

GIS Solutions for Agricultural Government



Agricultural governments around the world are made up of geographically dispersed regional offices that generate large volumes of agricultural data. The common denominator of this data is that it contains some element of location information. Recording, analyzing, regulating, and distributing this collective knowledge is the responsibility of agricultural government at all levels. GIS supports agricultural government in managing these responsibilities most efficiently.

The benefits of using GIS in agricultural government include the following:

- Increased efficiency
- Revenue generation and cost recovery
- Improved accuracy
- Task automation
- Increased access to government
- Time and cost savings
- Provision of decision support
- Resource management
- Enhancement of public participation
- Collaboration between departments

GIS can be used by agricultural agencies to support pesticide and food safety regulations, show economic impacts of policy, reveal environmental health issues, depict animal health and welfare issues, record data about an area, and arbitrate land use conflicts. GIS is an effective, proven technology in government. ESRI is the global market leader for GIS software.



GIS Solutions Offered by ESRI to Agricultural Government

Many agricultural agencies need a GIS capable of integrating services and data from multiple sources and in different formats. ESRI's technology and products support this advanced level of interoperability. ESRI's active role in the development of open standards has helped ensure that data can be easily accessed by other technologies and applications. The ArcGIS® software suite supports numerous data converters and provides direct read access of more than 40 formats including Spatial Data Transfer Standard, Vector Product Format, imagery, computer-aided design (CAD) files, digital line graph, and TIGER formats. Of equal importance, ESRI® systems enable organizations to share GIS services and communicate across different vendor implementations.

ESRI has also given great attention to the relationship between GIS and corporate operating system infrastructure. For GIS users, this means compatibility and interoperability with major enterprise systems such as enterprise resource planning, customer relationship management, database management systems, work management systems, decision support systems, and others. ArcGIS architecture provides the framework for sharing data and services.

In addition to its ArcGIS product suite, ESRI offers professional services to help users incorporate GIS technology throughout their work flow. Types of professional services offered include consulting and design services, database services, programming services, and implementation services. Learn more by visiting www.esri.com/consulting.



Interagency Data Sharing

Maximizing the Benefits of GIS

As GIS products evolve from simple project-based applications toward an interoperable enterprisewide solution, so must organizations that implement GIS technology. Justification for GIS development must provide definitive returns on investment and obvious cost avoidance measures.

Enterprise solutions from ESRI provide agricultural government with geospatial data, which can be any data that is location specific. Data that previously existed within a GIS project often remained on a single desktop and, therefore, provided limited accessibility to others who might benefit from that data. Data sharing reduces unnecessary task duplication, lowers cost, and opens new avenues of analysis. Data can be combined to create new geospatial solutions.

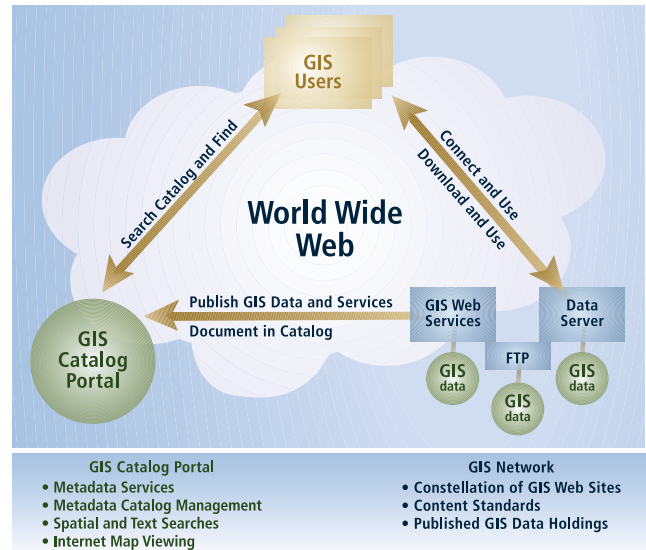
GIS-enabled Web applications are key to shared geodata management. The components of g.net increase public access to government processes and support potential opportunities to streamline existing operations. Justifiable concerns about data security require that permissions are easily managed within the GIS.

As technology supporting enterprise solutions continues to develop, there will be a reduction in the number of software licenses required for individual installs of software on a computer. This will reflect an increase in the number of GIS operations available as server-based applications over a network.

GIS Catalog Portals

A GIS catalog portal provides users with an online catalog that references numerous GIS holdings such as geographic data, Web mapping services, data collection activities, references, and contact information about GIS professionals. GIS catalog portals are built using ESRI's standards-based ArcGIS and ArcIMS® software.

The U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Resource Data Gateway is an e-business style application that accepts data orders from its Web site. Three thousand field offices, 13,000 employees, and thousands of public customers rely on the USDA resource information



GIS Catalog Portal and GIS Network Concept

available at this portal. The GIS catalog portal enables visitors to navigate to data about specific lands, retrieve images from the server, merge data with other map information, and get visual pictures of the area of interest. Find out more about NRCS's GIS catalog portal at www.nrcs.usda.gov/.

Spatial Data Infrastructures

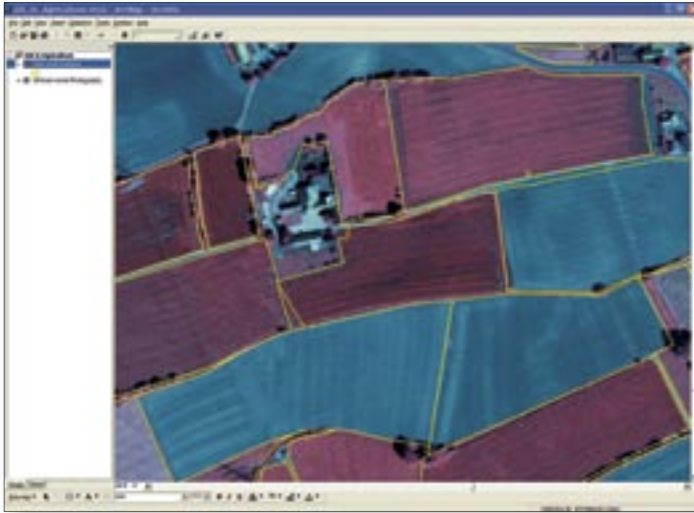
A GIS network is a constellation of user sites that publish, discover, and use geospatial information on the World Wide Web. Internet portals provide a single location for users to access and register multiorganization geographic data and services. A network of GIS catalog portals forms a spatial data infrastructure to serve both national geographic networks. An example of a national-level spatial data infrastructure is the U.S. government's Geospatial One-Stop (www.geo-one-stop.gov/), which provides a single location for users to access and register multiorganization geographic data and services that cover all aspects of government.

Return on Investment

GIS has proven cost decreases and revenue increases.

Organization	Discipline	Problem	GIS-Based Solution	Return on Investment
Citrus County, Florida	County Property Appraiser	Increase the accuracy of the property improvements database to account for all improvements so properties will be properly assessed.	Used GIS in combination with digital orthophotography to detect unreported new construction.	The project added tax revenue of \$200 million (or about 5 percent of the annual tax base) from unrecorded property improvements.
City of San Antonio, Texas	Environmental Services Department	Environmental Services Department performs more than 500 site assessments each year.	ArcMap™ was used for all modeling and editing tasks as well as map-based project analysis.	The city of San Antonio anticipates saving approximately \$175,000 per year in consulting fees.
Clark County, Washington	Weed Management Department	Difficulty in identifying the owners of properties needing weed abatement.	The weed control officers now use laptop computers with access to a custom GIS application that uses global positioning systems (GPS) to locate each parcel with noxious weeds and identifies the property owner.	Weed control officers now identify more than 100 outbreaks of noxious weeds per day compared to eight to 10 before using GIS.
Cook County, Illinois	County Assessor's Office (CCAO)	CCAO decided that the public should have access to its newly created GIS parcel data and be able to perform tabular and spatial queries that would allow parcel information to be compared.	The solution developed by Great Arc Technologies, Inc., used ArcIMS and ArcSDE® on Microsoft SQL Server. Using a secure application, internal and external users can select parcels and obtain parcel information with a street view image. Comparison of neighboring properties is then possible by selling price, square footage, or assessed value. Users could also generate a thematic map that outlined the types of neighboring properties.	The number of requests for parcel-related information by the public, both by phone and in person, have decreased by 1,000 inquiries per month.
Newport News Waterworks, Virginia	Water Department	State permits right-of-way view, profile, and vicinity maps. Hand drawing these maps was very time-consuming.	The state automated map production using ArcView.	Production time for each map was reduced from between two to four hours to just 15 minutes using ArcView.
State of Ohio	Department of Natural Resources—Division of Wildlife	Despite a growing population, Ohio's residents were not buying fishing licenses at a rate consistent with that growth. In addition, renewal of fishing licenses by residents was erratic. The state agency's goal was reducing the turnover rate and retaining existing anglers.	To reduce turnover and increase retention of fishing licenses, the agency needed to manage customer relationships by identifying the target audience and segmenting existing and potential customers using demographic information. Point-of-sale purchase and U.S. Census data were processed using SAS, ACORN, and ESRI software. SAS's analytics, data manipulation, and reporting capabilities combined with the spatial analysis and visualization capabilities of ESRI software allowed the agency to streamline processes.	The Ohio Division of Wildlife generated \$560,000 in new revenue and received a \$3.50 return on investment for every dollar spent. SAS's business intelligence and analytics extended traditional GIS capabilities to answer more complex business questions.

GIS at Work in Agriculture



Field Boundaries in Germany

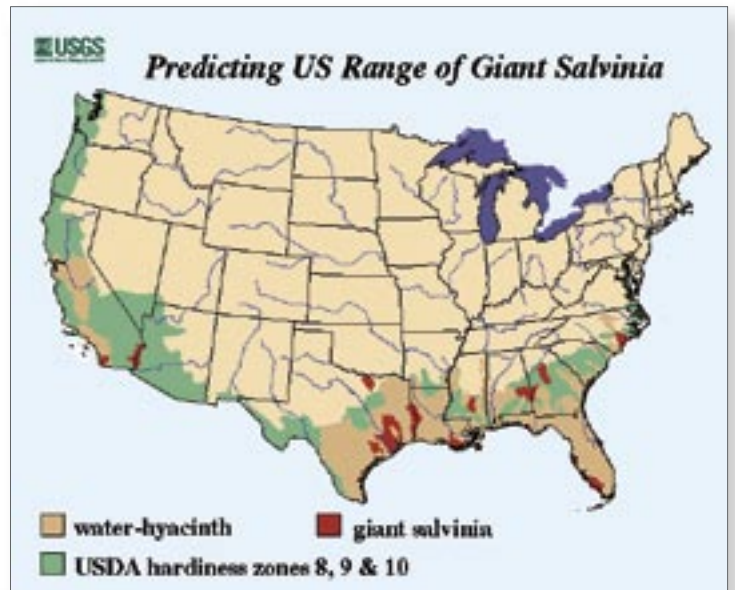
Weed Abatement

San Luis Valley complies with Colorado state legislation that mandates a county by county determination of the scope of the state's noxious weeds. Counties are required to find, identify, and catalog noxious weeds. Mobile GIS is used in the field to collect data with performance in the submeter accuracy range. Once weeds are located and identified, a few simple clicks of the unit's keys enter all the pertinent information. Then, with the help of satellite positioning, the exact spot is logged in just a few seconds. There is virtually no postprocessing of raw data for the file collection process.

GIS serves spatial information across the World Wide Web to tell customers what they need to know about regulations, crop changes, risk management, soils, policy, environmental constraints, and so forth. An agricultural network can also transfer vast amounts of information to and from technicians in the field, from department to department, or from agency to the public. Here are some examples.

Interdepartmental Data Sharing

Northrhine-Westfalia's Department of Agriculture in Germany has implemented an enterprise GIS that increases the efficiency of data sharing throughout the organization. Different departments concurrently use data. GIS provides users access to information about every farm in Northrhine-Westfalia (approximately 60,000 locations). The enterprise GIS also accommodates interagency data sharing. The system helps the department comply with the European Union's regulations. Since several German state agencies already have geodata servers and operating systems, these departments are able to integrate activities.



Weed Occurrences by County across the USA

Disease Management

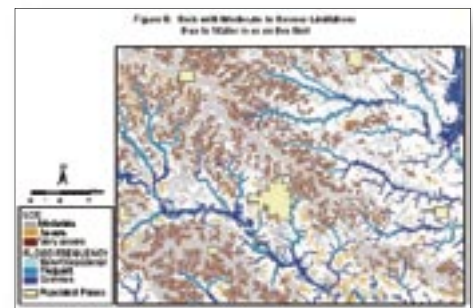
The Missouri Department of Agriculture is using GIS for contingency modeling for responding to potential foreign animal disease outbreaks. Using GIS, the department created The Exotic Newcastle Disease Map Book. This book provides first responders with critical information for handling an outbreak of the disease. Using handheld GPS units, first responders relay an accurate assessment of a situation back to the office. From this assessment, the state veterinarian determines an appropriate response for disease eradication. The assessment solution also calculates the number of personnel needed for quarantine control and traffic monitoring; moreover, it estimates animal populations located in proximity to the affected area. Furthermore, it determines the manpower needed for subsequent quarantine control and disease eradication efforts as well as the size of decontamination areas around an infected site. GIS also provides department staff with information for cleansing the infected site with minimal environmental impact.



ArcPad® for Field Data Capture

Risk Management

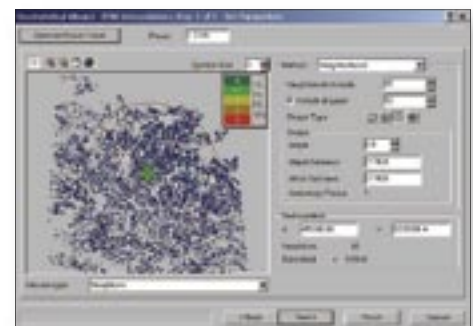
The U.S. Department of Agriculture Risk Management Agency (RMA) administers the nation's crop insurance program. RMA uses ArcGIS to spatially represent relationships of agricultural factors, business indicators, and geography. The output demonstrates important risk factors: decline in price, drought, hail, excess moisture, and insects. Depiction of soils indicates moderate to severe limitations (shallow, drought, strong soils). RMA also uses GIS in its business processes to provide predictive modeling and mapping tools for risk assessments. By comparing the number of policies sold to the number of farms in the area as reported by the U.S. census, RMA is able to create a strong visualization of underserved areas. GIS creates intelligent maps that show the types of insurance coverage held by area or county. For example, GIS maps show insurance memberships by rating levels of participation as high, medium, and low. GIS produces correlative analysis of participation by net acres at county levels. This information helps RMA target insurance campaigns.



Soil Limitations for Risk Analysis

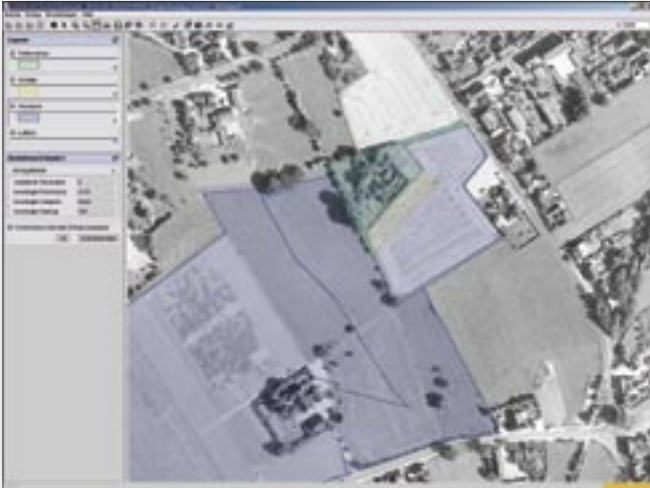
Rural Development

Canada's Saskatchewan Assessment Management Agency (SAMA) puts ArcGIS Geostatistical Analyst to work in determining agricultural land valuation. Saskatchewan has 65 million acres of agricultural land with approximately 50,600 farms. To determine land values, a productivity system of evaluation considers factors of climate, organic matter, soil texture, and soil profile. The rating is adjusted for topsoil depth as well as physical factors such as flooding, salinity, and frost. The ArcGIS Geostatistical Analyst modeler factors in these variables to determine equitable values. Ratings are further refined for determinants that increase the cost of productions such as topography, stones, hazards, and tree cover. Economic variables, such as proximities to cities or oil and gas areas, are also added to the equation. SAMA assessors claim that the GIS solution has proven to be statistically better at predicting property value than the traditional approach of using fixed neighborhood boundaries.

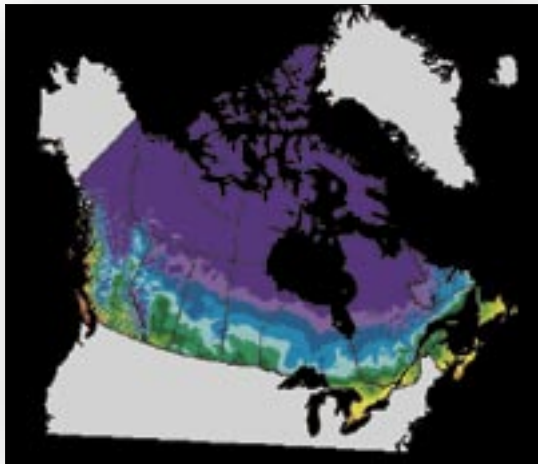


Land evaluation determines equitable values.

GIS at Work in Agriculture



Web services provide farmers with spatial imagery.



Plant Hardiness Zone Map

Subsidy Control

Rural Support Service in Latvia uses ArcGIS for its Land Parcel Identification System (LPIS) project. The project provides a basic infrastructure to accumulate the information on more than 300,000 field parcels located in Latvia. LPIS creates field parcels, records all changes after data editing, and automatically prints maps without any constraints, thereby providing agency employees and agricultural workers with updated information about specific parcels of land. LPIS works together with the European Union's Integrated Administration and Control System financial support and calculation system.

Regulatory Compliance

Northrhine-Westfalia German farmers use GIS Web services to file documentation with their Department of Agriculture. Most owners of small farm operations do not have GIS software on their desktops. Through GIS-enabled Web services, however, these farmers can complete aid applications on the Internet without GIS knowledge or GIS desktop software. The Web services allow farmers to identify, edit, or create field units based on aerial photographs and cadastral data, enabling them to complete their aid applications from the local farm office. Once a farmer has sent information to the server, the server application confirms the correctness of the data. Should this be incongruent with the geodatabase, farm bureau employees would take mobile GIS units into the field to resolve discrepancies.

Land Management

Agriculture and Agri-Food Canada is developing an Internet-based initiative that provides land use decision makers with one-stop access to current, local, and relevant land and water data. This new program, called the National Land and Water Information Service (NLWIS), is the result of partnerships with federal governments, provincial governments, nongovernment organizations, and industry groups. Their combined efforts are creating a spatial data infrastructure that provides one-stop Internet access to current, local, and relevant land and water data. Most recent projects that have used information from the NLWIS site include an interactive mapping application for supporting on-farm decisions, plant hardiness zone maps for Canada, distributions of principal soil and landscape attributes for Canada, and an interactive application that allows the user to view current and historical dugout levels and pasture grass growth for the prairies.

Build an Enterprise GIS

GIS can be used as a stand-alone solution or expanded for use throughout an agency accessing integrated databases and being put to work simultaneously by multiple users. ESRI supports both approaches with an array of tools for GIS professionals. ESRI business partners provide solutions to create a GIS that meets the most specific needs of an organization.

ArcGIS

ArcGIS, a family of software comprising a complete GIS, is built on industry standards. Out of the box, it provides rich functionality and applications—ArcView®, ArcEditor™, ArcInfo™—that can be configured to match an organization's needs. Built out of modern object-based components, these software programs share the same core applications, user interfaces, and operating concepts. ArcGIS is used for the creation, management, integration, analysis, display, and dissemination of spatial data. Strong visualization, editing, and analysis, along with advanced data management, distinguish the ArcGIS software family as the leading GIS software.

ArcIMS

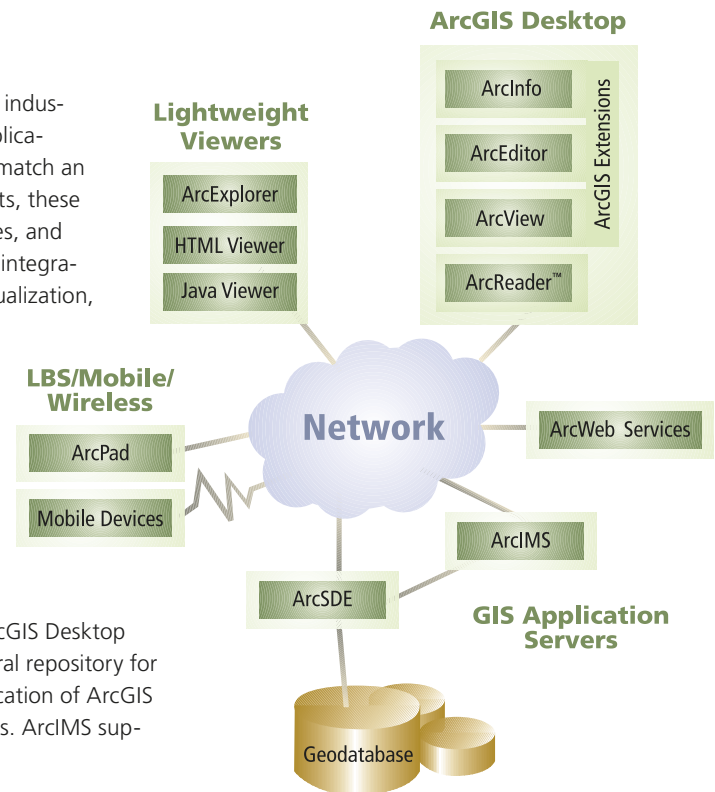
ArcIMS software is the foundation for distributing GIS data and applications on the Internet. By providing a common platform for sharing GIS resources, ArcIMS integrates information within and between agencies. ArcIMS can serve geographic information to a variety of clients, integrate services with ESRI's ArcGIS Desktop products, provide secure access to map services, and create a central repository for publishing and browsing metadata. ArcIMS extensions allow publication of ArcGIS documents and supply routing and point-to-point driving directions. ArcIMS supports Windows®, UNIX®, and Linux® platforms.

ArcSDE

ArcSDE is the GIS gateway for managing spatial data in a database management system. ArcSDE allows users to manage geographic information in commercial databases such as IBM® DBS® Universal Database, Informix®, Microsoft® SQL Server™, and Oracle® as well as serve ESRI's file-based data.

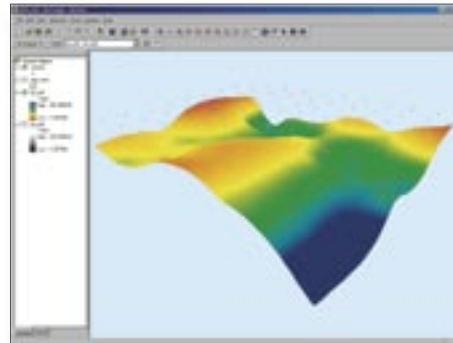
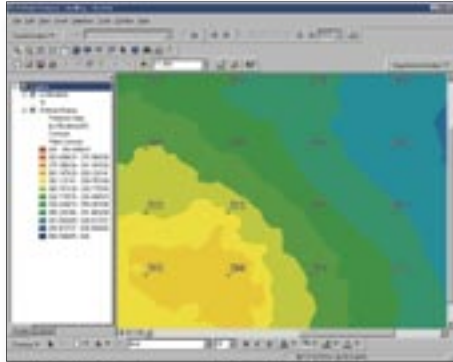
ArcWeb Services

ArcWeb™ Services deliver GIS data and functionality on the Internet. Subscribers to ArcWeb Services can include GIS content and capabilities in their applications without having to host the data or develop the necessary tools themselves. This results in a significant savings of time, expense, and computer resources. With terabytes of dynamic, up-to-date data available, the possibilities for using geographic information are limitless.



More ArcGIS Software for Agriculture

These optional GIS software solutions dramatically extend functionality capabilities of ArcGIS.



ArcPad

ArcPad software, a mobile GIS technology, makes data collection in the field easy and efficient. Using a handheld device, GIS data copied from a desktop computer or obtained from the Internet via wireless connection can be accessed virtually anywhere. Custom forms tailored to data collection activities make staff more productive and improve accuracy. GPS receivers can be added for direct capture of location data.



ArcGIS Spatial Analyst

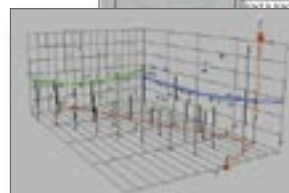
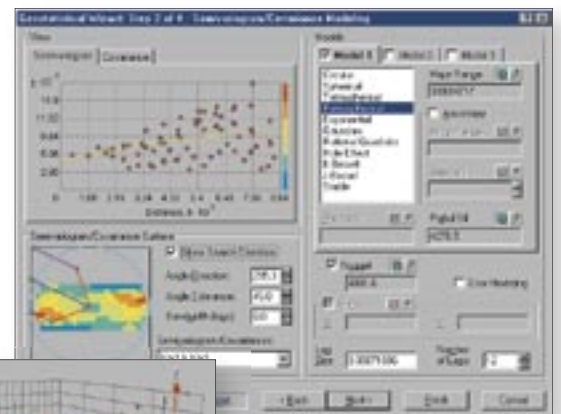
Take advantage of the broad range of powerful spatial modeling and analysis features available with ArcGIS Spatial Analyst. Create, query, map, and analyze cell-based raster data; perform integrated raster/vector analysis; derive new information from existing data; query information across multiple data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

ArcGIS 3D Analyst

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

ArcGIS Geostatistical Analyst

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



GSA Schedule

ESRI's GIS software and services are available to federal agencies through ESRI's GSA Schedule. To order GIS software from ESRI's GSA Schedule, call 1-800-447-9778. Refer to ESRI's GSA Schedule No. GS-35F-5086H.



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Learn More About GIS for Agriculture

ESRI knows that information is vital to every successful GIS implementation. Therefore, ESRI offers agricultural industry information covering topics related to GIS technology and applications as well as GIS.

GIS Solutions for Agriculture

GIS Solutions for Agriculture CD-ROM contains information on leading ESRI software programs that help many types of agriculture to obtain high-yield results. Animated slide shows illustrate how ESRI and business partner products provide best of breed GIS solutions for agriculture. Whether you are a farmer, research analyst, or crop manager or run an agribusiness, agency, or university, GIS provides the perspective you need for effective crop and enterprise management. The *GIS Solutions for Agriculture* CD-ROM is free and can be ordered online from www.esri.com/agriculture.

Training Opportunities

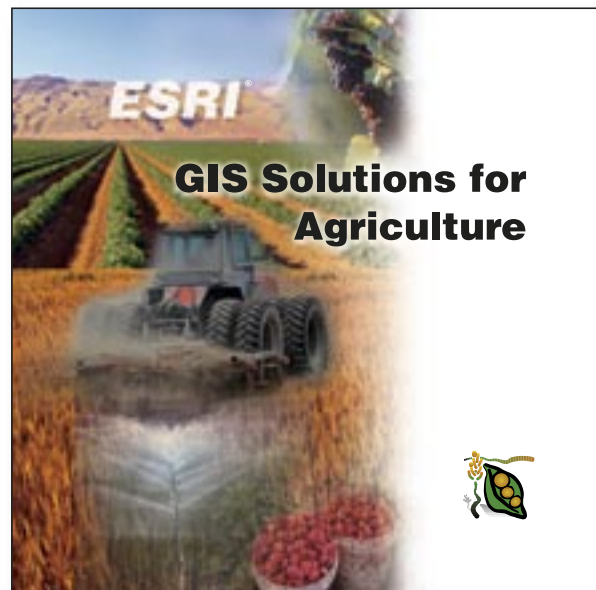
The newest way to learn GIS skills is through the online service Live Training Seminars. An ESRI technical expert delivers a live presentation to your desktop. Live Training Seminars are designed for those who want GIS training on a focused topic presented live by an ESRI technical expert.

Training seminars include these titles and many more.

- *Partnering for Community Action*
- *Understanding ArcSDE Table Relationships*
- *Understanding the ArcSDE Spatial Index*
- *What's New in ArcGIS 8.3*

The Live Training Seminars are free but only available to members of ESRI's Virtual Campus. To become a member, simply go to the Virtual Campus Web site and register. Once you are a member, you can receive recordings of ESRI's Live Training Seminars, viewable at your convenience.

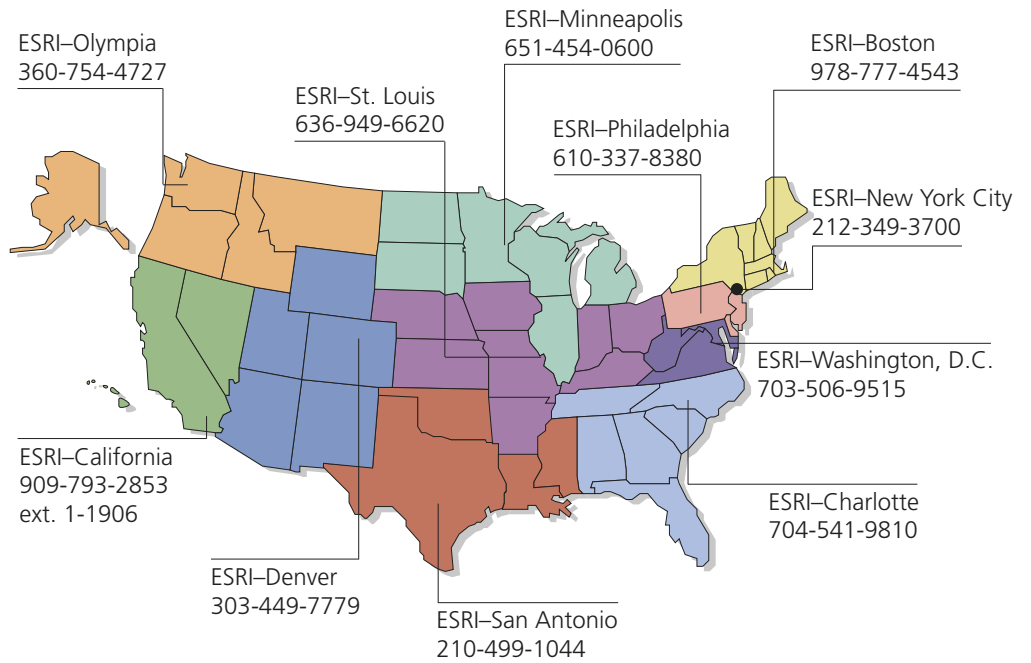
The seminars are 50- to 60-minute presentations that offer an interactive question and answer session with the presenter. They have scheduled start and stop times. Seminars are broadcast with streaming technology through a broadband connection to the Internet.



See the list of available Live Training Seminars by visiting the ESRI Virtual Campus at <http://campus.esri.com/campus/seminars>.

Visit the ESRI Agriculture Industry Web site and read *GIS in Agriculture* news, find out about trade shows in your area, and learn about the latest agricultural GIS solutions and tools at www.esri.com/agriculture.

Regional Offices



ESRI Corporate Headquarters

380 New York Street
Redlands, California
92373-8100, USA
Telephone: 909-793-2853
Fax: 909-793-5953
E-mail: info@esri.com

ESRI Europe

Stationsplein 45
3013 AK Rotterdam
The Netherlands

Post:
Postbus 29099
3001 GB Rotterdam
The Netherlands
Telephone: 31-10-217-7788
Fax: 31-10-217-7789
E-mail: europe@esri.com

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