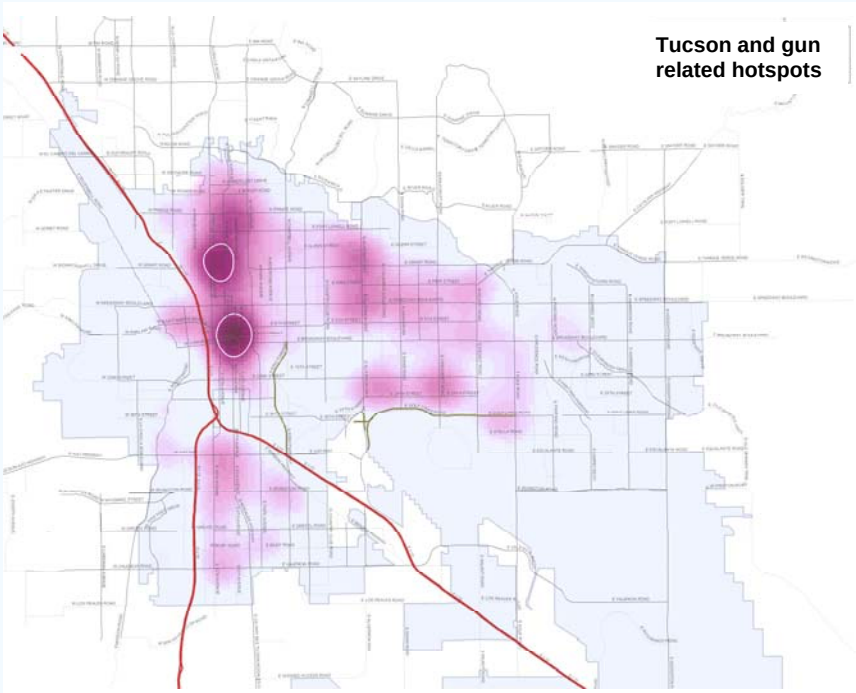
Maricopa County assisted the Independent Redistricting Commission with technical resources for the process through an inter-governmental agreement that included hosting the IRC website. An interactive map viewer was created to allow detailed, universal, and rapid access to the dozens of district alternatives created by the Commission. The viewer allows new map alternatives to be published to the web within minutes. Interested parties can then review and navigate the districts down to residential street level detail as well as find addresses and compare districts to other geographic layers.

The application has proven to be an incredible asset amidst the otherwise rapidly changing redistricting environment. Over three million map images have been generated and viewed since the application went live in the summer of 2001.

Mapping Crime

State Government

Arizona Criminal Justice Commission



Problem: As part of Project Safe Neighborhoods, the Arizona Criminal Justice Commission (ACJC) was asked to identify and track the location of crime hot spots in particular Arizona communities. The identified areas would be targeted for intervention, such as special prosecution and stepped up enforcement, as well as to track overall crime patterns.

Solution: ACJC used a Geographic Information System (GIS) to create the required maps. For one of the project areas, crime data was obtained from the Tucson Police Department (TPD) and address level gun trace data was obtained from the Bureau of Alcohol, Tobacco, and Firearms (ATF). The resulting maps show hotspots for gun related crime calls in Tucson.

The resulting maps are used on their own or overlaid on other maps: gang territories, neighborhood associations, census tracts, police sectors, zip codes, and others.

Outcome: The outcome of the first map book created using Tucson data was very successful. The maps confirmed the opinions of local law enforcement and criminal justice agencies as to where the highest concentrations of crime existed.

The next steps in this project are to create a similar map book for the city of Phoenix and to update the Tucson maps with more recent data.

Overview

Project Safe Neighborhoods is a comprehensive approach to reducing gun violence in America. The Executive Committee of the Arizona Project Safe Neighborhoods project has selected the Arizona Criminal Justice Commission (ACJC) to be the research partner for their three-year program. The Statistical Analysis Unit of the ACJC works directly with various Project Safe Neighborhood groups to provide them with information regarding gun violence in Arizona.

Project Safe Neighborhoods in Arizona is a compilation of issues developed in conjunction with the United States Attorney's Office and other project participants. It is reflective of combined efforts to thwart and reduce gun violence in jurisdictions across Arizona.

Though there are various topics of interest in this phase of the Arizona Project Safe Neighborhoods activities, the focus of mapping efforts is to discover the prevalence of gun-related violence in Arizona's large metropolitan areas. In order to address this area of concern, the Arizona Criminal Justice Commission Statistical Analysis Center is conducting several data-gathering and analyses projects.

One project involves an analysis of homicides, armed robberies, and aggravated assaults with firearms for 2002 and 2003 in Pima, Maricopa, and Pinal Counties. Another is the development of a crime mapping effort regarding violent gun crimes for Maricopa, Pima, and Pinal Counties for 2002 and 2003.

Protecting Our Environment

Federal, State, and Local Government

Science Applications International Corporation

55 gallon drums at a facility in the main study area

Problem: Large amounts of environmental and facility-related data were being compiled during the investigation of the Motorola 52nd Street Superfund site. Researchers in various organizations, at different locations, needed to access this data and display it in a form that would improve their assessment of the lateral and vertical extent of contamination and their identification of source facilities.

Solution: A web-based GIS (geographic information system) application was developed that integrates the environmental and facility-related data with site geographic data, such as interpreted groundwater contamination areas. From their own desks, researchers can now display, query, and conduct basic geographic-centered analysis with this data–such as comparing possible source facility locations to contamination areas.

Outcome: Researchers are using this system to identify source facilities, refine the ongoing remedial investigation and support the cleanup.

Supporting data are from the cooperative efforts of ADEQ and ADWR, Maricopa County, the City of Phoenix, potential source facilities, and investigative contractors.

Project contacts:

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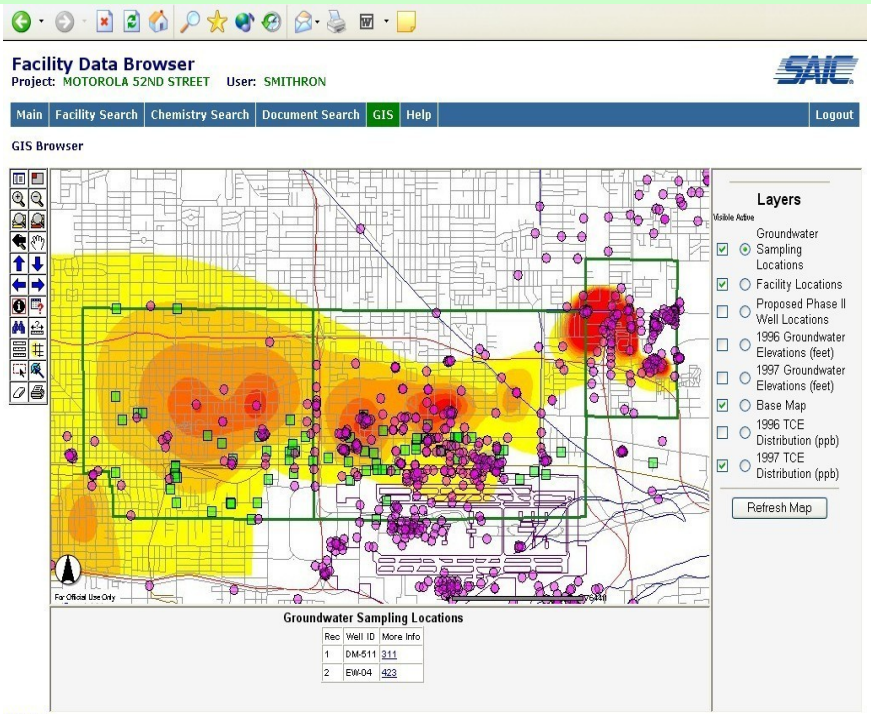


Overview

The Motorola 52nd Street Superfund site is a large groundwater contamination site in Phoenix, Arizona. Industrial and commercial operations have released chemicals into the soil and groundwater for at least the last 50 years, and the site has been under investigation for the last 20 years. The analysis of the nature and extent of groundwater contamination is ongoing, as is the investigation for possible source facilities.

Over the course of this remedial investigation and search for possible source facilities, nearly 400,000 groundwater chemistry records have been compiled, several thousand facility data elements have been logged, and more than 20,000 documents have been indexed. The sheer volume and variety of data made access and analysis of that data extremely challenging for researchers at different locations. A database was developed to store and maintain the environmental and facility-related data, and a secure Intranet site with a GIS application was created. Researchers can log on to this system from any location to support their investigations and search for possible source facilities. For example, researchers can display interpretations of how the groundwater contamination has changed over time and compare this to possible source facilities and the kinds and amounts of chemicals that were used at each of those facilities.

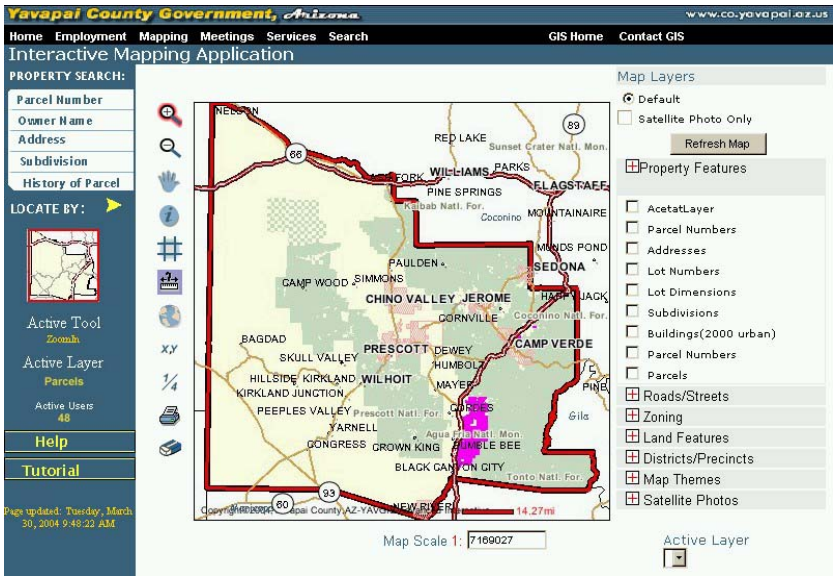
This type of analysis is one of many employed by researchers to determine possible sources of contamination and target further field investigations and specific facility research.

Providing Public Information

County Government

Yavapai County GIS Division

Prior to Internet capabilities, public access to information often resulted in long waits at county offices.



Problem: Yavapai County, Arizona, needed a way to address the growing number of public requests for county records. With no Internet access to county data, citizens needed to travel to county offices to place requests for information. Personnel resources of the county were being pushed to the limit and the manual processing resulted in long lines of customers waiting for assistance.

Solution: In 1998 the first online application was created for Yavapai County. It helped improve production levels within the county offices and allowed the general public access to the county's digital data from any computer connected to the Internet. The online application has been modified and improved many times to provide more tools and functions, and to respond to the changing needs of the public and county management.

Outcome: The availability of this online application has increased productivity in every county department and has allowed the public to easily access needed information. It has benefited county departments by enabling widespread data access from computers throughout county government. It has substantially reduced the number of calls, requests, maps, and in-house questions.

URL: http://www.co.yavapai.az.us/departments/GIS/GISOnlineApps.asp

Overview

Yavapai County began offering online mapping applications so people would have an easy way of finding information. Once awareness grew, it became apparent that the application would need to be improved to support additional needs throughout the county. The Yavapai County GIS Division began the task by customizing ESRI's ArcIMS Internet Map Server software and creating custom tools. In 2001, the county's first interactive mapping application went live. It earned fourth place recognition in the 2001 Geography Network Challenge, sponsored by ESRI.

Over time, the GIS division has had to revamp and improve the application to make it more user-friendly and quicker to access. Currently, there are two applications available to the public through the county's web page. The first is a basic system created for use with a slower modem connection. It uses just clicks to zoom in and out and offers four basic searches. The second application, designed for faster Internet connections, is more robust and has more search options, the ability to turn on and off layers, and more data available about specific features.

The new applications now have the functionality to link to the Recorder's Maps and Plats, the Treasurer's Tax Inquiry, view comparable parcels, buffer parcels for mailing labels, and offer more information on sales, improvements, and parcel values. Every tool on the map is easier and faster to use, which makes a more user-friendly application.

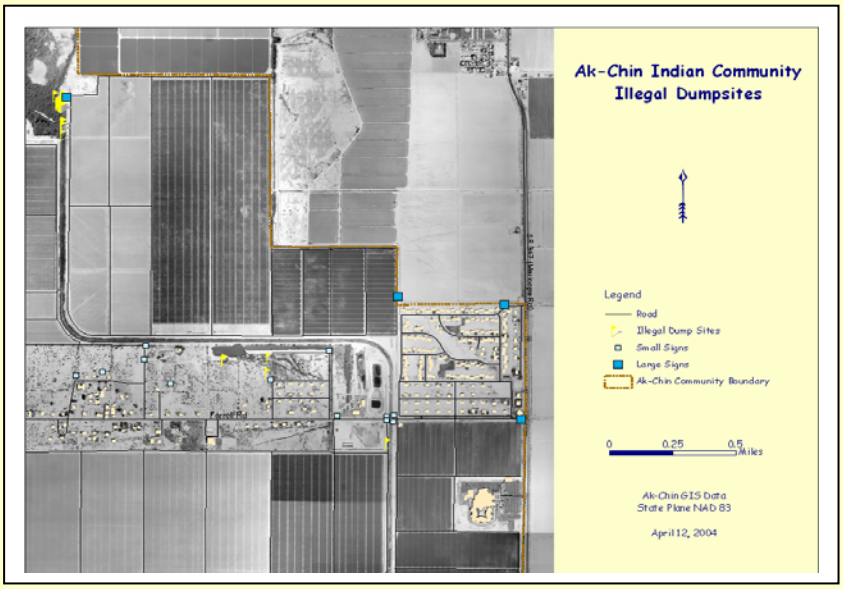
Yavapai County employees and residents use these applications on a daily basis. As technology improves, the Yavapai County GIS Division will continue to update the applications to meet the needs of county management and the citizens it serves.

AGIC Arizona Geographic Information Council

Stopping Illegal Dumping

Tribal Government

Ak-Chin Indian Community



Problem: The Ak-Chin Indian Community (ACIC) located in central Arizona, like other tribal affiliates, face illegal dumping issues on a regular basis. They needed a tool to help them track and understand the extent of this serious problem and a plan to help them fight its growth. Prior to this program, there were no mechanisms in place to identify dumpsite locations, types of waste, dates of illegal dumpsite discovery, or dates of clean-up and site closure.

Solution: ACIC Environmental Protection Department (EPD) decided to utilize its growing Geographic Information System (GIS) capabilities to consolidate dumpsite information into a single mapping application. This system included the exact location of each site, along with relevant data (waste types, dates of discovery, etc) and allowed staff to visualize the areas most affected by the dumping problem. The use of GIS technology also assisted with the strategic placement of "No Dumping" signage and the ability to track illegal dumpsite reoccurrence.

Outcome: Ak-Chin's EPD used GIS technology to identify and catalog 45 open dumpsites. Also, GIS assisted in the placement of warning signs in appropriate areas. As a result, ACIC adopted a Solid Waste Ordinance, which prohibits open dumping.

The success of the program has demonstrated the capabilities of the GIS system and the Environmental Protection Department is currently using the technology to map other departmental projects.

Overview

In 2001, Ak-Chin's Environmental Protection, Police, and Sanitation departments identified 45 illegal/open dumpsites. It was suspected that individuals from outside the reservation were responsible for the majority of the illegal dumping, possibly due to high disposal fees at nearby landfills and the convenience of the rural areas of the reservation. The dumpsites consisted of household waste, tires, and construction debris and were located near residential homes, within surface water bodies that flow through the Reservation, and on land designated for environmental uses, (i.e., 404 permitted wetlands).

Environmental Protection Department staff photographed and classified the dumpsites, pinpointed the sites using global positioning system (GPS) technology, and used a GIS to create a map of dump locations and related waste data. Dates of dumpsite discovery, clean-up efforts, and other related information was added as attributes to the GIS database. The resulting map was used to coordinate a collaborative clean-up effort.

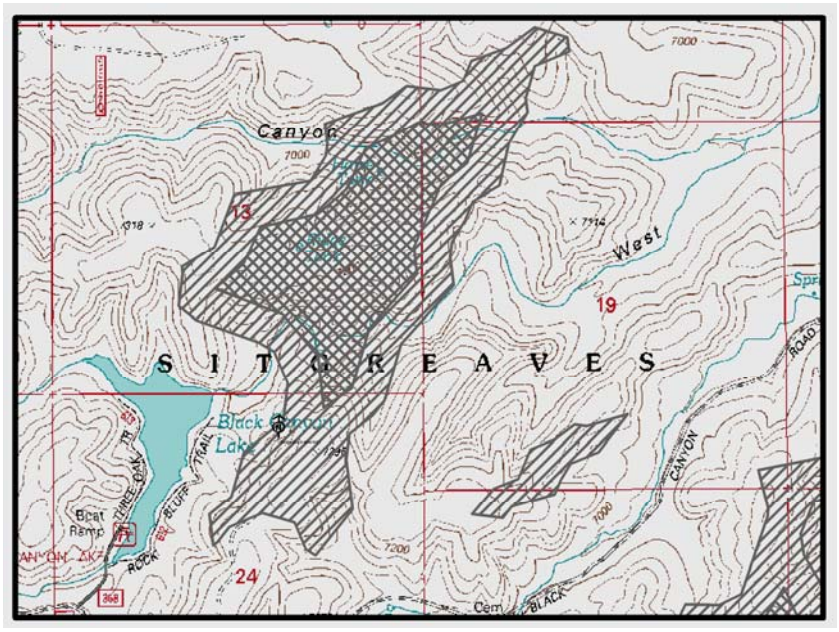
To address the ongoing problem, the Ak-Chin Indian Community developed and instituted an Environmental Code, which includes a Solid Waste Ordinance prohibiting the dumping of any waste within the boundaries of the Reservation and requiring anyone who wishes to transport waste off-Reservation to obtain a solid waste permit. The EPD utilized the open dumpsite map to identify locations for the posting of signs warning individuals that dumping is a violation of the Ordinance.

The EPD continues to use GIS to track reoccurrences of dumping at specific locations. Overall, the volume of illegal dumping has been substantially reduced as a result of these efforts.

Recovering from Forest Fire

Federal Government

Apache-Sitgreaves National Forest



Problem: The Rodeo-Chedeski fire of 2002 burned over 460,000 acres of public and private land in northern Arizona. Over 74,000 acres of forested land in the Apache-Sitgreaves National Forests were completely devastated by intense fire. Though many of those acres destroyed by the fire will reseed naturally over the next few decades, there are many areas that are simply too far from surviving trees to have much hope for a natural forest recovery.

Can these areas be identified for prioritization of hand-planting efforts?

Solution: Geographic Information System (GIS) mapping tools are being used to identify priority planting areas that are at too great a distance from sources of natural seed. Areas that contain surviving trees were mapped and entered into the GIS system. Then, GIS analysis tools were used to calculate and map areas that were not near to any surviving trees. These are the areas that require the most help to recover.

Outcome: Through the use of GIS, several alternate plans have been developed for replanting the identified forest areas. The plans call for planting between 2,000 and 36,000 acres and, as funding levels and work priorities are set, a matching strategy for planting will be selected.

URL: www.fs.fed.us/r3/asnf

Overview

The Rodeo-Chediski Fire of 2002 burned more than 166,000 acres of the Apache-Sitgreaves National Forests north of the Mogollon Rim. Approximately 74,000 acres of Ponderosa pine and Douglas fir forestlands experienced near-total mortality; almost all of the living trees being destroyed.

Over the next several decades, much of the forest will recover naturally. Burned areas will benefit from seeds produced by surviving trees, if they're within a reasonable. However, there are several areas too far removed from surviving islands of green trees to reasonably seed naturally.

To assist in the fire recovery process, a planting analysis was undertaken using Geographic Information Systems (GIS) technology to identify the forest areas that would need the most help to recover. These areas would be candidates for hand planting of new tree seedlings. Areas were identified that are more than 500 feet away from surviving tree islands (the single-hatched area in the sample map segment above). Areas were also identified that are more than 1,000 feet away from surviving tree islands (the double-hatched area in the sample above).

Several alternate overall reforestation plans were developed from this information and are currently under consideration. The use of GIS is helping the Forest Service to allocate limited resources to locations that will benefit the most. The planting of thousands of acres of new trees will be a major step forward in helping restore devastated forest areas in northern Arizona.

Projecting Community Growth

Regional Government

Maricopa Association of Governments

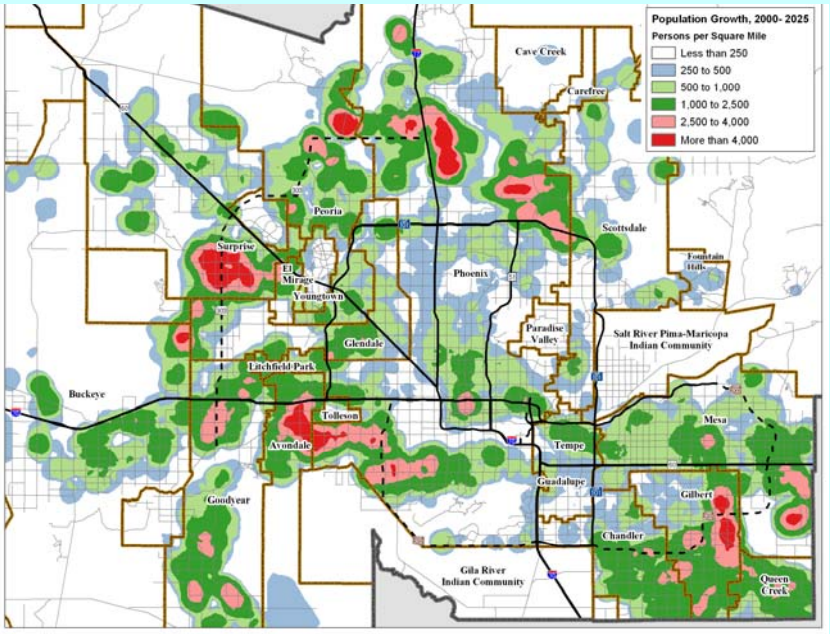
MARICOPA ASSOCIATION of GOVERNMENTS

Problem: As the Council of Governments (COG) and Metropolitan Planning Organization (MPO) for the Phoenix metro area, the Maricopa Association of Governments (MAG) requires socioeconomic projections for input into transportation and air quality models. Additionally, projections are needed by local governments to evaluate infrastructure improvements and for various planning activities. In order to meet the needs of the agency and others, MAG required a method to distribute the Arizona Department of Economic Security county level projections to sub-regional levels. Methods to review the projections were also needed to allow member agencies to validate data throughout the process, increasing local involvement in the development of projections.

Solution: A GIS-based model was created to distribute socioeconomic projections from the regional level to one-acre grids. The one-acre grids then can be aggregated to any level of geography such as Traffic Analysis Zones (TAZ), Census Tracts, city council districts, or zip codes. This enables projections to be used more extensively by MAG and others in planning efforts.

Outcome: GIS has changed the way socioeconomic projections are prepared and reviewed. GIS has made it possible to generate more accurate projections at small levels of geography. GIS also improves the review process by allowing projections to be distributed to local jurisdictions and reviewed graphically in digital, hardcopy, and Internet GIS mapping applications developed by MAG.

URL: www.mag.maricopa.gov



Overview

The Maricopa County region has experienced tremendous population growth over the past several decades. As the Council of Governments (COG) and Metropolitan Planning Organization (MPO) for the Phoenix metro area, MAG provides socioeconomic projections internally as well as to member agencies in order to better plan for this growth. This data consists of long-term projections of dwelling units, households, population, and employment by different sectors.

GIS enables the projections created by the Arizona Department of Economic Security at the county level to be allocated to smaller areas. First, a spatial allocation model distributes the county projections to approximately 150 MAG Regional Analysis Zones (RAZ). Then a GIS-based Sub-area Allocation Model (SAM) is used to distribute the projections from the Regional Analysis Zones to one-acre grids. These two models iterate until equilibrium is achieved.

The GIS-based SAM was developed expressly for use in the MAG projections process. The model takes GIS databases maintained by MAG, such as existing land use, future land use, major employers, development plans, residential building completions, group quarters, hotels/motels, and street centerlines, as input. Projected population, housing, and employment are allocated to vacant developable land identified by the input GIS databases in accordance with a scoring system. The scoring system prioritizes parcels by their likelihood for development. Factors influencing these priorities include known developments with various development patterns, redevelopment areas, travel times based on the transportation models, the underlying land use, policy actions such as encouragement of infill, proximity to freeways and main arterials, and location of recent development.

GIS has made it possible for socioeconomic projection data to be evaluated and used at the sub-regional level, increasing the value of the data. The use of GIS technologies has also allowed the data to be reviewed over the Internet, eliminating the need for creation and distribution of data CDs. Creating and maintaining data in a GIS format allows member agencies to easily acquire and use socioeconomic projection data in their own GIS applications.

Tracking Health Risks

State Government

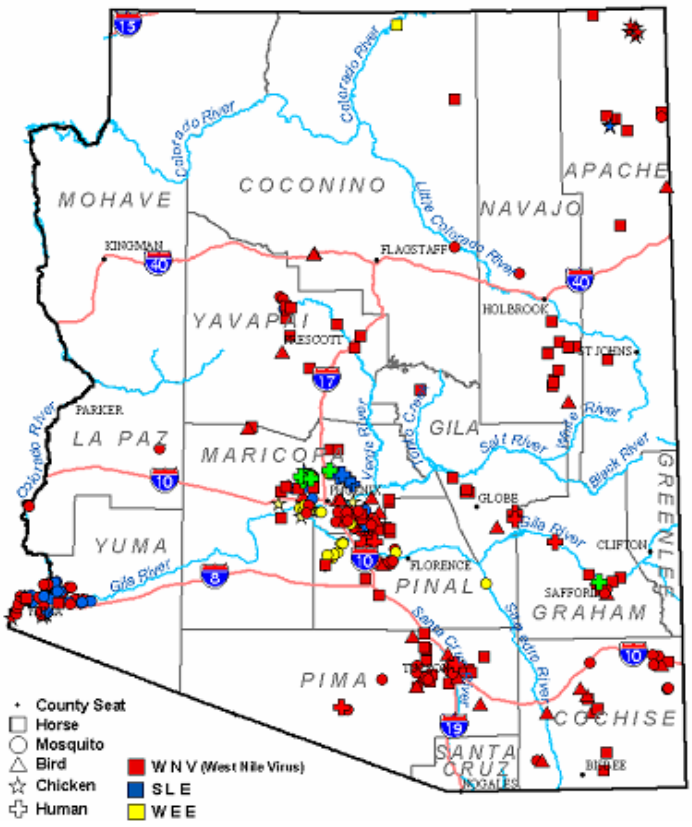
Arizona Department of Health Services

Problem: Understanding sources of biological infection, identifying patterns and methods of transmission, and developing strategies of intervention, are all core responsibilities of the Arizona Department of Health Services (ADHS). Often surveillance and other data must be collected from varying sources in differing formats to form a complete picture of a particular health threat. Once collected, this data must be logically integrated with other data (geography, topography, habitat, etc) to look for patterns of risk.

Solution: A Geographic Information System (GIS) is used bring together various data sets into a single view of existing and potential risks. For example, to track West Nile Virus (WNV), the process involves integrating five different types of surveillance data and three different mosquito-borne viruses, mapping data with varying location information, and overlaying habitat data. Different symbols are used to identify different modes of surveillance and different colors are used to denote different viruses.

Outcome: West Nile Virus and other mosquito-borne disease data are mapped on a regular basis. GIS is being used to track the spread of the virus across Arizona. To date, West Nile Virus has been documented in 12 of the 15 Arizona counties.

Regardless of the type of disease, or method of transmission, GIS mapping allows public health officials to quickly visualize areas of increased risk, and to implement appropriate measures.



Overview

West Nile Virus (WNV) has emerged in recent years in regions of Europe and North America, presenting a threat to public and animal health. The most serious manifestation of WNV infection is fatal encephalitis (inflammation of the brain) in humans and horses, as well as mortality in certain domestic and wild birds. WNV is becoming a significant cause of human illness in the United States. Arizona has reported 387 human cases of West Nile Virus through October of 2004. Eight of these cases have been fatal.

To better understand the sources and spread of the disease, health officials throughout Arizona conduct surveillance each year to monitor West Nile Virus and other mosquito-borne diseases. The surveillance effort consists of collecting and testing mosquito samples, testing dead birds, testing sick horses, testing chicken blood samples, and testing human patients with meningitis or encephalitis.

The surveillance data must be processed, mapped, and analyzed on a weekly basis in order to identify areas of high risk for West Nile Virus transmission. A Geographic Information System (GIS) is used to map virus activity. Interventions by public health officials to reduce risk, including targeted prevention education and mosquito control, are based on this surveillance data.

Background

The Arizona Geographic Information Council (AGIC) was established by Governor's Executive Order in 1988 as Arizona's primary forum and oversight group for Geographic Information Systems (GIS) and geographic information data, technology issues, and coordination. AGIC identifies standards, development, and implementation strategies to provide a framework in order to optimize the state's investment in geographic data and technology. Through cooperation and partnerships, AGIC facilitates the acquisition, exchange, and management of geographic information and related technology to benefit state agencies and the Arizona Geographic Information System (GIS) community.

Since the 1970s the use of GIS has grown rapidly across the country. All federal, state, county, and most local governments have, or are soon expected to have, GIS. GIS usage in the private sector is also expanding significantly. However, the implementation of these systems creates problems:

- Installations create their own standards for data resulting in incompatible databases.
- A lack of coordination creates the potential for duplication of work and data and precipitates errors.
- Without statewide coordination, federal and state dollars available for GIS and geospatial data development may be used less efficiently and may not contribute to solutions that benefit Arizona citizens.

In order to be effective and to maximize limited resources, the coordination of GIS development, integration, and maintenance is essential. The purpose of AGIC is to provide this coordination.

Mission

"The mission of the Arizona Geographic Information Council is to coordinate the development and management of geographic information in Arizona. AGIC supports the use of Geographic Information Systems (GIS) and geospatial technologies to address problems and better manage the natural, infrastructure, and economic resources of the state."

Strategies

The long-term goals of AGIC involve three interrelated strategies:

- ***Coordinating Data Resources***
- ***Improving Data Access***
- ***Improving Communication and Information Exchange***

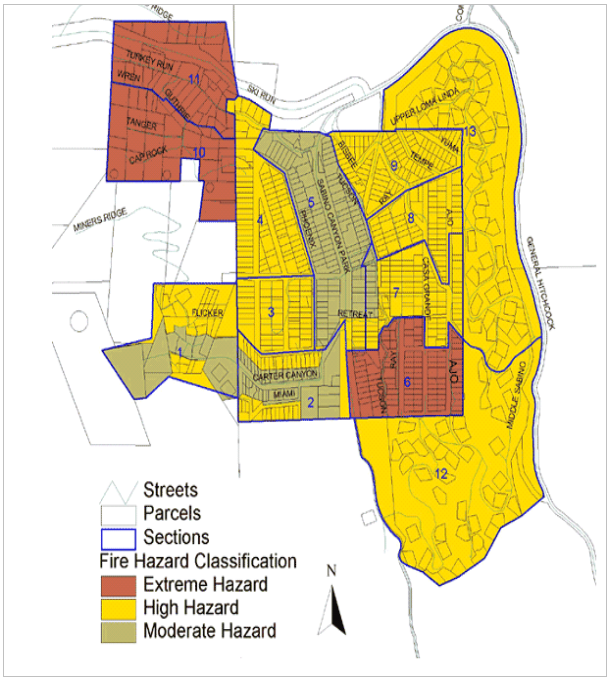
Though each of these strategies involves a unique set of activities, they are interrelated and, as a whole, continue the advancement of GIS technology and data sharing efficiency within the state of Arizona.

Data

Geographic, or geospatial, data is the key to any Geographic Information System (GIS). The quantity, quality, and availability of that data are what ultimately determine the effectiveness.

As organizations adopt computerized GIS, they begin to collect or generate data that they believe is required for their business needs, not a quick or inexpensive process. Many state, federal, county, tribal, and local governments are spending many years and millions of dollars developing and maintaining data for their projects.

Are they collecting the right data? Are they using the best standards for measurement? Are they developing or purchasing data that another agency already has? These are all questions that AGIC can help to answer.



Pima County, Arizona uses geographic data from several sources to identify fire hazards on Mount Lemmon after the 2003 Aspen fire.

AGIC's roles include:

- Prioritizing state data requirements so there is agreement on what data needs to be developed.
- Setting data standards so developed data is compatible with other data used in the state.
- Promoting and conducting the acquisition and maintenance of geospatial data through the most cost efficient methods available.

This will help the citizens and communities of Arizona to spend their funds more effectively.

Access

Once data is developed, it must be shared with others to become most useful. AGIC's goal is to improve data access by advancing technological capabilities statewide, and to overcome policy and legal roadblocks to effective data sharing among agencies.

Technology is advancing rapidly with the advent of faster computers, improved Internet access and wireless communications. AGIC's role is to identify standards for geospatial data, assist in the development of applications that allow access to GIS data repositories, and identify and utilize technologies that will be both efficient and effective for state and local government.

Policy and legal issues continue to be some of the most complicated and time-consuming challenges. Arizona has dozens of state agencies, more than 100 local, tribal, and regional government bodies and thousands of individuals using and producing geographic information on a regular basis. Each organization has unique policy and legal restrictions regarding access, sharing and selling of data. AGIC's role is to facilitate the effective use of geospatial data throughout Arizona.

Access to useful data is undeniably a necessary component to an efficient statewide geospatial information network. Without it, there will be no statewide network, but only individual organizations spending limited resources on incompatible and redundant geospatial data.

Communication

As an executive board, AGIC has no authority to force an organization to produce data or force those with data to share it. AGIC's primary tool is communication.

In order to produce more compatible and useful geospatial data and improve access throughout the state, AGIC facilitates communication between data producers and users, prioritizes and coordinates data production and acquisition, and informs individuals and organizations about data availability, technological advances, partnering benefits, and cost-saving opportunities.

AGIC prioritizes the collection of geospatial data and information, assists organizations with analysis and distribution of data throughout Arizona, and distributes, develops and maintains print and Internet publications. It also works to consolidate diverse resources to gain benefits of scale and compatibility where possible.

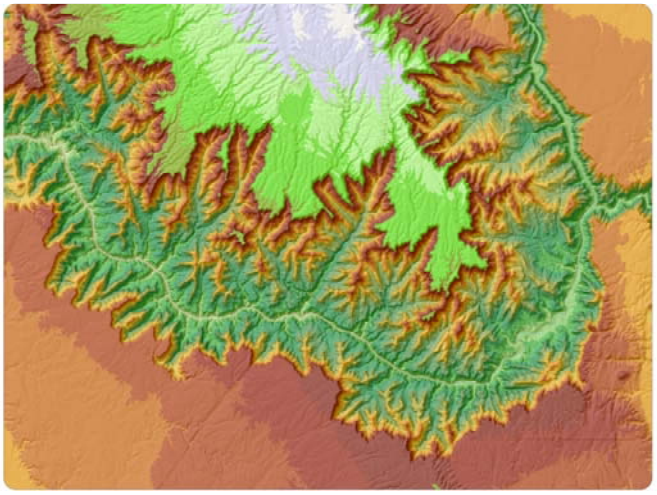
As an important part of the ongoing communication efforts, AGIC also organizes educational events and programs, topic specific workshops, and hosts an annual GIS education and training symposium.

The Executive Board

AGIC is managed by a 34 member Executive Management Board that is composed of representatives from federal, state, and local governments, regional GIS consortia, universities and the private sector. The Executive Management Board holds quarterly open meetings at a location selected by its officers.

Membership

Members of the Executive Management Board are appointed by the governor from agencies and organizations that use GIS. Typically board members are management level GIS professionals designated by their organizations' directors.



Elevation Data can be used for many purposes, such as this depiction of a portion of the Grand Canyon.

AGIC Accomplishments

In recent years, the Arizona Geographic Information Council (AGIC) has produced many substantial benefits for the State of Arizona. A few of these accomplishments include:

- Information exchange and ongoing coordination with state, federal, and local government and the private sector
- Acquisition and sharing of state-wide aerial photography
- Statewide survey of GIS data, contacts, and priorities
- Conducting statewide disaster response workshops
- Acquisition of statewide 1993 Landsat imagery
- Sponsorship of National Geodetic Survey state advisor to improve geodetic control
- Production and maintenance of AGIC informational web site
- Promotion of statewide cadastral integration and height modernization projects
- Acquisition of statewide hydrology data
- Participation in the National States Geographic Information Council
- Initiation of Arizona GIS Day activities and proclamation
- Hosting of annual state GIS conference, since 1993, to provide statewide information exchange

Officers

Officers are elected by vote of the Executive Management Board members. The elected officers are the president, vice president, past president, and secretary. The Arizona State Land Department provides board support.

Committees

Committees are the backbone of AGIC. They accomplish most of the Council's work. Committees are created and directed by the Executive Management Board and are comprised of board members and non-members. The president proposes a representative to serve as the chair of each committee.

Committees are organized to develop and recommend actions for critical strategic issues, goals, objectives, and specific activities. The committees meet to identify and implement actions necessary to carry out the goals of AGIC. Additional information regarding specific committees, contacts and goals can be found on the AGIC website at: http://agic.az.gov

AGIC Committees

- **Data Resources**
- **Homeland Security**
- **Technology**
- **Administration and Legal**
- **Conference, Education, and Outreach**

AGIC Membership

State Government

Arizona Department of Administration
Arizona Department of Commerce
Arizona Department of Economic Security
Arizona Department of Education
Arizona Department of Environmental Quality
Arizona Department of Health Services
Arizona Department of Public Safety
Arizona Department of Revenue
Arizona Department of Transportation
Arizona Department of Water Resources
Arizona Game and Fish Department
Arizona Geological Survey
Arizona State Cartographer's Office
Arizona State Land Department
Arizona State Parks

State Universities

Arizona State University
Northern Arizona University
University of Arizona

Federal Government

Bureau Of Indian Affairs
Bureau of Land Management
Bureau of Reclamation
National Geodetic Survey
Natural Resource Conservation Service
U.S. Forest Service
U.S. Geological Survey

County Government

Arizona Association of Counties

Municipal Government

League of Arizona Cities and Towns

Private Sector

TerraSystems Southwest

Regional GIS Consortia

Maricopa Association of Governments
Northern Arizona Geographic Information Forum
Pima Association of Governments
Southern Arizona Geographic Information System
Yuma Regional Geographic Information System

Associations

Arizona Professional Land Surveyors

part four:

AGIC INITIATIVES

The mission of the Arizona Geographic Information Council is to coordinate the development and management of geographic information in Arizona. Dozens of dedicated board members, committee members, organization staffs, and community volunteers devote countless hours to these efforts each year. Though the accomplishments of each individual are too numerous to detail, major projects can be identified. The following six initiatives are currently being pursued by AGIC:

- ***Arizona Core Data Resources***
- ***Arizona Preparedness***
- ***AGIC GeoData Portal***
- ***The Arizona Map***
- ***Arizona Height Modernization***
- ***GIS Education and Outreach***

AGIC's efforts are directed toward helping Arizona maximize the benefit from its ongoing investment in geospatial data and technologies. These six initiatives present a roadmap to that end.

Significant progress has already been made in many areas. Through the actions of AGIC board and committee members, member organizations, and continued support of the state's leadership, these initiatives can and will be accomplished.

The following pages describe each initiative in more detail. A brief summary of each subject is followed by background information, a more in-depth look at the issues to be overcome, the goals to be accomplished, and the proposed actions to be taken.

Core Data Resources

Setting priorities and standards for obtaining strategically important statewide geospatial data for the efficient day-to-day business operations of Arizona.

Arizona Preparedness

Acquisition and maintenance of critical data for a secure geospatial network to support Arizona disaster management, homeland security, and wildfire management.

AGIC GeoData Portal

Creation of a web-based application to allow access to Arizona geospatial data, maps, and related information from anywhere in the state.

The Arizona Map

An interactive viewer that will allow Arizona geospatial data and information to be accessed, manipulated, and analyzed, initially by state agencies, then local governments and the public.

Arizona Height Modernization

Expansion of the National Spatial Reference System in Arizona to add needed geodetic control to the existing Public Land Survey System.

GIS Education and Outreach

Implementing programs to educate, communicate, and provide information exchange within the Arizona GIS community about current geospatial technologies and resources.

INITIATIVE:

CORE DATA RESOURCES

AGIC Core Data is geospatial map information that can be used by many different organizations for many different purposes. It is a collection of digital base maps and data that form the foundation for any number of specialized mapping projects.

AGIC's Core Data Resources Initiative is a collaborative effort by the Council to identify the common needs of statewide map producers and users, and to create a base set of digital geospatial map data that can be widely used by all sectors of government, business, and the citizens of Arizona.

The inherent advantage of AGIC Core Data is that it can be used alone or be combined with other map data and geographic features in an unlimited number of ways. Organizations can build upon the Core Data foundation, adding their own geographic information and developing their own specialized GIS applications.

Some Core Data, however, can require millions of dollars to produce and years of development time. AGIC's role is to coordinate the development of these Arizona datasets to ensure that they are produced or acquired to agreed-upon standards and that the work builds upon that of other organizations as much as possible. By pooling statewide resources, AGIC is able to generate products that are not only widespread in usage, but also cost effective in production.

Keys to Success

There are four key components to the success of this initiative: identification and prioritization, acquisition, standardization, and accessibility. The Data Resources Committee (a group of data specialists that includes AGIC members and non-members) has been formed to oversee these efforts. Other committees assist this group as needed. The Administration and Legal Committee assists with various documentation and agreements of cooperation between specific organizations. The Technology Committee assists with issues related to data standards, formats, and storage mechanisms. Other individuals and organizations are called upon where needed.

Through this initiative process, the Data Resources Committee will identify potential strategies for securing necessary information, and look for various funding mechanisms, partnerships, and legislative forums to forward the process.

A Pima County aerial image base map with a transportation data overlay.

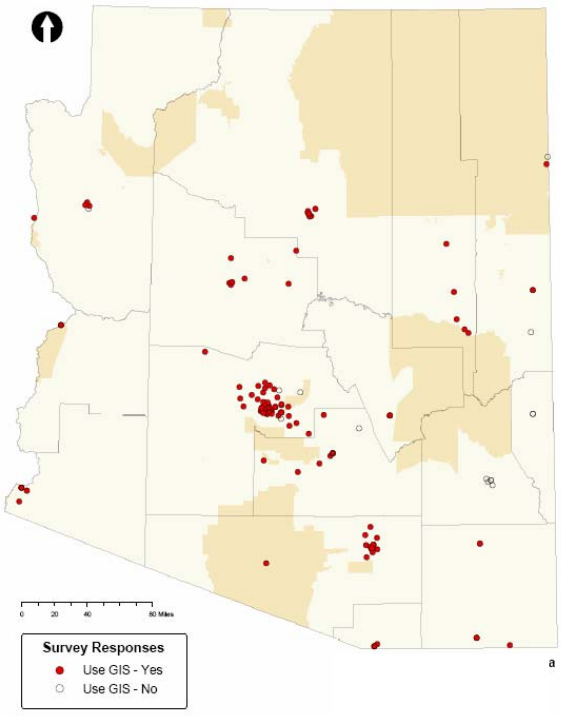
Identification and Prioritization

Before core data can be developed, organized, or distributed, it first must be identified. This means identification of what geographic data is needed, what data is currently available, and what data is in production. It also means identifying the format the data is in or needs to be in; the accuracy of the data; and whether that data is available to others.

While the committee looks to identify and prioritize data requirements for the state, it will work to identify gaps in the geospatial data as well. The committee will work closely with a variety of geospatial users to understand how these data gaps can influence the business practices of potential users. Understanding that a particular portion of a county lacks accurate road information, for example, can greatly affect the reliability of first responder activity within that region. Knowing that this gap may affect lives assists the committee in setting both geographic priorities and data priorities for information.

As first steps in this identification process, AGIC recently produced a Geospatial Data Resource Survey and received responses from more than 200 geospatial data producers and users from across the state. Questions on the survey regarded technical and staff capabilities of these organizations, as well as specifics about thirty-five types of geospatial data. This survey will be the starting point for a comprehensive inventory of Arizona geospatial data and continued follow-up will provide a guide to determining the ultimate success of this project.

Also, the Arizona State Cartographer's Office, in conjunction with the University of Arizona and other AGIC member organizations, conducted regional workshops in late 2003 in an effort to discover the needs of the local first responder communities. In addition to identifying specific data requirements, these workshops proved useful in identifying and prioritizing the needs of geographic information data users around the state.



The 2003 Geospatial Data Resources Survey generated responses from data users and producers statewide.

Acquisition

The acquisition of Core Data Resources involves several facets. When data exists and is available for sharing, the committee will work to acquire this data for use by other organizations. The committee will develop procedures to acquire the core data and inform the original data developers, presumably the owners of the data, as to the intended end use. If appropriate, a general Memorandum of Understanding (MOU) will be developed and agreed upon by those parties concerned.

Where datasets are identified as important or critical but a gap remains, this committee will identify procedures to produce, develop, or acquire the needed geographic data. These procedures will entail identifying potential strategies for funding, as well as other avenues for acquisition.

Standardization

Because the ultimate goal of this initiative is to make data available to a diverse group of end users, it is of paramount importance that the geographic data be made available in a standardized, understandable, and useable format.

The acquisition of geospatial information from various sources throughout the state will prove to make this task difficult. However, the geospatial data will be worthless if standards are not developed, distributed, and followed.

This process will likely involve the identification of existing standards and the creation of new standards and will necessitate proper data documentation (metadata) be required to accompany all datasets. Existing federal standards will be followed where possible.

Accessibility

Once it is determined that particular geographic data is available, sharable, and in a useable format, the next step is to document who has the data, where it is located, and how to access it for a particular purpose.

A necessary component of this initiative will be the creation of a data and contact directory that identifies what geographic data is available across the state, how to gain access to that data, and who to contact with questions about the specifics of the information. The same reference system might be used to identify who the geographic information expert is in a particular town, or to find out if there's a project underway that will generate data pertinent to a particular mapping application.

AGIC Core Data Themes

AGIC currently has 14 specific core data themes identified as useful on a statewide basis. The following pages offer specifics on each of these data themes: what the data is used for, current status, and what is needed to complete each.

Core Geospatial Data

- ***Critical Infrastructure***
- ***District Boundaries***
- ***Elevation***
- ***Geodetic Control***
- ***Geographic Names***
- ***Geology***
- ***Imagery***
- ***Land Cover***
- ***Land Ownership***
- ***Land Use***
- ***Political Boundaries***
- ***Soils***
- ***Surface Water***
- ***Transportation***

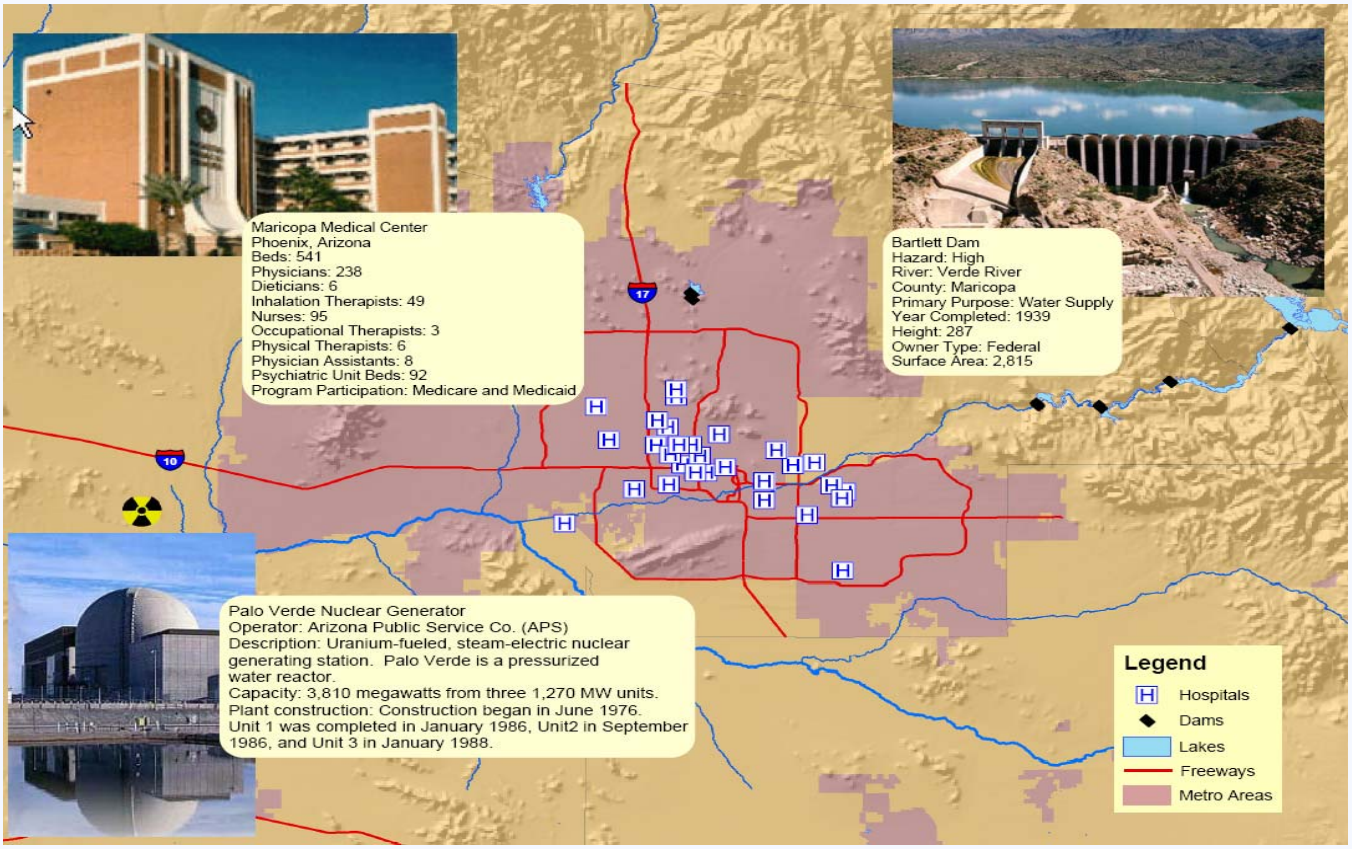
Common Theme Attributes

1. These datasets will provide the geographic data foundation for all other GIS mapping applications. They serve as a reference source or starting point for organizations to register their specialized geographic data to a map.

2. These datasets can be shared and reused among organizations because they can be built to common standards and technology and a common geographic scale. Therefore they will save tax dollars as they are used many times by multiple organizations.

CRITICAL INFRASTRUCTURE

Development of the proposed Critical Infrastructure theme is a primary goal of AGIC's Arizona Preparedness Initiative. As defined by the federal Department of Homeland Security, critical infrastructure includes a wide range of facilities in transportation, energy, agriculture, telecommunications, chemical, defense, public health, and other sectors. Although no single dataset can identify, locate and describe all such facilities throughout Arizona, this theme will be a comprehensive spatial and tabular inventory of the state's major critical infrastructures. Presented in a visual map format that can be displayed over other Arizona themes, this inventory will be an essential resource supporting all phases of the state's homeland security and emergency management activities. For security purposes, public access to portions of this inventory will be restricted.



USES: The ability to view, query, and map all categories of major critical infrastructure facilities is needed in every phase of emergency management, from planning, mitigation, and monitoring to response and recovery.

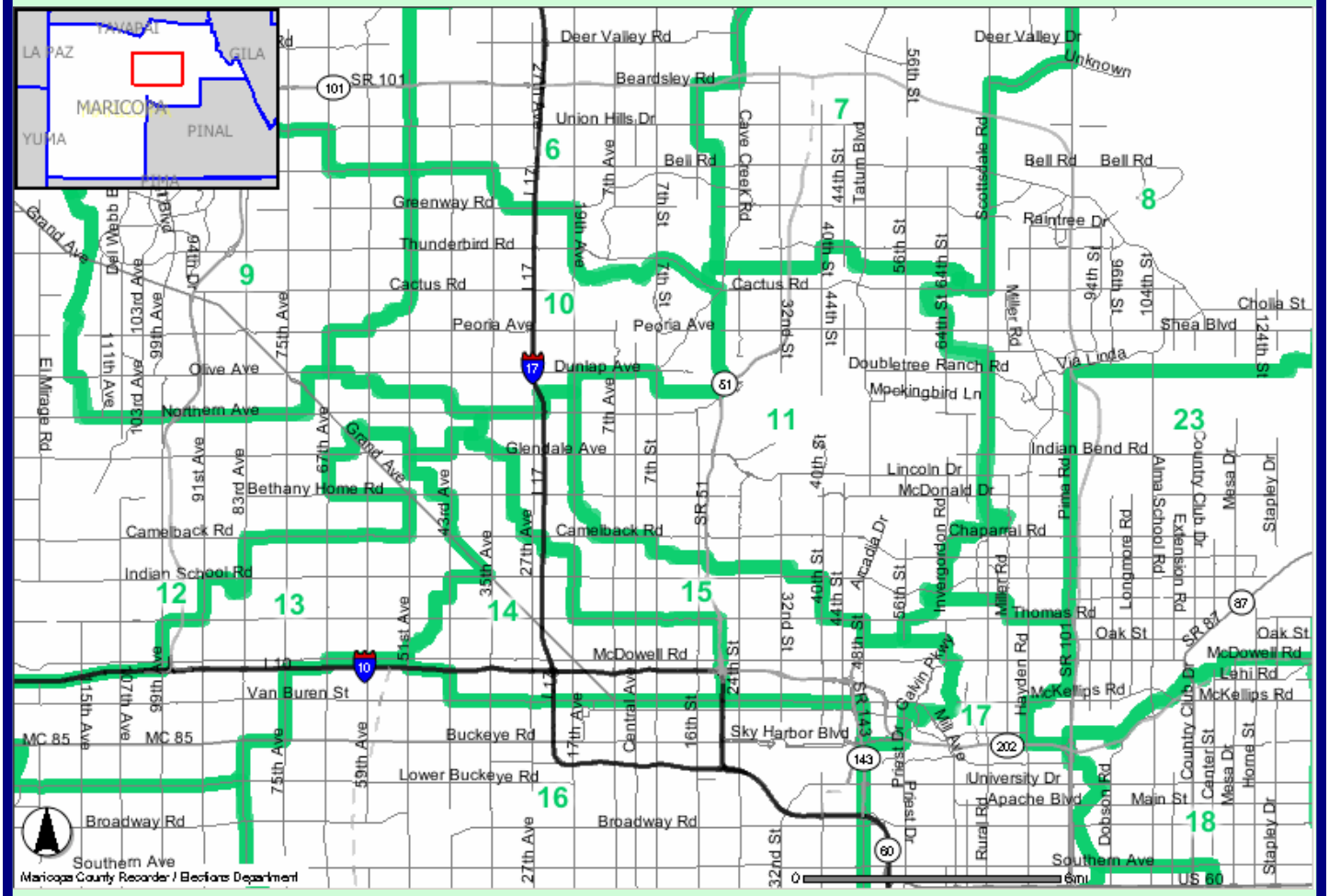
STATUS: Numerous state agencies maintain data related to major critical infrastructure facilities. However, most of this data is not maintained in GIS format, and much of it may be old or inaccurate. The federal Department of Homeland Security is requesting state and local jurisdictions begin compiling this data. This process is currently under way.

NEEDS: A significant amount of additional data compilation and conversion is required. Positional data must be gathered for those facilities lacking it. Some source data requires enhancement to meet state and federal standards. An update mechanism is needed to ensure the data remains current. AGIC is currently working with appropriate state and federal authorities to design, develop, and maintain this dataset and to secure necessary funding.

DATA COORDINATOR: Arizona Department of Public Safety, Arizona Department of Health Services

DISTRICT BOUNDARIES

The District Boundaries theme contains local and administrative zones, including but not limited to U.S. Congressional, state legislative, and other electoral districts, school districts, special taxing districts, and voting precincts. The District Boundaries theme, which is often associated with electoral processes, is distinct from the Political Boundaries theme, which contains jurisdictional boundaries such as cities and counties.



USES: Redistricting, drawing school attendance zones, drawing voting precincts, and urban planning. Applications associated with this theme frequently make extensive use of spatial and tabular data from the U.S. Census Bureau.

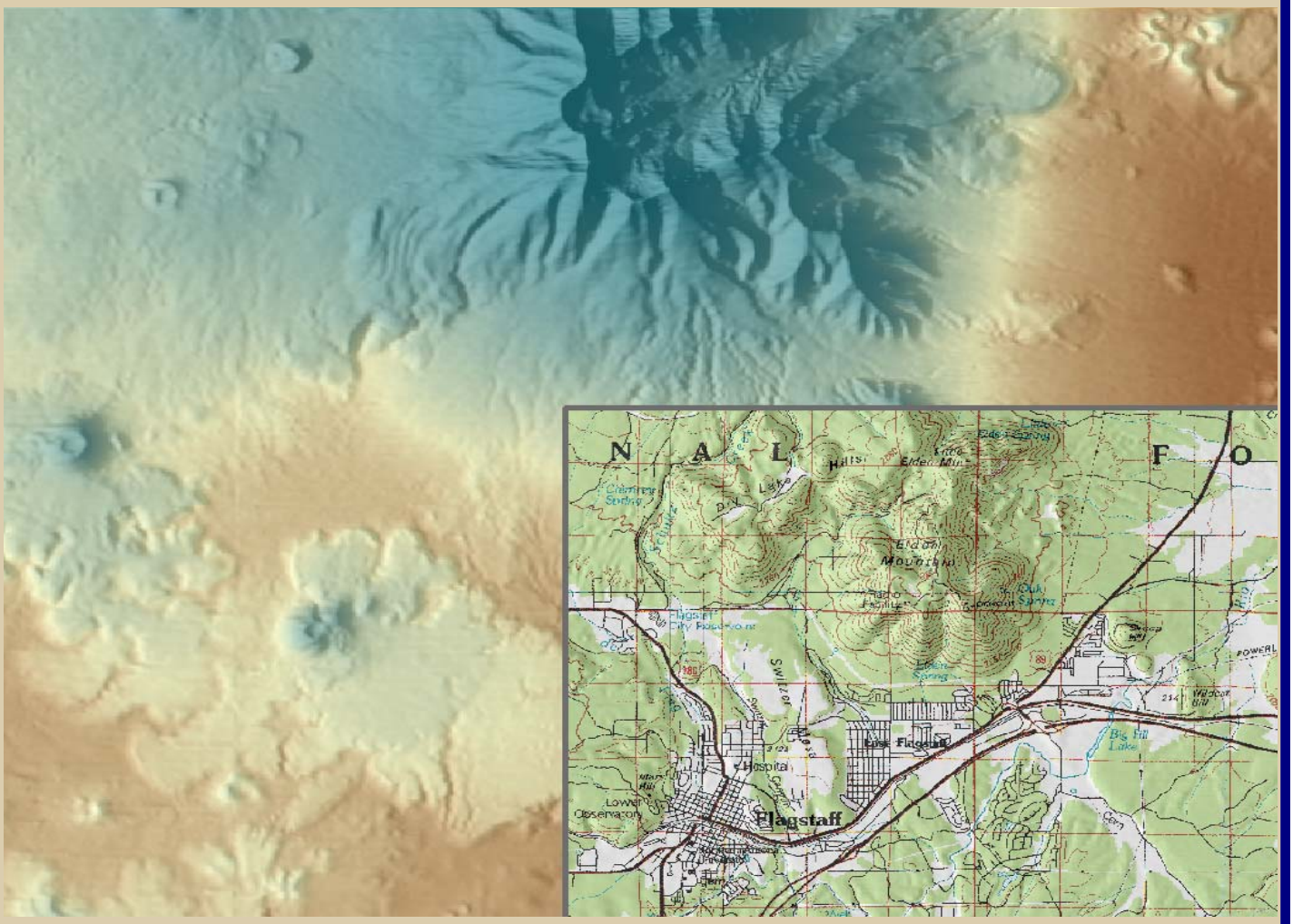
STATUS: Numerous local, regional, and state agencies maintain district boundaries using the Census Bureau's TIGER spatial data as a base map for mapping and analysis of socioeconomic data collected by the census bureau or other entities.

NEEDS: Maintenance is ongoing by agencies charged with maintaining various districts.

DATA COORDINATOR: Arizona Department of Revenue, Arizona Land Resource Information System (ALRIS), County Governments

ELEVATION

The Digital Elevation Model (DEM) theme contains surface elevations for billions of points spaced at 10-meter intervals throughout Arizona. This data can be used with GIS software to model the shape of Arizona in three dimensions. Digital elevation models are useful for planning projects that involve terrain relief and are necessary for production of digital ortho-imagery.



USES: Delineating watersheds, flood modeling, slope determination, tower placement, and utilities planning. Also used to create digital ortho-imagery and to calculate viewsheds.

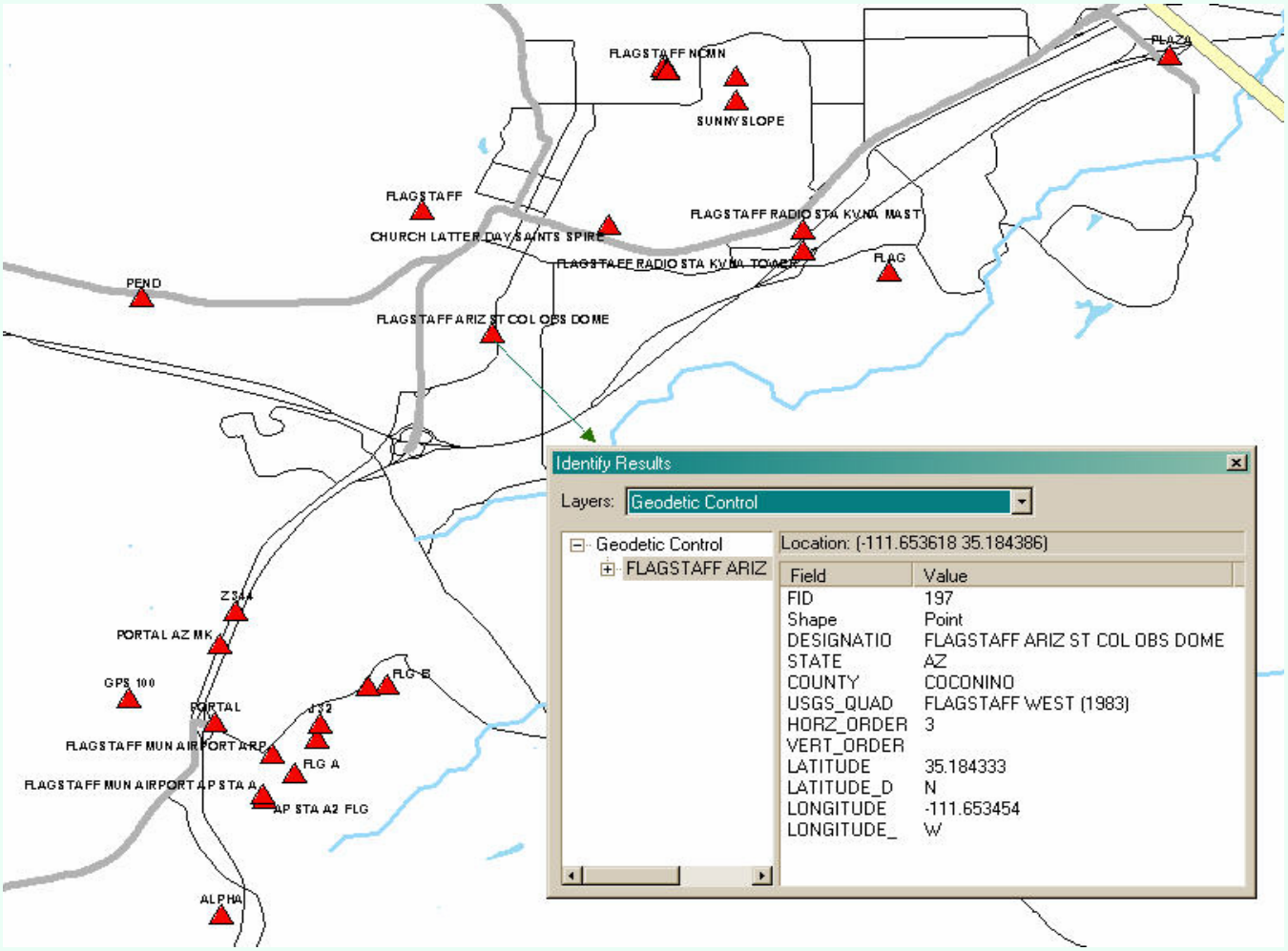
STATUS: Statewide 30-meter and 10-meter Digital Elevation Models (DEM) have been completed by U.S. Geological Survey. DEMs, shaded relief ,and contour data are available from ALRIS.

NEEDS: Distribute 30-meter and 10-meter DEM products. Integrate detailed local elevation data with statewide data.

DATA COORDINATOR: Arizona Land Resource Information System (ALRIS)

GEODETIC CONTROL

The proposed Geodetic Control theme will provide public access to a statewide database of survey markers and control points. Survey control information is established and collected by various governmental agencies at great expense. This theme would be developed and maintained under the auspices of the National Geodetic Survey's Geodetic Advisor to Arizona. The theme's purpose is to collate information on survey markers within the National Spatial Reference System (NSRS) and survey markers established by local entities but not incorporated into the NSRS. The Geodetic Control theme will improve access to information on existing survey markers and will serve as georeference material assisting in the production of other geospatial themes.



USES: Survey markers and control points are the fundamental source of position or elevation for virtually all mapping products.

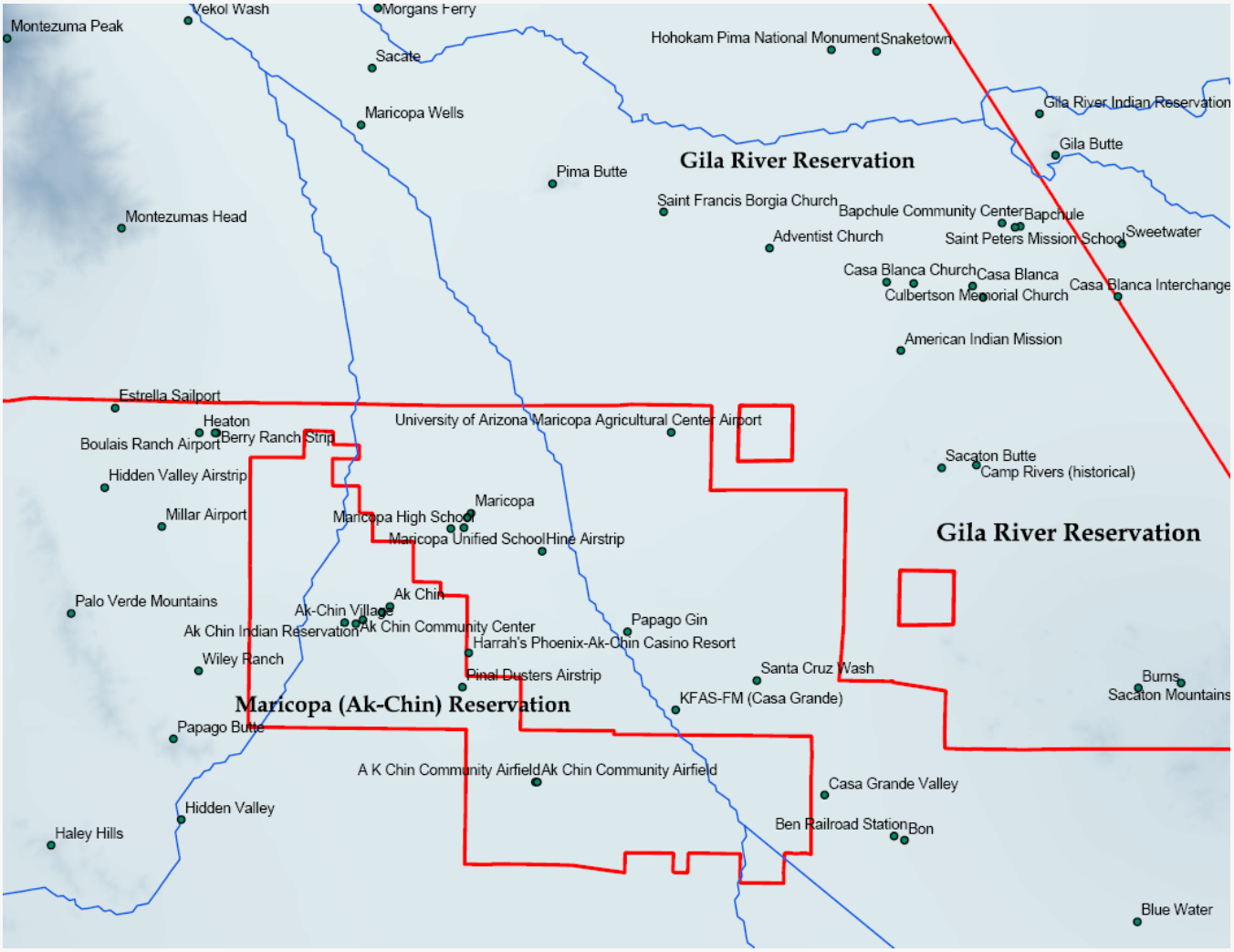
STATUS: Numerous local, regional, state, and federal entities establish survey control markers, but there is no single location where information can be accessed for all of these sources.

NEEDS: Development of this theme for Arizona requires continued involvement of the NGS State Advisor Program. Arizona is proposing federal funding of $15-30 million over the next 10 years for a Height Modernization Program to develop and implement improved geodetic control throughout the state. Funding will also be required for a program to maintain local data and to include new survey control data into the National Spatial Reference System (NSRS).

DATA COORDINATOR: National Geodetic Survey, Arizona State Cartographer's Office.

GEOGRAPHIC NAMES

The Geographic Names theme is a tabular database with map coordinates for virtually every named place in Arizona, such as towns, schools, parks, airstrips, churches and creeks. The first phase of the Geographic Names Information System (GNIS) has been completed nationwide by the U.S. Geological Survey (USGS) using features depicted on its 1:24,000 map series.



USES: Searching by place name, labeling maps, and identifying features. This theme will also support emergency management and critical infrastructure mapping.

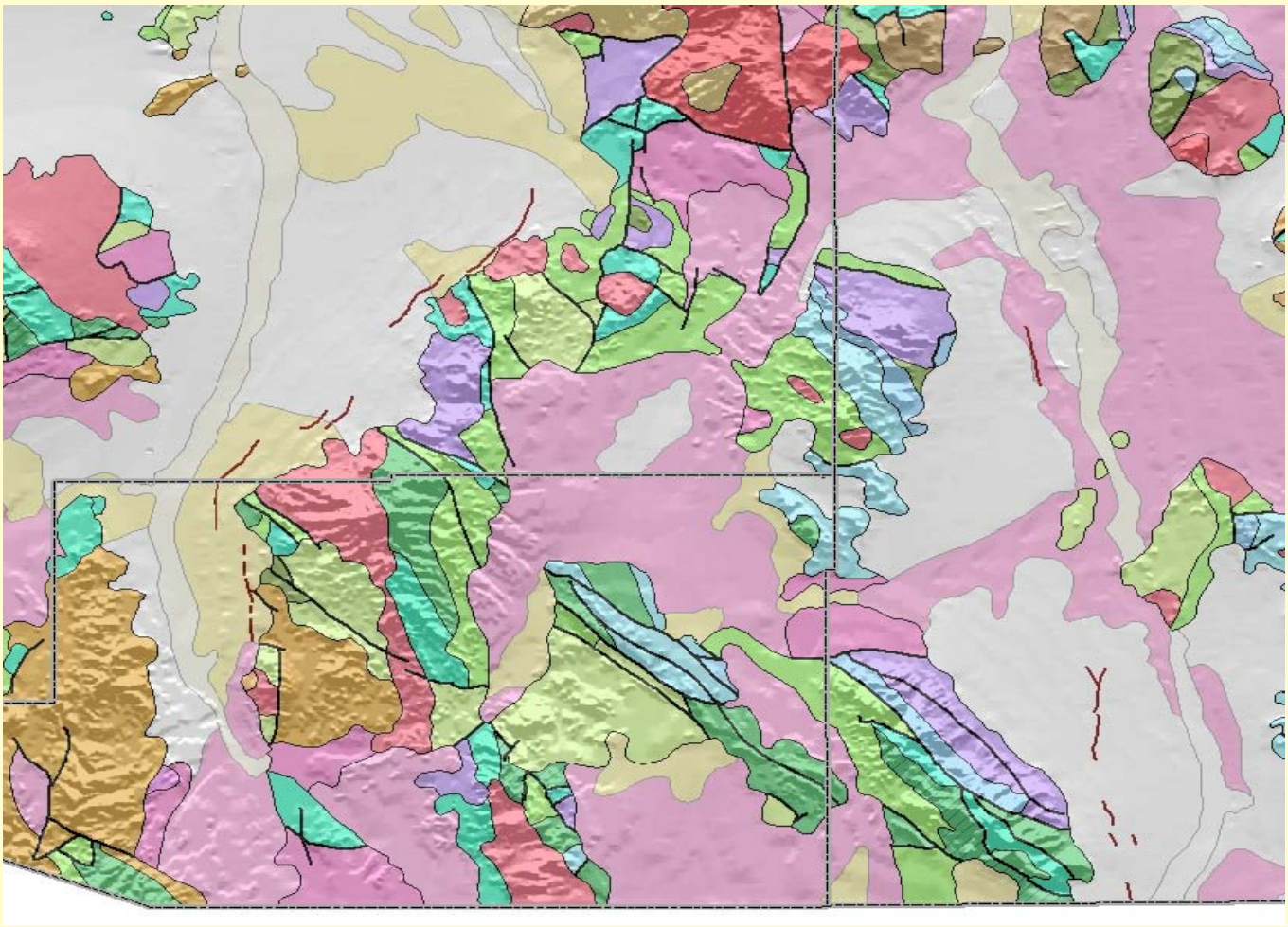
STATUS: AGIC is evaluating the development of GNIS Phase Two, a five-year project to correct and add features using local data sources.

NEEDS: Positional accuracy of GNIS features should be increased to 40-50 feet, to match other Arizona Base Map themes. This would require additional funding. Links should be established between the GNIS data and other detailed information stored in databases managed by other agencies.

DATA COORDINATOR: Arizona Land Resource Information System (ALRIS), United States Geological Survey (USGS)

GEOLOGY

The Geology theme depicts the distribution of rock types and fault locations in the state of Arizona. Digital data is available for the entire state at 1:1,000,000-scale and is being developed at 1:100,000 and 1:24,000-scales. Geologic data complements soil survey, surface water, and land cover themes, and is applicable for flood hazard and mineral resource assessment, as well as engineering and planning.



USES: Groundwater monitoring and planning, infrastructure planning and construction, pollution modeling and remediation, ecological inventories, mineral resource utilization, geologic hazard assessment and mitigation.

STATUS: 1:1,000,000 scale geology is complete, maintained by Arizona Geological Survey. About 20% of the state is available in 1:100,000 or 1:125,000 scale data, about 15% in 1:250,000-scale compilation, and about 10% in 1:24000 scale compilation. The 1,250000 or more detailed data cover about 33% of the state.

NEEDS: Many existing 1:100,000 and 1:24000-scale geologic maps remain to be digitized and compiled into an integrated statewide geology theme.

DATA COORDINATOR: Arizona Geological Survey

IMAGERY

Aerial and satellite photography contain vast amounts of visual information that is impossible to map by traditional methods. This rich information can be incorporated into GIS only after it has been "ortho-rectified." This process involves removing geometric distortions inherent in aerial photography and imposing a standardized coordinate system to allow the images to be aligned with other mapped features.

USES: General mapping, detecting land cover changes, zoning applications, property appraisals, environmental analysis, feature identification, and many other uses. Imagery provides a very economical tool for developing and updating the Transportation, Land Ownership, and other themes.

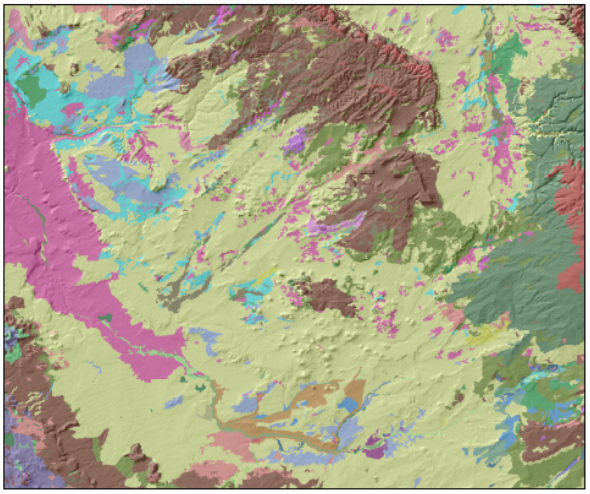
STATUS: Digital Orthophotography Quarter Quadrants (DOQQs) with a one-meter base resolution have been acquired from the US Geological Survey for the entire state and are distributed through the Arizona State Cartographer's Office. These files are based on imagery taken between 1992 and 1999.

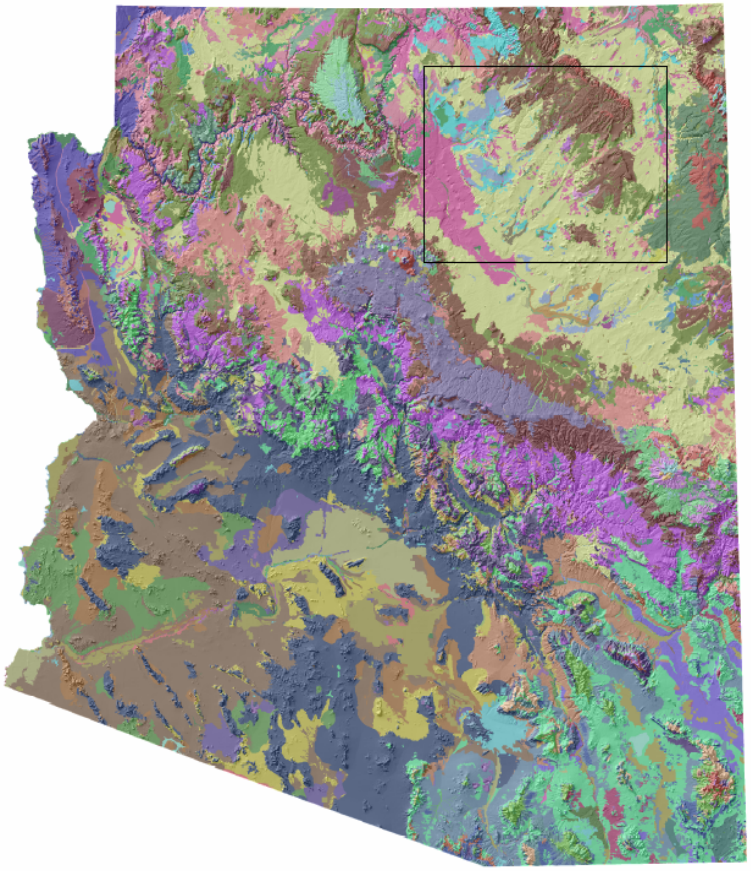
NEEDS: To remain useful, imagery must be kept up to date. AGIC is pursuing programs and projects to update existing DOQQs on a regular maintenance cycle.

DATA COORDINATORS: Arizona State Cartographer's Office (SCO), Arizona Land Resource Information System (ALRIS), United States Geological Survey (USGS)

LAND COVER

The Land Cover theme classifies Arizona and other U.S. lands by natural vegetation type. Twenty-one classes of land cover are mapped, using consistent procedures for the entire U.S. The resulting land cover dataset is being used for a wide variety of national and regional applications, including watershed management, environmental inventory, transportation modeling, fire risk assessment, and land management.





USES: Fire fighting, watershed management, fire prevention planning, bark-beetle monitoring, drought and wildfire management, forest health monitoring, environmental inventory, and municipal planning.

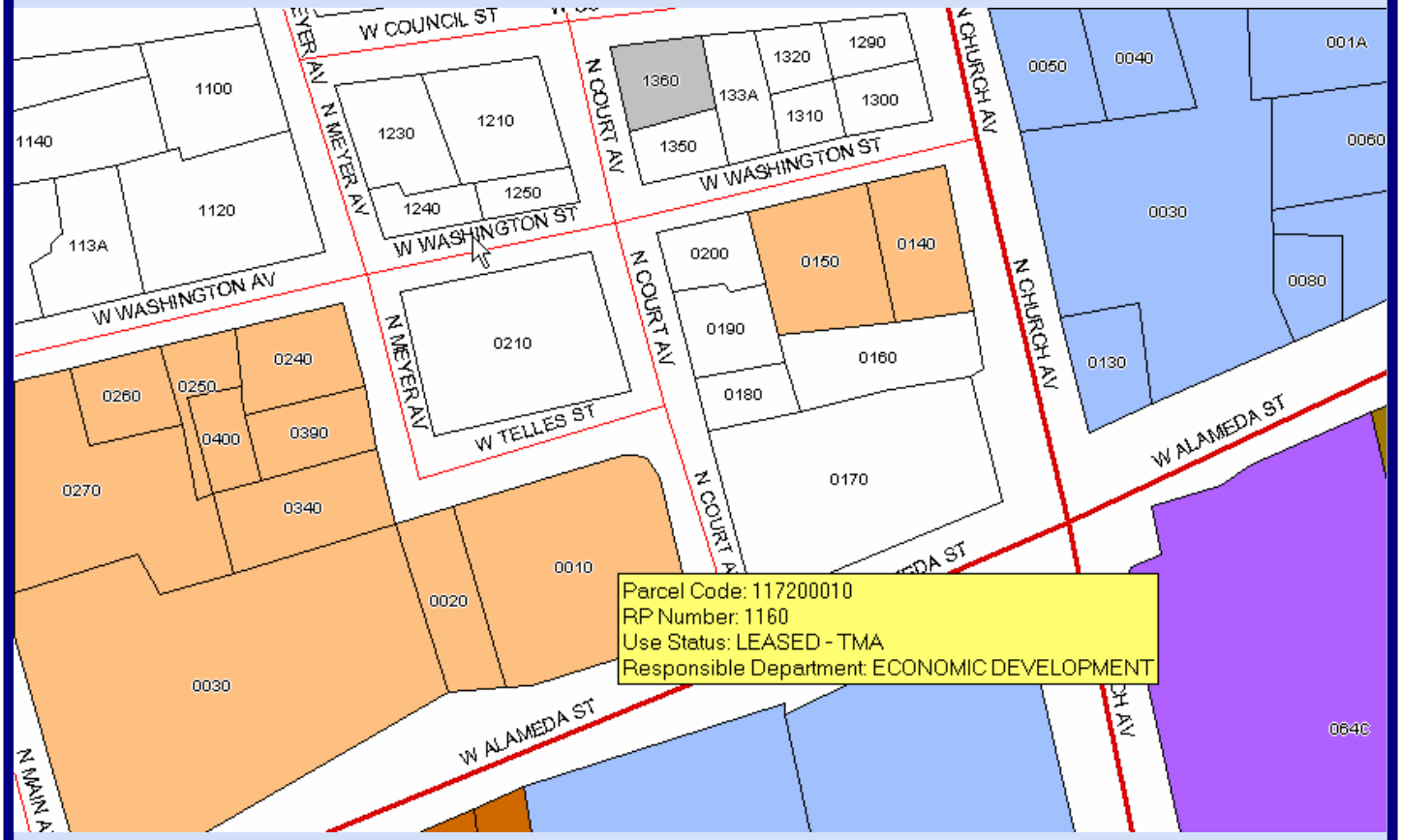
STATUS: Statewide vegetation land cover is complete and is being maintained by the Arizona Game and Fish Department. A 30-meter land cover layer was completed by the USGS in 1992 and is expected to be updated in 2005.

NEEDS: Improved land cover data needs to be developed with a set of classifications based on updated land use classes. The new classification system would include data such as pasture, grassland, rock/sand, commercial and residential.

DATA COORDINATOR: Arizona Land Resource Information System (ALRIS), Arizona Game and Fish Department, United States Geological Survey (USGS)

LAND OWNERSHIP

A Land Ownership theme would be a collaborative mechanism to link together county-level GIS maps containing deeded, recorded land parcels and individual property boundaries. Many Arizona county appraisal districts maintain parcel information using GIS, but the formats vary and the data is not always available to the public in digital form. Linking this data, the Land Ownership theme would support a variety of regional and statewide uses.



USES: Notification to property owners of flood potential, transportation right-of-way planning, and many other uses. GIS conversion of manual parcel records has been shown to increase property tax receipts through identification of "missing" ownership parcels and through more accurate appraisals. Potential users include county appraisal districts, Emergency 911, city planning and public works departments, Division of Emergency Management, Arizona Department of Transportation, Federal Emergency Management Agency and the public.

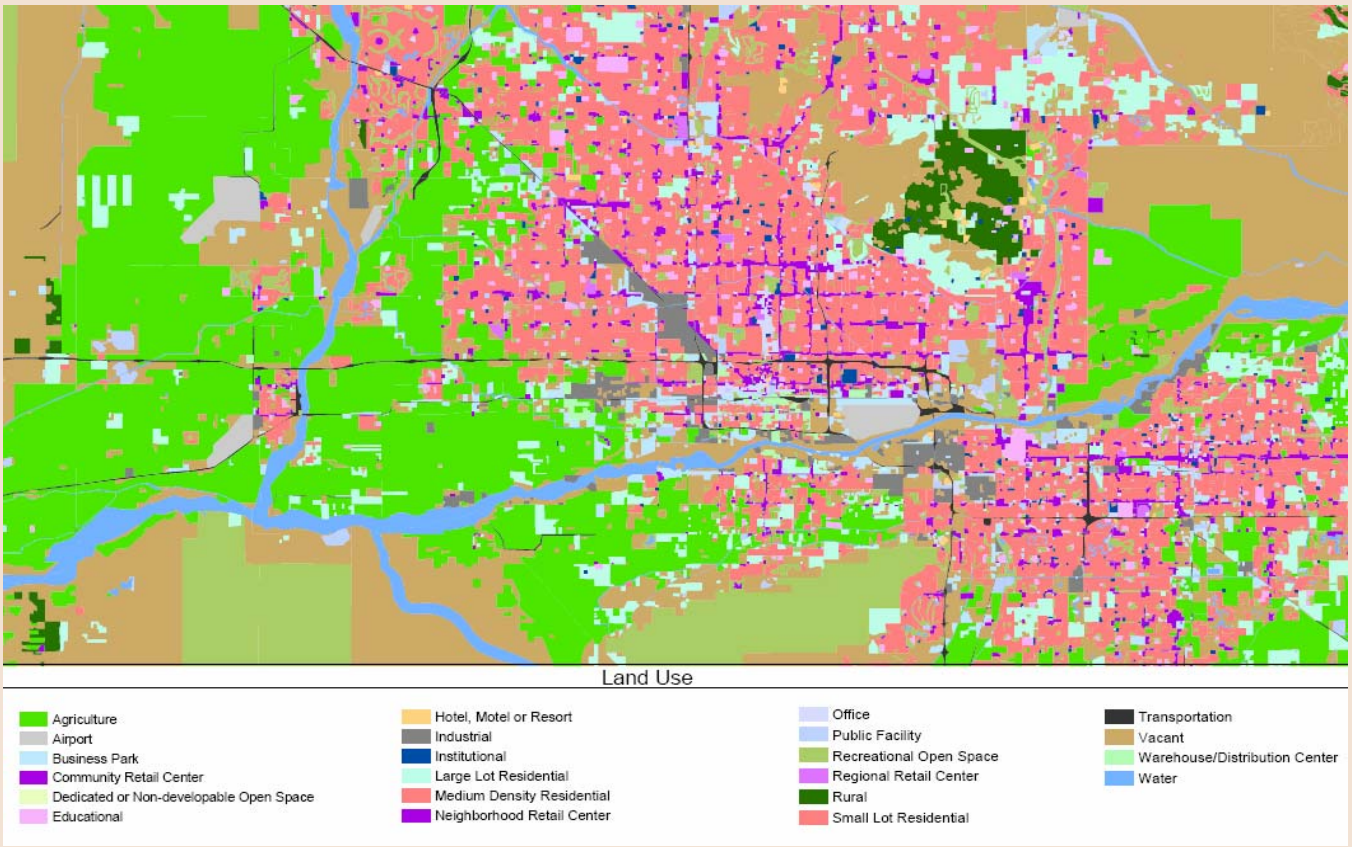
STATUS: Proposed. Some individual counties currently maintain digital parcel maps.

NEEDS: Coordination between AGIC and Arizona counties to develop a common framework for county-level parcel mapping in Arizona. This will lead to wider adoption of digital parcel mapping in the counties and a mechanism for statewide sharing of non-confidential parcel data.

DATA COORDINATOR: Arizona Department of Revenue, County Assessors Offices

LAND USE

This theme contains two different features pertaining to land use: primary and future (proposed) use. The Land Use theme uses existing cadastral boundaries to relate primary use of specific properties for review. This data becomes important when reviewing zoning, growth, and interface issues. The land use coverage enables users to identify trends of use within a region and look for potential issues with zoning, public safety, and code violations at the local level. Also included in this theme are data for planned use of regional areas – users can review both existing and future uses to determine how an environment may change as the general plan for a region nears completion.



USES: Emergency E911 response planning, services distribution, regional growth analysis, urban and rural area planning, 0pen space identification, code violation identification, zoning issues, and general map production.

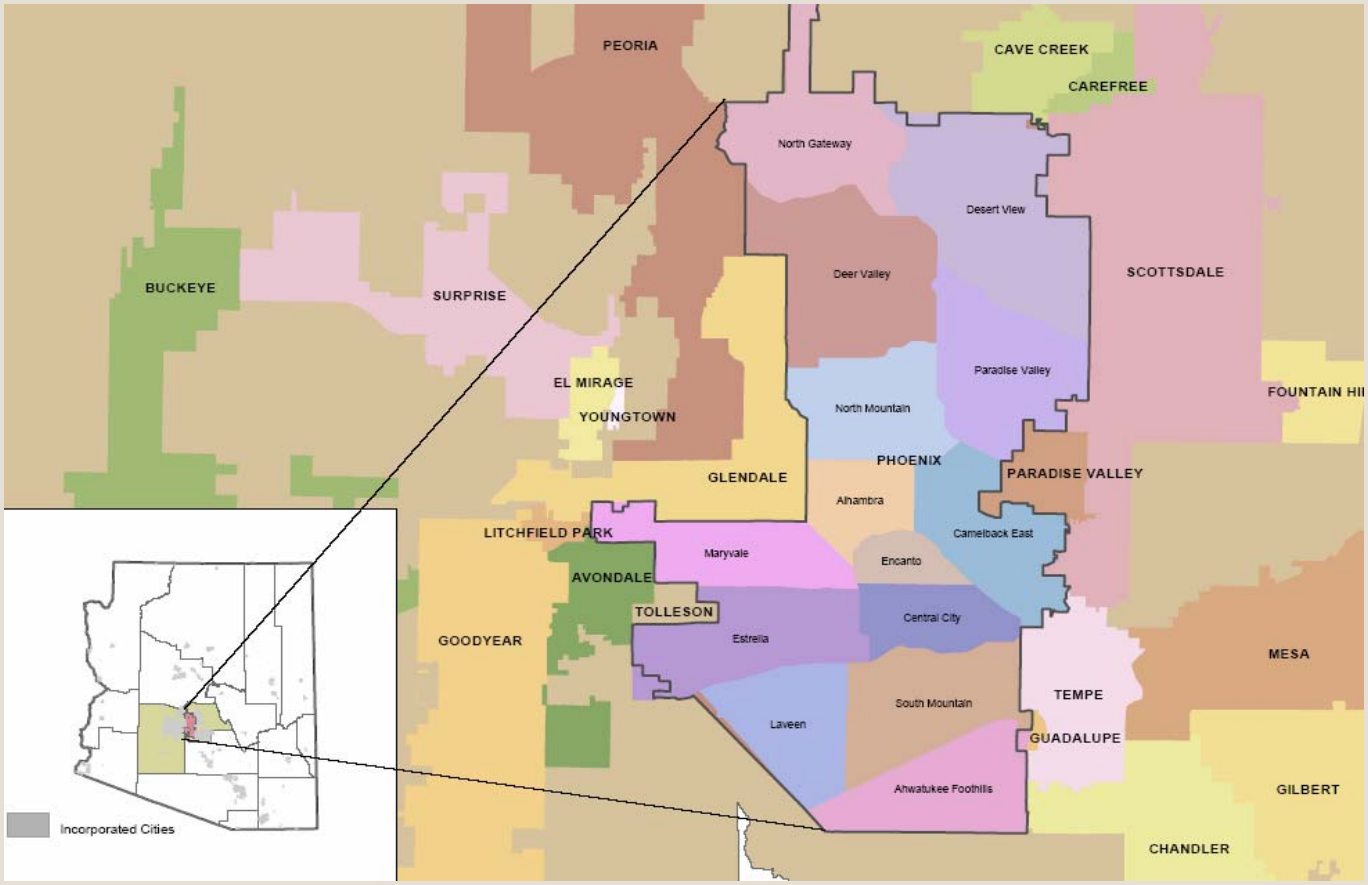
STATUS: Not available statewide. Arizona Counties with GIS capabilities have primary use information available through cadastral integration. Municipal Planning Organizations (MPO) retain most planned-use information through a compilation of regional general plan documents defining the future use area lands.

NEEDS: A central repository is needed to collect and inventory property use information for the state. Though the Arizona Department of Revenue (ADOR) could coordinate and provide a statewide cadastre, coordination between ADOR and various county assessors and planning organizations throughout the state will be required to obtain proper files for the incorporation of the data for a statewide effort.

DATA COORDINATORS: Local Municipal Planning Organizations (MPOs), councils of government, county and local planning agencies.

POLITICAL BOUNDARIES

Political boundaries for the state of Arizona comprise features delineating a variety of jurisdictional separations. The Political Boundaries teme constitutes a compilation of both public lands ownership information and political subdivisions for the state. This theme represents boundaries for forest service lands, Bureau of Land Management lands, military reservations, Bureau of Reclamation lands, wilderness areas, state trust lands, Native American reservation lands, county boundaries, incorporated areas (cities and towns), and others.



USES: Emergency E911 response planning, services distribution, growth analysis/urban planning, Public/Private Land inventory, and general map production.

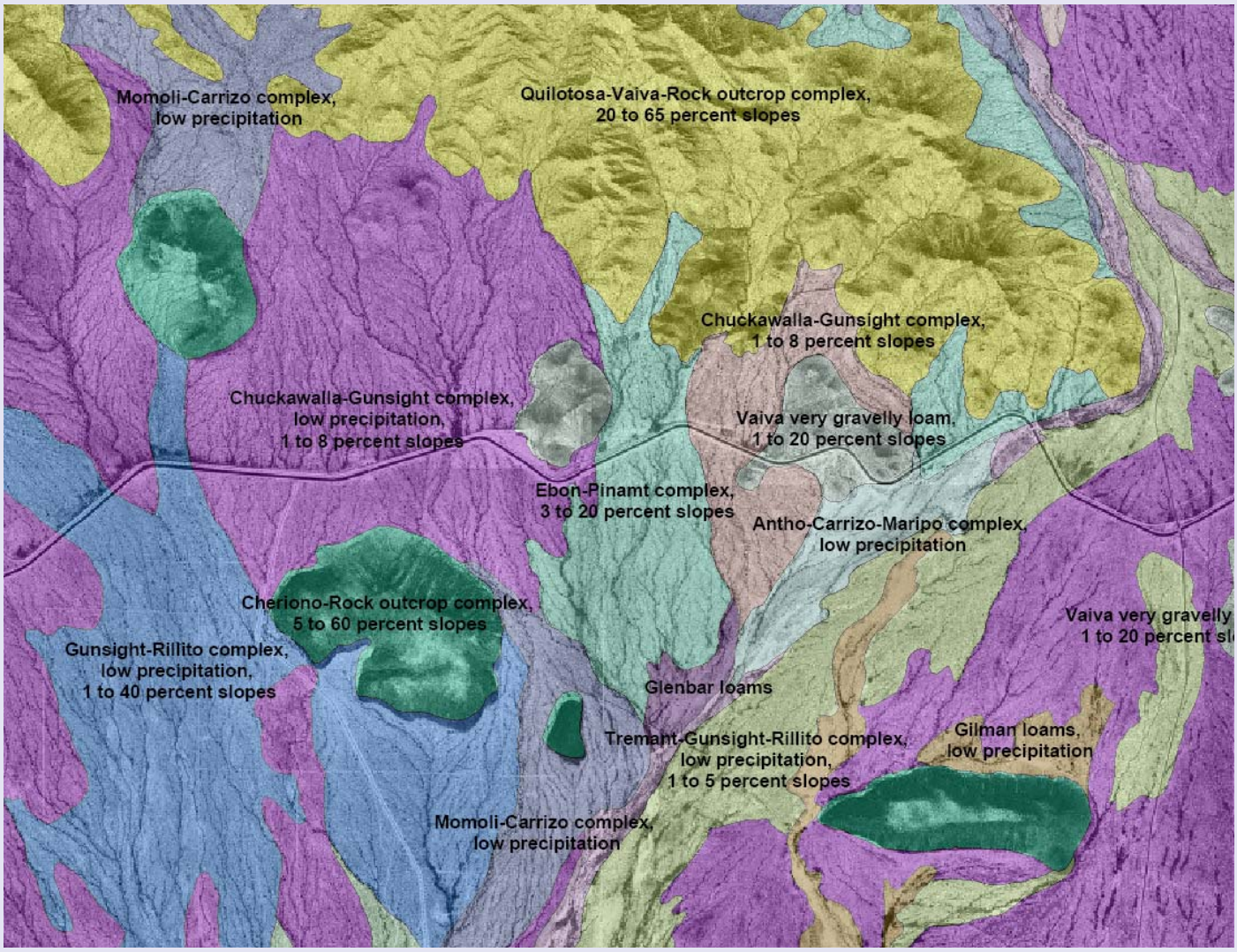
STATUS: The Arizona State Land Department has developed and maintains a statewide theme of non-tribal federal lands, state lands, counties, and incorporated areas.

NEEDS: This theme must continue to be updated frequently to stay current with changing boundaries. Coordination needs to continue with federal, tribal, state, and community data sources to assure the latest possible data is available.

DATA COORDINATOR: Arizona Land Resource Information System (ALRIS). Incorporation boundaries are updated and maintained through local jurisdictions.

SOILS

The Soil Survey theme is made up of Digital Soil Survey Geographic (SSURGO) datasets being developed by the Natural Resources Conservation Service (NRCS) of the U.S. Department of Agriculture. These datasets are updated digital versions of the original 1:24,000 county soil surveys which have been produced on paper.



USES: Land appraisal, site selection, agriculture, construction, transportation planning, flood control, and estimation of groundwater contamination susceptibility.

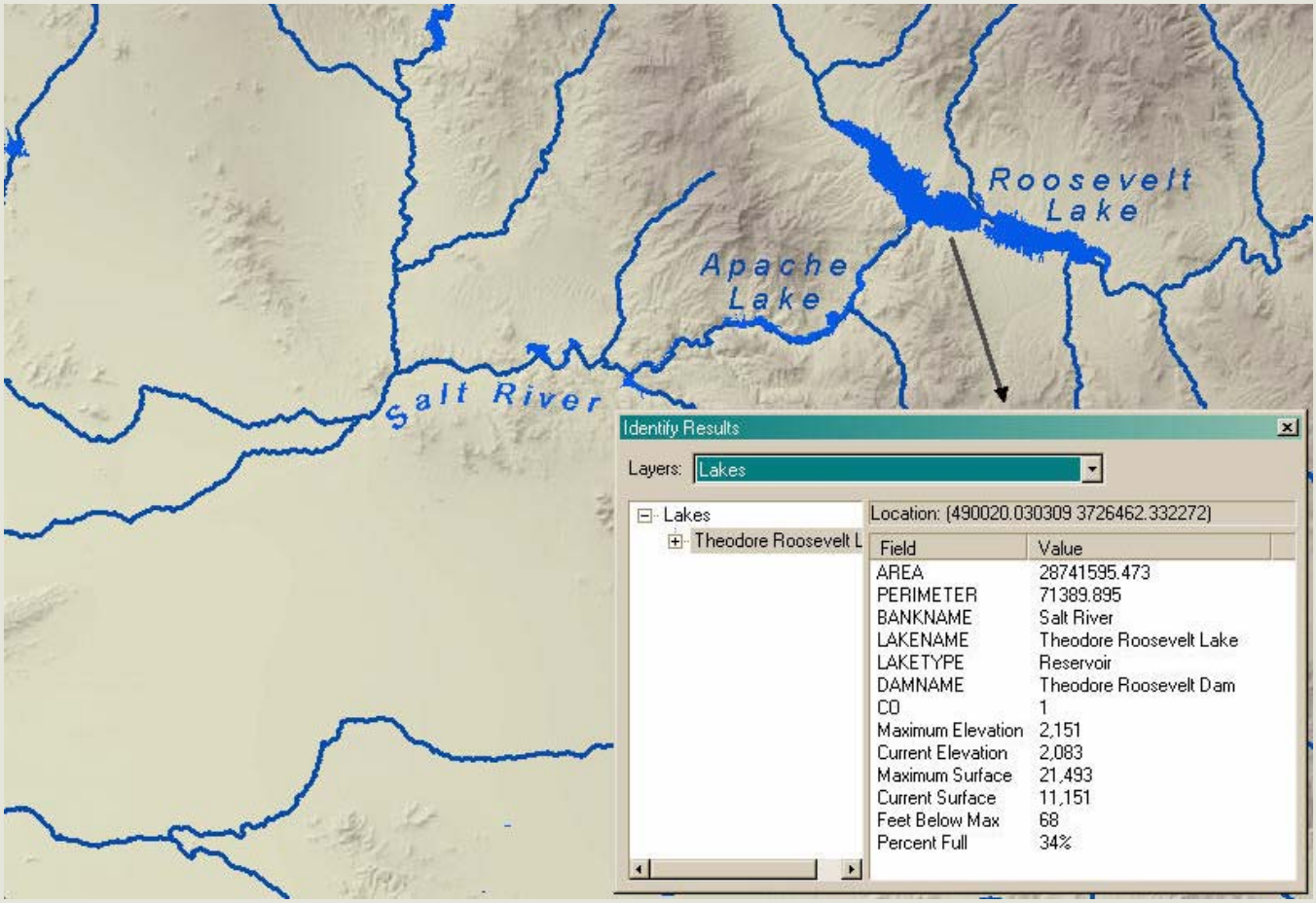
STATUS: SSURGO maps have been completed for approximately 60% of Arizona. Conversion is in progress during FY 2004 for approximately another 10% of the state.

NEEDS: Production of SSURGO datasets by NRCS for the remainder of Arizona. Updates and additional soil survey completions are ongoing and done on an irregular basis. No maintenance is expected once SSURGO is complete.

DATA COORDINATOR: Arizona Land Resource Information System (ALRIS), USDA Natural Resources Conservation Service

SURFACE WATER

The Surface Water theme depicts hydrographic features as shown on the U.S. Geological Survey (USGS) 1:24,000-scale map series. Features include rivers and streams, lakes and ponds, swamps, springs, canals, and others. Note that the depiction of some surface water features in this theme is dependent on the existing ground condition at the time of the original USGS mapping.



USES: Water resource planning, land use planning, flood control, agriculture, and urban planning.

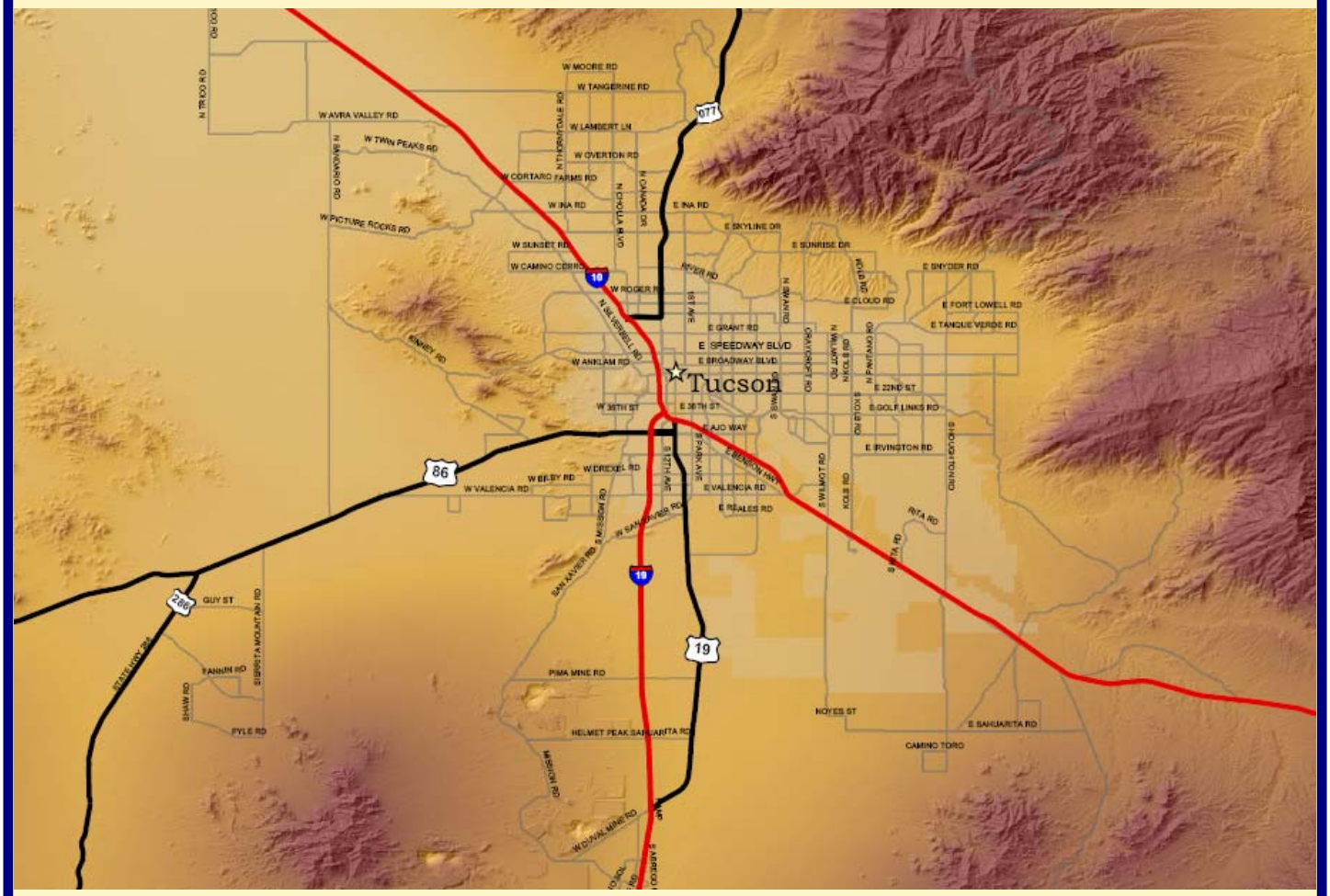
STATUS: The first-generation of statewide hydrography and surface water data are complete. (1:100,000 scale.)

NEEDS: Relatively little maintenance will be needed for most features represented in this theme at the current scale. Integration of related information such as dam locations, pumping schedules, water intakes and outflows, and irrigation volumes will be considered. The USGS is developing an Enhanced National Hydrography Dataset (1:24,000 scale) that will be made available through ALRIS once completed.

DATA COORDINATOR: Arizona Department of Water Resources (ADWR), Arizona Department of Environmental Quality (ADEQ), Arizona Land Resource Information System (ALRIS), US Geological Survey (USGS)

TRANSPORTATION

The Transportation Theme contains roadbed centerlines and associated attribute information on all public roads in Arizona. The core spatial components of this theme are the U.S. Census Bureau's TIGER files and the Arizona Department of Transportation (ADOT) inventory of state-maintained roads and county roads, with significant additional contributions from various cities, counties, and regional councils of government.



USES: Urban and regional planning, disaster preparedness, service delivery, E-911 emergency response planning, travel, zoning, and general map reference.

STATUS: The U.S. Census Bureau's TIGER files are used for many statewide mapping applications requiring road centerlines and address ranges, but do not meet the accuracy requirements for many purposes. ADOT 's state-wide transportation layer is used where possible.

NEEDS: Many GIS applications would benefit from improved transportation data. Greater use of ADOT data would provide more accurate and current transportation information. A consistently maintained transportation dataset, which would include address ranges for geocoding, is being pursued.

DATA COORDINATOR: Arizona Department of Transportation

INITIATIVE:

ARIZONA PREPAREDNESS

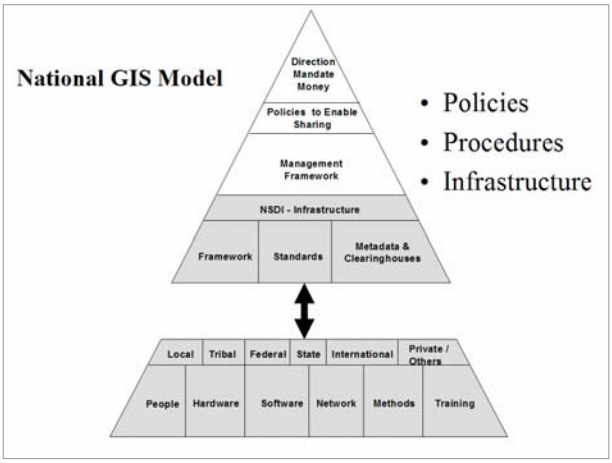
Arizona today faces issues of border and homeland security, extended drought, wildland fire, potential flooding, and other threats to its safety and security. Events of September 11, 2001 have reinforced the need for better preparedness at many levels of government and for all eventualities.

Many state, federal, and local governments are employing geospatial data and Geographic Information Systems (GIS) to help Arizona better prepare for and manage manmade and natural disasters. First responders and emergency management personnel need to access many kinds of data and information from many diverse sources. They require timely and accurate information that is easy to understand. The real value of GIS for emergency response is its ability to quickly integrate a large amount of raw data from many sources, consolidate it, and present it in a visual way that meets their needs.

National Efforts

Timely and accurate information which is easily accessed and capable of being shared across federal, state, and local political jurisdictions is fundamental to the decision-making capability of those tasked with the homeland security mission.

The Federal Geographic Data Committee (FGDC) Homeland Security Working Group ensures that the National Spatial Data Infrastructure (NSDI) supports the preparation for, protection against, and response to threats to the nation's population centers and critical infrastructures. The FGDC Working Group is a major effort and involves members from the Departments of Agriculture, Commerce, Defense, Energy, Homeland Security, Interior, Transportation, the Environmental Protection Agency, Federal Communications Commission, National Aeronautics and Space Administration, National Capital Planning Commission and the National States Geographic Information Council.

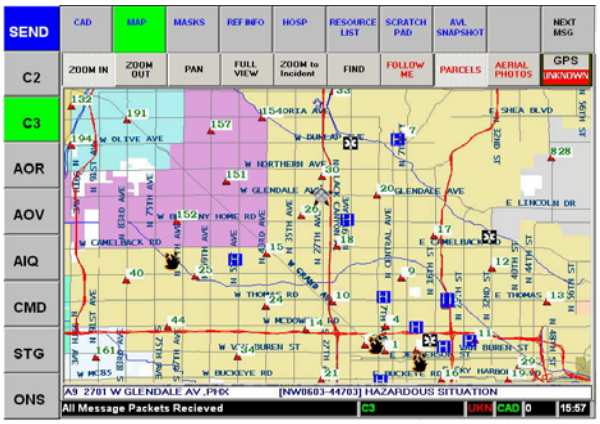


Federal, state and local efforts all work together to provide the critical data needed to respond to today's threats.

State Activities

The Arizona State Homeland Security Strategy (SHSS): State Homeland Security Assessment of 2003 maintains that the state needs to "…assess reliable data on potential threat elements and vulnerable key assets and critical infrastructure." It also states that "The location of potential threat elements, key assets, critical infrastructure and population will direct the state's efforts to mitigate threat, protect infrastructure and enhance existing response and recovery capabilities."

One of the objectives identified in the SHSS is development of "... a secure web communication system to disseminate and exchange intelligence and critical information among public and private sector entities ..." One step taken to meet this objective is the implementation of the Arizona Counter Terrorism Information Center (ACTIC) to enhance existing intelligence exchange systems and support programs currently under development in Arizona. The Arizona Department of Public Safety (DPS) utilizes GIS as part of its operations. ACTIC uses cutting edge technologies, including geospatial data and an advanced GIS, to help achieve its mission.



The Phoenix Fire Department currently uses a Computer Aided Dispatch system and GIS technology in all of its response vehicles.

Work is also being undertaken at Arizona State University as the result of a grant to develop advanced computer applications for first responders. The Phoenix Fire Department, which already has a sophisticated Computer Aided Dispatch system, along with others is scheduled to receive the new software designed to enhance existing capabilities to track and route assets and efficiently respond to emergencies.

Issues

The current ***state*** of geospatial information technology can provide decision makers the data they need to confidently confront a wide variety of threats including natural disaster, terrorist attack, sabotage, and similar crises. However, the current ***implementation*** of that technology, across all the federal, state and local agencies and jurisdictions necessary to fully coordinate and effectively respond, is seriously lacking in specific areas.

The goal of the Arizona Geographic Information Council (AGIC) Homeland Security Committee is to enhance the ability of all Arizona agencies to respond to and recover from a terrorist attack or natural disaster. The AGIC Homeland Security Committee proposes to create an Arizona Geospatial Data Network to provide geospatial data for use by the DPS, the Arizona Department of Health Services (ADHS), the State Forester, the Division of Emergency Management, federal, state, and local agencies and first responders. The objective of the AGIC Homeland Security Committee is to collect and integrate core data layers and critical infrastructure data with applications that improve Arizona preparedness.

Data produced at the local level is often best for First Responders and needs to be accessible and available for practical and immediate use. This data can be utilized in GIS applications, such as E-Teams, CATS, SIRENS, the Arizona FIRE MAP, and other applications.

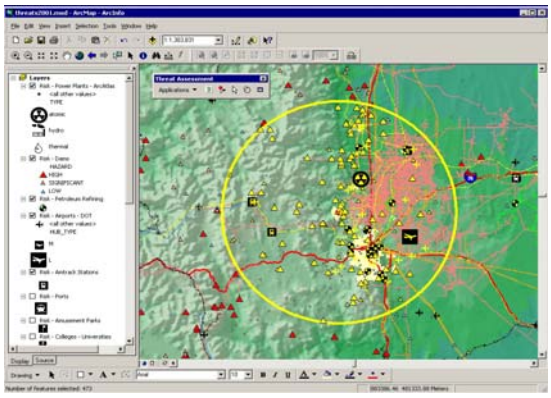
Critical infrastructure and other core data sets are being identified and, along with help from AGIC's Data Resources Subcommittee, are being prioritized. Some of the highest priorities for statewide data include:

- Aerial Ortho-Photography
- Street Centerlines with Address Ranges
- Critical Infrastructure
- Elevation Data
- Geodetic Control

Priorities

The AGIC Homeland Security Committee and Data Resources Committee believe that Enterprise GIS will provide a valuable tool and resource that can be used in the management of natural and manmade disasters, while also supporting day-to-day federal, state, and local business needs.

The AGIC Homeland Security Committee will coordinate with other AGIC committees and initiatives to develop the GIS infrastructure and geospatial data required to improve Arizona Preparedness. The Arizona Geodata Portal, Height Modernization, Core Data Resources development, the Arizona Map, and GIS Education and Outreach all play an important role in improving Arizona Preparedness.



Today's emergency preparedness efforts rely on GIS data, mapping. and analysis.

INITIATIVE:

AZ GEODATA PORTAL

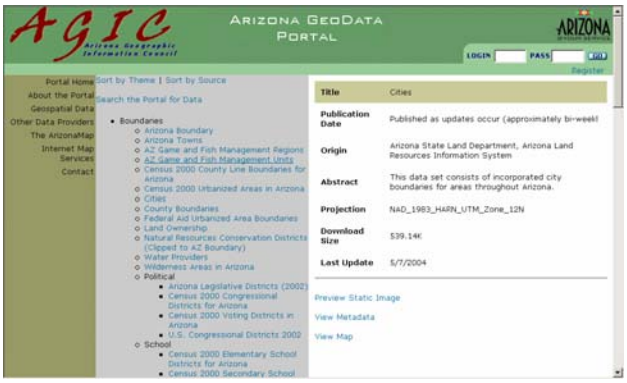
Access to Geodata

Data sharing and distribution is a key issue for AGIC. Organizations of all types will benefit from easier access to geospatial data. The purpose of the Arizona Geodata Portal is to provide a clearinghouse for GIS users to discover and acquire Arizona geodata through an online service. As a web service, the portal will provide not only geospatial data, but also georeferenced imagery of existing paper maps, and reference and support materials to aid organizations in documenting their own data.

Portal data holdings will initially be comprised of geodata provided by the Arizona Land Resource Information System (ALRIS) and other state agencies. Organizations will be invited and encouraged to contribute data, or provide links to their own online data stores. Because of the potential volume of available information, the portal will provide a metadata search tool that will allow users to find the geodata they are looking for with minimum effort. Users will have the ability to search for data by keyword, theme, or place.

The primary component of the portal will be a catalog of geodata holdings that will enable users to access and download Arizona data in ESRI shapefile format. Since access to downloads will be password protected, user login information will be compared to stored user profiles and permissions.

The portal will also provide users with Internet map viewers such as the Arizona Map, which will provide the ability to view statewide base geodata through a web browser or with desktop GIS software that supports ArcIMS image services. Other content provided by the portal will include ArcIMS feature services, static geospatial content (such as historical and special purpose maps), information on standards and best practices, and contact information for persons in the Arizona GIS community.

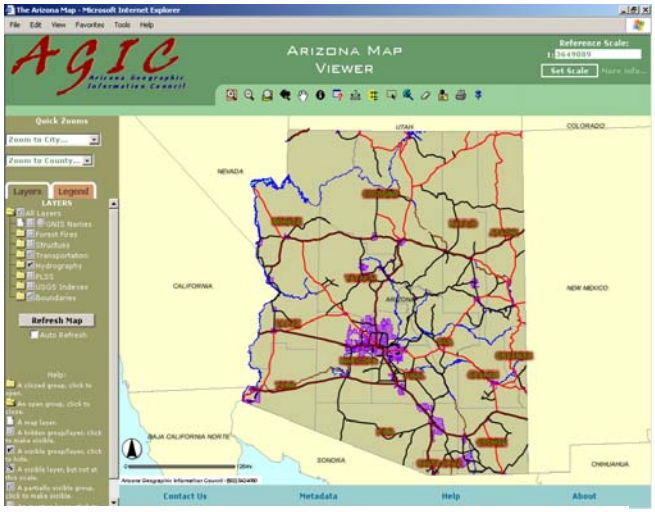


The Arizona Geodata Portal will offer information and access to important data for GIS users statewide.

Geodata Standards

Geodata standards provide guidelines for organizations that develop and maintain geodata. Standards ensure consistency, across and within jurisdictions, of geodata content, accuracy, format, and other technical issues. The Arizona Geographic Information Council has endorsed geodata standards published by the Federal Geographic Data Committee as appropriate for Arizona. The portal will support the acceptance and adoption of federal geographic data standards throughout the state by requiring contributors of data and services to comply with federal standards. The portal will also provide a central repository of standards related information and links to other standards resources.

Internet map server technology provides online access to geodata clearinghouses and map services across the nation. Numerous organizations in Arizona maintain Internet map services, but references to these sites and instructions on using them in desktop GIS applications have not been collected in a central location. The Portal will provide this capability, allowing for users to view map services online or import the services into desktop GIS software.



The Arizona Map will be a key component of the Arizona Geodata Portal, allowing statewide access to core datasets

Future Enhancements

We envision the portal as a "living" website, in that its design will to be flexible and able to expand to meet user needs. As such, feedback from users will play an important role in the development and growth of the portal and the services offered through it. Moreover, as the portal evolves, additional enhancements will improve the utility of the product. Two proposed enhancements are enabling automatic data updates and adding metadata creation and validation services.

Data updates

The nature of many geodata themes is that they are not static. Many types of data, such as land records and boundaries, change often and a system by which contributors to the portal can share updates to their data will need to be developed. One option is for dynamic geodata to be hosted by the contributing organization and linked to from the portal. Feature streaming map services will also play a role in distributing dynamic data. Feature streaming map services will allow a desktop GIS user to add a dataset residing on a different organization's server to their own maps without having to download updates. Not all GIS users may have technology that supports feature streaming, therefore a subscription-based service in which information on updates to the portal are emailed to users is an alternative.

Metadata Creation and Validation

Metadata is information that describes data. Metadata is important to GIS users because it offers basic information to the user, such as the regularity of updates to the data, technical information about the data, contact information, and insight into the quality, accuracy, and process by which the data was created. Metadata is also essential in modern desktop GIS because it allows data in different projections to work together seamlessly. Metadata creation, however, is a daunting task, especially for organizations without the needed technical expertise. A future enhancement to the portal will provide users with the ability to write and validate metadata through an online interface. This metadata tool would allow users to create metadata that is compliant with at least the minimum required Federal Geographic Data Committee (FGDC) standard elements, without having to be an expert. At the same time, this tool would provide metadata files back to the user, as well as offer them the opportunity to contribute their geodata and metadata to the portal.

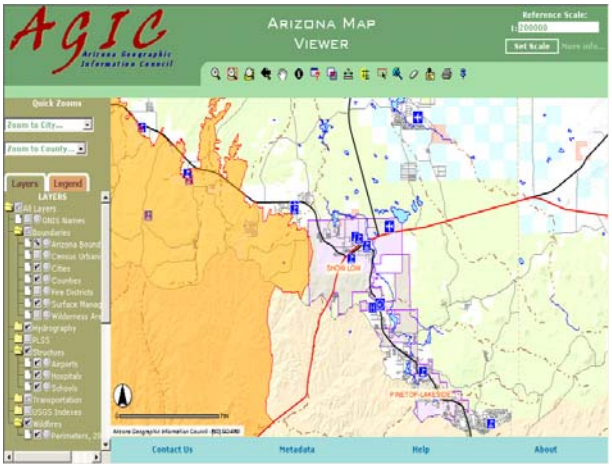
Historical maps, like this early twentieth century depiction of Phoenix, offer insight into the rapid growth of our state and the importance of ongoing planning efforts.

INITIATIVE:

THE ARIZONA MAP

The Arizona Map

The Arizona Map is currently being developed as an extension of the Arizona GeoData portal for viewing Arizona base data layers. The Arizona Map will provide an Internet based interactive mapping service to allow users access to core Arizona geospatial data through a web browser or through desktop GIS software.



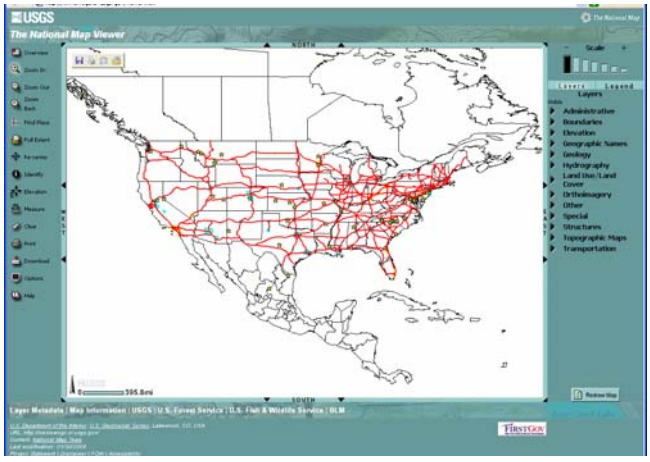
The Arizona Map will serve as the "viewer" function associated with the Arizona GeoData Portal and will be designed to provide a map viewing service to organizations, first responders, decision makers, and the public. It will also provide a means of distributing core geospatial data through a streaming map service to Arizona ArcGIS users. Organizations that have contributed geospatial data to the Arizona Map include the Arizona Department of Health Services, Arizona Department of Transportation, Arizona State Land Department, US Forest Service, and US Geological Survey.

During the initial phase of development, state agencies such as the Department of Public Safety and the Arizona State Land Department tested the application, provided feedback on performance, and suggested enhancements that will make the interface easier to use. In the next phases of development, improving application speed and acquisition of additional datasets will be a priority, as will increasing direct access to the geospatial data hosted by the Arizona Map through feature streaming of selected geospatial datasets. This will allow desktop GIS users direct access to the data.

Initially, the Arizona Map feature service will provide datasets that are frequently updated by the Arizona State Land Department and will be password protected to allow only governmental and educational access. The scope of accessibility and the quantity of geospatial data provided through feature services will be expanded over time.

The National Map

The National Map, developed by the US Geological Survey, provides access to geospatial data from multiple federal, state, and local partners to help support decision-making. The Arizona State Land Department and the US Geological Survey have entered into a partnership to build an Open Geospatial Consortium (OGC) compliant web mapping service (WMS) connection to the Arizona Map from The National Map. This will allow selected datasets used in the Arizona Map to be displayed through The National Map.



AGIC Arizona Geographic Information Council

INITIATIVE: EDUCATION AND OUTREACH

The growing use of shared geospatial data, the rapid population increases within the State, and the many new programs being implemented by AGIC and other Arizona organizations, make it a challenge to stay current with the latest in Geographic Information System (GIS) technology. To take full advantage of the opportunities offered by GIS, the AGIC Conference, Education and Outreach Committee works to provide resources to the state's geospatial professionals.

One of AGIC's primary goals is to improve communication between all Arizona GIS users, potential users, government leadership, and the general public. Through various publications, including this report, AGIC is sharing information with those who want and need to know more about geospatial technology.

Annual GIS Symposium

Each year the Arizona Geographic Information Council hosts the GIS Education and Training Symposium. The Symposium, held at various Arizona locations, is designed to bring together geospatial professionals from across the State. The annual symposium typically includes an assortment of software-specific workshops, technical demonstrations, and group discussions designed to educate geospatial professionals at all knowledge levels.

*The **AGIC 2004 GIS Education and Training Symposium** held in Prescott drew hundreds of participants from across the state.*

*The AGIC web site, **http://agic.az.gov,** is updated frequently with information about GIS data, resources, and activities of interest to Arizona GIS users.*

Web and Print Resources

The Arizona Geographic Information Council website (http://agic.az.gov) offers a variety of resource content related to the activities of AGIC itself and the greater GIS community.

Information available at agic.az.gov includes elements such as:

- GIS user survey results
- Statewide GIS contact information
- Arizona geospatial news
- Board meeting agendas and minutes
- Committee information
- Educational resources
- Hyperlinks to other GIS resources

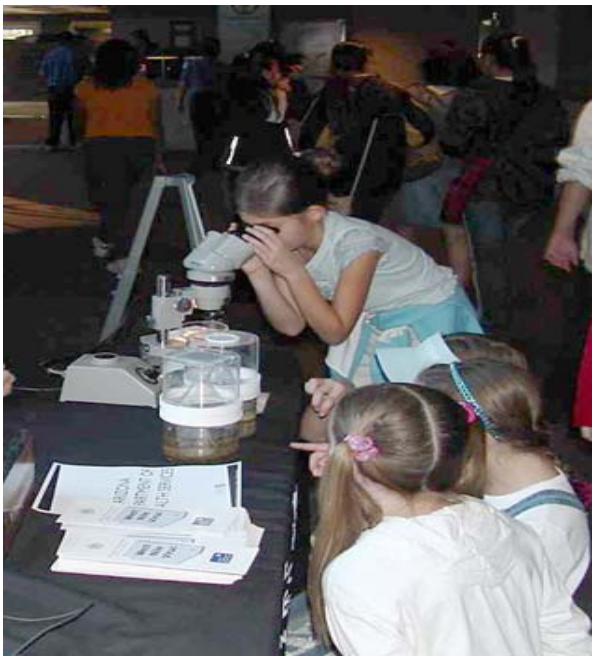
Printed documents distributed by AGIC include this report as well as general AGIC informational brochures, and mailed pieces relating to the annual GIS Education and Training Symposium.

Internet List Service

The AGIC-L list service is an Internet based email forum open to anyone interested in staying up-to-date with current Arizona GIS issues. The list service is intended to provide a low volume, high quality forum for the discussion of GIS and GIS-related issues within the state of Arizona. This often includes questions on data access and availability, data and metadata format and standards, GIS management and policy development, and announcements for AGIC-related meetings and special events.

K-12 Education

Today's elementary school students will be using geographic information systems on a daily basis by the time they graduate from high school. From studying social sciences, geography, mathematics and astronomy, to operating an automobile, GIS will be part of everyday life. AGIC takes an active role in working with the education community in Arizona to make sure teachers and students are exposed to this emerging technology.



*A proclamation by Arizona Governor Janet Napolitano declared November 19, 2003 to be Arizona's official **GIS Day**. Enthusiastic school children attending activities at the Arizona Science Center were able to see first hand how GIS is being used to solve everyday problems.*

*Gene Trobia, Arizona State Cartographer, and the University of Arizona's Barron Orr present material at one of the November 2003 **Arizona Geospatial Resources for Homeland Security** workshops.*

Statewide Outreach

Working with the Arizona State Cartographer's Office, AGIC has been able to conduct outreach workshops and programs throughout Arizona.

In 2003, AGIC produced the regional workshop: *Arizona Geospatial Resources for Homeland Security.* These sessions were designed to share information with local GIS users in the first responder (police, fire, etc.) communities and were hosted throughout the state.

In 2004, at the request of the Arizona Professional Land Surveyors (APLS) and the Arizona Geographic Information Council (AGIC), the National Geodetic Survey and the State Cartographer's Office conducted a Phoenix forum to investigate the need for improved statewide geodetic control. The outcome of this workshop resulted in a much better understanding of the issue and eventually led to the Height Modernization Initiative being pursued statewide.

Technology User Groups

Constantly evolving GIS technology requires that users work to stay up-to-date on new software and hardware options. Periodic user group meetings hosted by AGIC and member agencies focus on topics such as Internet map services, geodatabase design and maintenance, and other software developments.

The meetings often feature presentations by regional experts and always offer opportunities for local GIS users to get answers to their technical questions.

Executive Board Recruitment

For AGIC to successfully continue the important role of statewide representation to the Arizona geospatial community, it is important to maintain active board membership that successfully represents all aspects of the community. For this reason, AGIC continually works in concert with the Governor's Office to make sure that the membership of the board accurately reflects the geospatial community in Arizona.

Geospatial Community

AGIC has long acknowledged the commonality amongst all professions utilizing geography to solve problems. AGIC has taken a leading role in facilitating interaction of GIS professionals with other geospatial organizations and professionals. AGIC Board members have become very active in informing and promoting GIS in other geospatial organizations.

In February 2004, AGIC Board members participated in a joint ceremony with the Arizona Professional Land Surveyors (APLS) to proclaim the state's center of population to be in Gilbert, Arizona.

In this photograph, Gene Trobia, the Arizona State Cartographer, is shown speaking to the group while Rick Bunger, president of APLS, looks on.

INITIATIVE:

ARIZONA HEIGHT MODERNIZATION

Height Modernization

Many critical Arizona activities require accurate mapping – border security, pipeline safety, disaster response, wildfire management, subsidence monitoring, highway construction, flood control, growth planning, and infrastructure management. In turn, modern accurate digital maps require precise horizontal and vertical geodetic control. Height Modernization is a means to obtain this needed geodetic control.

Height Modernization will provide Arizona a geodetic framework for scientific, surveying, engineering and geographic information systems. These systems and associated technologies are critical for managing Arizona's public safety, health and welfare. Without Arizona Height Modernization, the production of maps to meet the pressing needs of the state will continue to be extremely costly, and in some cases impossible.

Due to land subsidence, the elevation of this spot near Luke Air Force Base in Maricopa County has dropped by more than 18 feet over a 34-year period. Knowledge of subsidence areas is a fundamental requirement for planning infrastructure such as pipelines, canals, and power plants.

Improved Mapping

Height Modernization will improve vertical and horizontal survey accuracy within the state. Adding geodetic control to our existing Public Land Survey System will improve mapping capabilities and facilitate access to the best possible federal, state, and local map information.

Height Modernization will mean "map modernization" for Arizona. Improved maps will help provide better public safety, health, and welfare for the citizens of Arizona.

Arizona Height Modernization Will Benefit

Border Mapping and Security

Wildfire Mapping

Disaster Preparedness and Relief Efforts

E911 Computer Aided Dispatch Systems

Pipeline Safety

Subsidence Monitoring

Airport Safety

Aircraft Landing Systems

Flood Control Mapping

Critical Infrastructure Mapping

Reservoir and Well Level Monitoring

Precision Agriculture

Geographic Information Systems

Statewide Map Integration

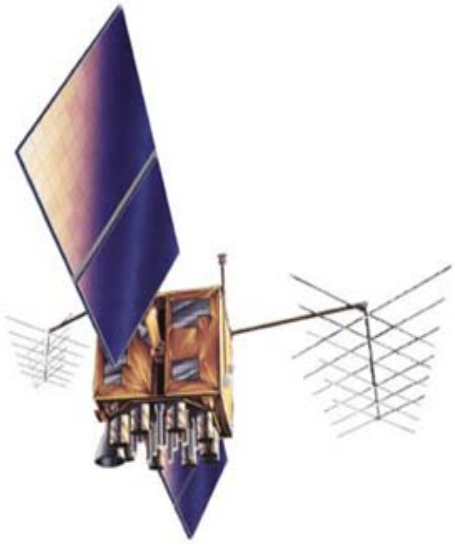
Emergency Response

Funding

Federal funding for maintenance and expansion of the National Spatial Reference System (NSRS) is available to state governments through Congressional action under an activity called "Height Modernization". To date, federal funding has been appropriated for eight states and is being pursued by several other states. The funds are used locally to maintain and expand the NSRS to meet the needs of the current population.

Arizona Height Modernization Forum

The National Geodetic Survey (NGS) conducted an Arizona Height Modernization Forum in April 2004 at the request of the Arizona Professional Land Surveyors (APLS) and the Arizona Geographic Information Council (AGIC). The purpose of the Forum was to determine needs and identify the benefits Arizona would realize through Height Modernization. Many of the benefits identified at the Forum are listed on the previous page. Forum attendees unanimously agreed that Arizona Height Modernization would benefit the state and should be pursued.



By using modern, high efficiency technologies such as GPS (Global Positioning System) satellites, Bar-code differential leveling, LIDAR (Light Detection and Ranging), and IFSAR (Interferometric Synthetic Aperture Radar) the NSRS in Arizona can be extended into priority areas very quickly.

Current Activities

Both AGIC and APLS fully support the need for Height Modernization. The AGIC Data Resources Committee has formed an Arizona Height Modernization Working Group to implement Height Modernization in Arizona. The working group has begun to address issues such as statewide needs, priorities, and possible organizational structures for administering funds.

In addition to important activities identified in the forum, the Height Modernization Working Group has identified several action items that are being pursued to further the progress of both Height Modernization and map modernization in Arizona.

Height Modernization will allow more accurate monitoring of the effects of drought on reservoir levels and aquifers, measure results of tectonic activity across the state, and assess the safety of critical structures such as the Glen Canyon Dam pictured here.

For More Information

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Information and presentations from the 2004 Arizona Height Modernization Forum may be accessed at:

http://agic.az.gov/hm/

Height Modernization In Arizona Is Map Modernization!

part five:

APPENDIX

AGIC Committees

Acknowledgements

APPENDIX

AGIC Committees

There are currently five AGIC Committees comprised of AGIC Executive Board members and non-members. Use the following contacts to request information about committee activities, meetings, and current membership, or about assisting or joining a committee.

Administration and Legal Committee

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APPENDIX

Acknowledgements

Many people have played important roles in assembling this report; from writing and editing text, formatting images, and interpreting meeting notes, to organizing initiatives and summarizing technical information. Many of those individuals are listed here, though apologies are due to those inadvertently omitted and those that contributed anonymously behind the scenes.

A special thanks is due to Michael Ouimet and the Texas Geographic Information Council for allowing their report, *Digital Texas – 2002 Biennial Report on Geographic Information Systems Technology*, to be adapted and used as an inspiration for many portions of this document.

A special acknowledgement is also due to the Federal Emergency Management Agency. Their support allowed the development of surveys and workshops that identified the need for geospatial information materials, and assisted in the production of this report.

Major credit goes to AGIC board and committee members and all GIS professionals who have worked to improve the state of GIS technology, data, and knowledge.

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