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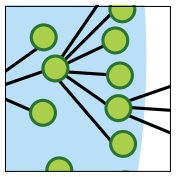
On Scale and Complexity and the Need for Spatial Analysis

By Carl Steinitz, Wiley Professor of Landscape Architecture and Planning Emeritus, Graduate School of Design, Harvard University



The best definition of *design* is that of Herbert Simon: "Everyone designs who devises courses of action aimed at changing existing situations into preferred ones." (Herbert Simon—*The Sciences of the Artificial*, 1968).

I come from a professional culture in which I began as an architecture student in a school of architecture; I then studied city and regional planning and urban design, and I have taught in a landscape architecture department and organized

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A Web-Based Solution for Planning and Policy Analysis

Community Analyst Now Available

Following a successful beta program, Esri is in the process of releasing Esri Community Analyst. This online GIS solution is specifically designed for policy makers, government agencies, and civic organizations that have little or no technical GIS experience. Through the online data and mapping tools, users can quickly explore the geographic characteristics of any area and develop the right strategies for policies and resource allocation in their communities.

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Find optimal locations for flu shot clinics in communities where there are large numbers of children in low-income areas.

Underpinning Land Management and Sustainable Development

GIS Grows in European Cadastres and National Mapping Agencies

A traditional cadastre is an official record of the dimensions and value of land parcels, used to record ownership and assist in calculating taxes. Today's cadastre, however, has evolved into a multipurpose land information system, as well as a foundational component of a nation's spatial data infrastructure (SDI). In most European countries, for example, the cadastre not only provides information about the ownership

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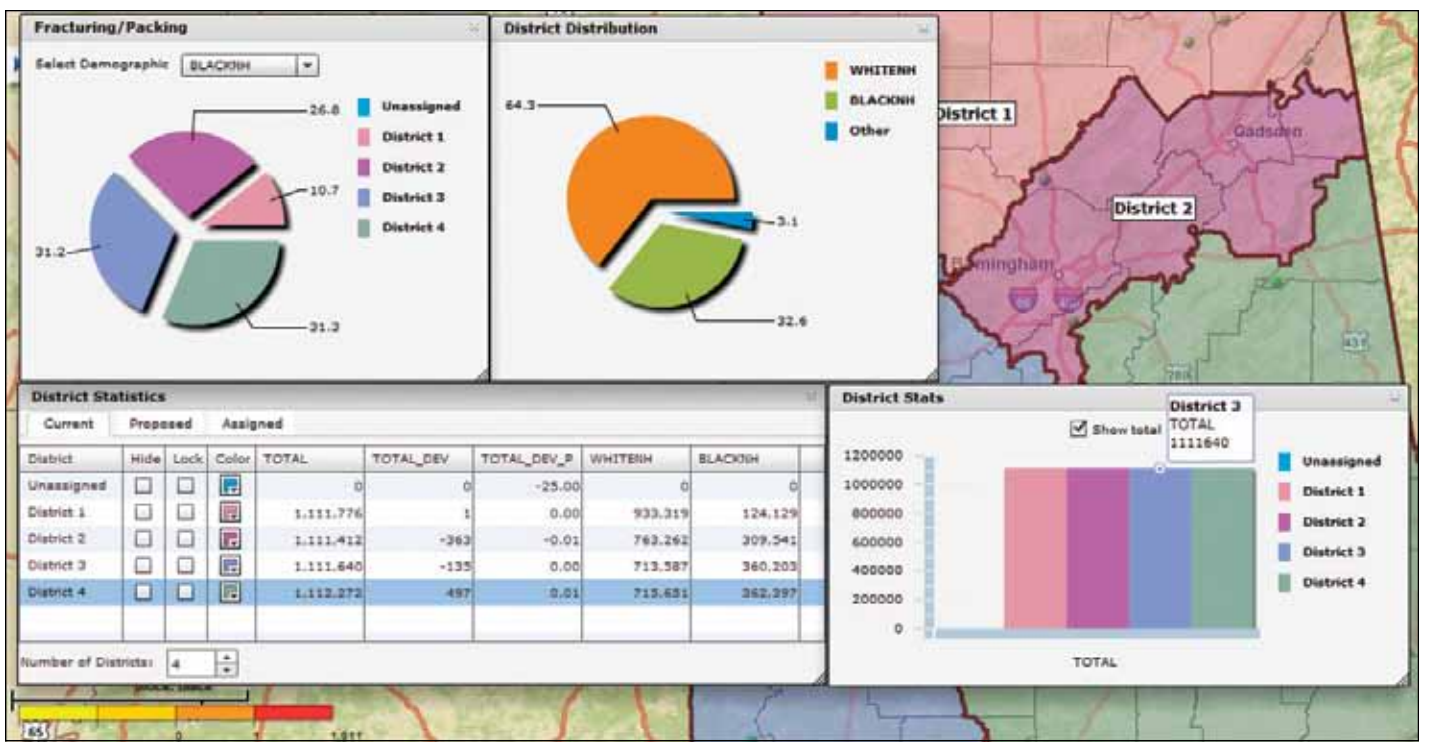
New Web Solution for Redistricting



Redistricting plans must aim to equalize the population of districts as closely as possible. **Esri Redistricting** allows users to compare information such as the total population or race in several districts, as well as identify unassigned or fractured areas. *See the full article on page 13.*

GIS-Based Traffic Light Project

Philadelphia Saves $1 Million per Year

The City of Philadelphia, Pennsylvania, is using ArcGIS software to implement its LED Traffic Lights Project, an ambitious traffic light replacement program funded in part by an American

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Kansas Signs ELA

The State of Kansas has signed an enterprise license agreement (ELA) with Esri. ELAs give state agencies unlimited access to core ArcGIS software that will enhance coordination, service delivery,

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New ArcGIS Online Content

ArcGIS Online basemaps published and hosted by Esri are freely available to all users regardless of commercial or noncommercial status or internal or external use. *ArcNews* is now providing regular updates on new content in a new regular feature.

See the full feature article on page 15.

Philadelphia Saves $1 Million per Year

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Recovery and Reinvestment Act of 2009 grant. With ArcGIS, the city's Department of Streets will track and manage the project, which will replace 87,000 incandescent light bulbs with energy-saving light-emitting diode (LED) bulbs. Estimated operational savings, resulting from significantly lower use of electricity, the greater longevity of LED bulbs, and the fixed department costs to replace bulbs, are expected to top $1 million per year.

In addition to saving money and field personnel time, Philadelphia's enterprise implementation of the system provides data access to other departments within the city, resulting in a significant return on investment.

Andy Mehos, GIS manager for the Department of Streets, says, "The opportunity to capture the asset data for the light replacement project, use it for other applications within the Department of Streets, and share it with other departments saves the city a considerable amount of time and money. It is significant enough to offset any cost of software development and the purchase of equipment. After observing our success in implementing this project, other city departments are considering similar GIS projects of their own."

The department employed Esri Partner geographIT to develop a customized GIS application integrated with ArcGIS that supplies a spatially enabled mobile solution for tracking street-related city assets. The application's bar code scanning capability provides a quick way to add an LED bulb record to the geodatabase while in the field. In addition to LED bulbs, the department is capturing asset data about traffic heads, traffic control boxes, and light and sign pole attachments with the application.

A video about Philadelphia's light replacement program, *The Recovery Act Is "Lighting Up" the Streets of Philadelphia*, can be seen at **esriurl.com/1726**.

For more information about Esri's public works solutions, visit **esri.com/publicworks**.

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GPS Is Being Threatened

By Joseph Paiva

In January, the Federal Communications Commission (FCC) granted a conditional waiver to LightSquared, a company with ambitions of providing wholesale mobile broadband service. LightSquared has radio spectrum licenses for use in communication satellites and now intends to install up to 40,000 high-powered, land-based transmitters that broadcast in the same band that its communications satellite channels now use. To do this, LightSquared needs approval from FCC to change the way the section of the frequency band allocated for satellite signals is to be used. The conditional waiver already granted allows LightSquared to continue development of the terrestrial network, and it can now broadcast high-powered signals in a section of the band formerly reserved for low-power signals from space.

Unfortunately for GPS, the section of the spectrum, referred to as the L-band, in which LightSquared will provide broadband service is immediately adjacent to the section of the L-band used by GPS. As people listen to their favorite FM radio station as they drive, they may experience interference when another station's transmitter is powerful, or nearby, or both. This is what researchers expect would happen with GPS should LightSquared ever be allowed to go operational. But the problem is much more severe—some estimates put the LightSquared signal at more than one billion times the power of signals from GPS as received by GPS receivers. Are there technical solutions? The fact is that any technical theory at this point is just that—a theory, untested, unproven, and unverified. The laws of physics make solving this problem very difficult. GPS has served us all extremely well for the last 30 years, in part because nearby frequencies have also been preserved solely for space-to-earth communications. Protection of the GPS service for all users has to be the number-one priority in the FCC process.

FCC has mandated GPS interference research. In response, LightSquared, the US GPS Industry Council, and others, are working on this study. One problem created by the FCC conditional waiver is that LightSquared is able to move ahead with its

infrastructure development assuming that viable solutions to the jamming issue will be found. For many users of GPS, theoretical fixes may not be sufficient.

What Can Be Done About It?
Stop FCC from issuing a Final Order in favor of LightSquared and prevent repurposing of the section of the L-band immediately adjacent to that used by GPS.

What Can You Do to Help?
Contact Congress. Members of the GPS survey community who are concerned by the proposal can send letters, e-mails, or faxes or call on their congressional representatives to contact the FCC chairman directly or the chairman of the Senate and House Commerce Committee. You can also voice your concerns about GPS interference by sending comments directly to FCC at fccinfo@fcc.gov. Don't forget to include FCC File No. SAT-MOD-20101118-00239 in your correspondence.

About the Author
Joseph Paiva, PS, PE, is a consultant to the geomatics industry—practitioners, manufacturers, and developers; educator; and writer. Dr. Paiva's experience includes private engineering, surveying, and mapping consulting practice; university educator; developer; and general manager for two leading geomatics products corporations.

Kansas Signs ELA

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and decision making between state agencies.

"The ELA is a really good idea and makes good sense for the way that we do business," says Ivan Weichert, GIS director for the State of Kansas. "Saving money is part of the benefit, but working smarter is even more important."

With the ELA, all requests for ArcGIS software will come through the state's Data Access and Support Center, which will provide Weichert and his team with a full picture of GIS implementations and initiatives throughout numerous agencies. The knowledge gained from this centralized coordination will help inform the agencies about activities in other parts of state government that could benefit them. It will also help Weichert eliminate redundant efforts.

"Our goal is to improve coordination of the state's GIS resources and develop infrastructure that improves efficient service and data sharing," Weichert says. "Those processes had been fractured, but now we have a tool that will help us achieve our goals."

GIS is critical to many business processes and workflows in a majority of the state's agencies. The Corporation Commission; Department of Health and Environment, Division of Emergency Management; and Department of Revenue are leaders in using GIS and strongly advocated the ELA. "It supports common government functions and provides a great framework for sharing data, information, and ideas," Weichert adds. "It is important to have strong GIS implementations throughout state agencies because decision makers want to make better decisions based on sound information."

In addition to agencies, legislators are increasingly using GIS to understand issues and make decisions. Ultimately, state chief technology officer Don Heiman would like to geospatially enable every bill, giving legislators and citizens a sense of place—the information that links what is done to where it's done. Once a bill is enacted, its effects could be tracked by geographic reference to measure whether it has the intended impact.

"Legislators have begun to see how important location is to understanding how the next bill they are going to introduce or vote on affects people in their district—with GIS, we can answer those questions for them," Weichert concludes. "We anticipate fast growth and high demand for GIS, especially regarding legislation and citizen engagement, and we want to be ready to deliver smart solutions with efficiency."

For more information on Esri ELAs, visit **esri.com/ela**.

On Scale and Complexity and the Need for Spatial Analysis

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landscape planning studies for more than 40 years. Working at a territorial scale—in which algorithmic thinking and spatial analysis are essential—is, in my opinion and in my experience, very different from what is taught to and practiced by most designers. I want to discuss the implications of scale and complexity, two themes that differentiate design activities and their need for spatial analysis methods. In doing so, I will purposely sharpen contrasts that are really more subtle and frequently mixed.

"Many devices which work on a small scale do not work on a large scale."

—Galileo

Scale Matters

Scale matters, and Galileo was right. Many methods, many processes, many ideas that work at one scale don't work at another scale. My school has architects, landscape architects, urban planners, and designers. We have a studio-dominant culture, and there are different scales of *problem*. Most students' studio sequence starts small and gets larger and more complex but does not include the full range of scales. Problems dealing with the landscape include placing a building on a site; designing a garden; and designing an urban complex in a difficult ecology, or a large urban park. Most students who think about the landscape stop at what can still be considered "project scale." They stop at the scale where the assumption is that you have a client, a site, and a program and eventually something will be built. Relatively few students, the ones who work with me at the end of their studio sequence, think about regional scale urbanization and regional conservation.

There are many people in the world who think in the other direction, from large to small. Geographers, cultural historians, hydrologists, geologists, ecologists, political scientists, and even lawyers and bankers tend to see things and work from large to small, and they almost never get to the details so important to architects and landscape architects. The question is, what is the lens through which we should look at the problem? I'm interested in the larger scales. I have spent a long time working at the territorial scale, and sometimes I get to the project scale but stop before the details. I tend to think from larger to smaller. (See figure 1.)

The focus of design decision changes with scale. At large scale, you are dealing with strategy; at middle scale, you are dealing with tactics; and at small scale, you are really dealing with details, and here the details do matter. The wise school mixes scale-direction but must recognize that there are real differences at the extremes of these two scales. At the large scale, if you make a mistake or decide something badly, you have a very high risk of harmful impact. The concept of risk dominates working at this scale. You want to minimize it. Why? Because the landscape is big, it has lots of people, lots of money, lots of change, and the larger decisions are very important. The benefits can be great, but the risks are serious.

As you go to a smaller scale, the risk goes down: I don't care so much if my neighbor has a modern house or a baroque garden. What's the risk to me? However, I do care greatly if I don't have drinking water. That's a very important risk. The greater the risk, the greater the need for serious analysis, and this is much more a need as scale-related risk gets larger.

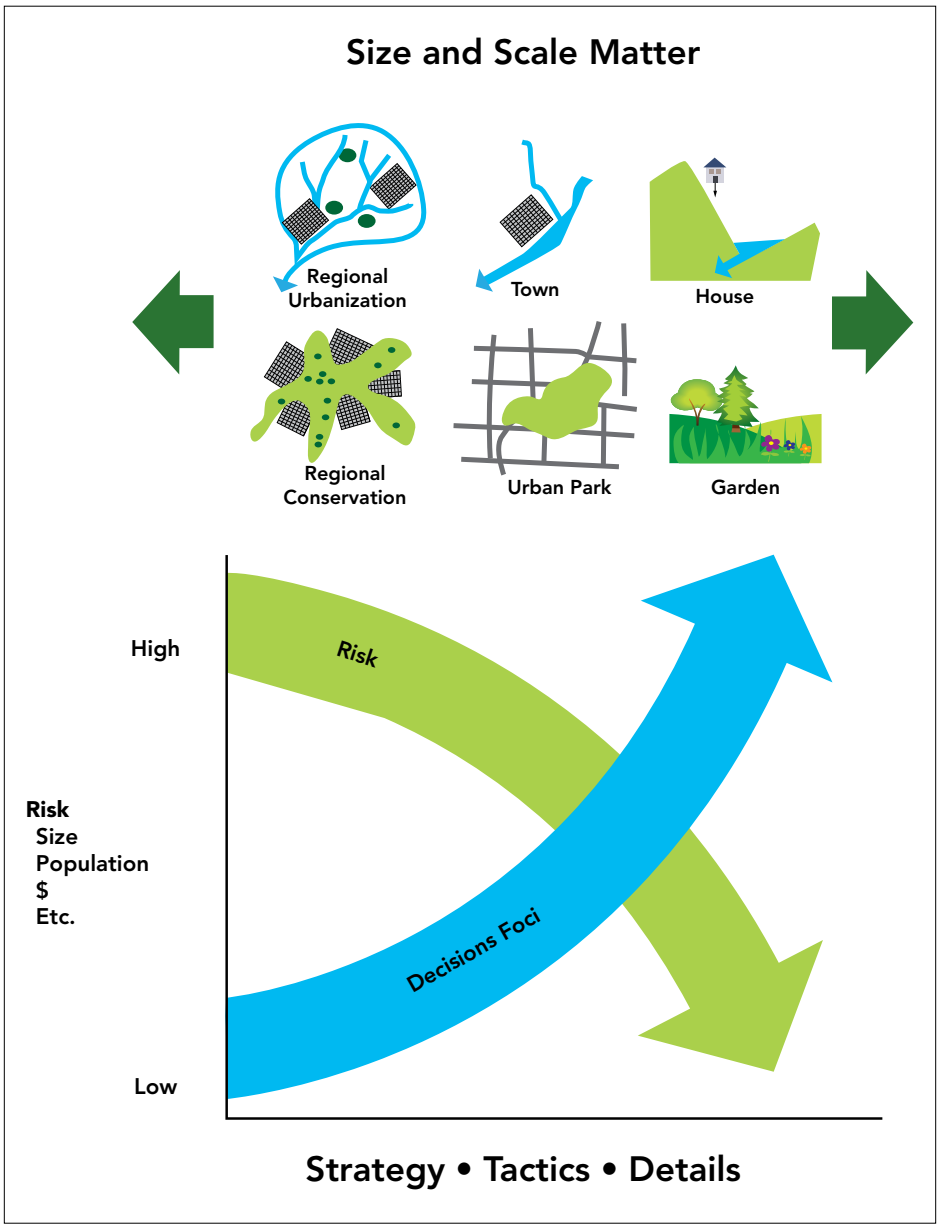

Figure 1

Minimizing social risk, economic risk, ecological risk, etc., makes a landscape plan essentially defensive. Here, the design processes emphasize *allocation*, deciding what goes where or where not. At a municipal or large project scale, it is more decentralized, with different professions, different neighborhoods, and different clients all coming together. At large project scale, the design emphasis is on *organization*, how different elements relate to each other. At small project scale, the emphasis is more on *expression*: what does it look like, what does it feel like? These are very different.

At large scale, you must have a high reliance on science, and you must have a much more complicated formal strategy. At the larger scale, the idea that you can make a simple *design concept* diagram and really see it on the ground is foolish; it doesn't work. At this scale, however, you must have much more public understanding, and this is not easy. At large scale, there is no single well-informed client. At small scale, there usually is. People normally understand their own house; they may understand their neighborhood. They usually don't understand their city, and they surely don't understand their regional problems. In a democracy, informing the public requires clarity and transparency in both assessment and presentation. There is necessarily a difference in roles between experts and the popular will in decision making.

As a result, at large scale, landscape decisions are made by experts and elected people and unelected people. Elected people are the people you vote for, your government. Unelected people are the heads of banks and development companies who make planning decisions. These larger decisions are not normally made by popular vote. However, at small scale, everybody makes decisions.

As the spatial scale gets smaller, you have more of a demand-based strategy. What I mean by that is that a client says, I want something! You happen to agree, and you do it. It is based on demand; it is based on the push of the market. At large scale, it is more supply based and defensive: you have to understand the landscape, you have to understand the cultural values, you have to establish priorities, and then you have to defend them.

At small scale, you can get famous for making new changes, while at large scale, you do not generally get famous for protecting old landscapes. These are very different. A good analogy is the first law of thermodynamics. Energy can be converted to light, or heat, or any combination. Energy, in our case, is the investment of cost, time, research, people, expertise, etc. Light means knowledge; heat means excitement. At large scale, there is usually little that is exciting relative to the newness sought and seen in the small scale.

There is another important complication related to scale. There are two fundamentally different ways to make a design. (I am purposely making this contrast, fully aware that the two ways are frequently combined.) The first way is anticipatory and deductive. You are sitting in the middle of the night, at your table, and you have an idea. And you see the future. You see the future, and then you have to figure out how to get there. Every designer has had this experience, likely many times. You have thought about the problem and you see the solution, and then you have to figure out how you get there, and you almost always fail. It's hard!

The other way is explorative and inductive. You basically put together a set of issues and choices—a scenario. A scenario is a set of assumptions and policies that guide you into the future. There are basically two ways to navigate this scenario chain. In the first and typical way for designers, one goes out as far as one can, and recycles back when confronted with a design problem. You decide to do this and this and this, etc. The second way is to simultaneously test several different scenario combinations and systematically compare them before proposing a solution. You realize that you could do this, this, or this; let's suppose I do *this*. I then can do this, this, or this; let's suppose I do *this*, this one, or maybe I should have done it this way.

And either way, you almost always fail, because a typical large plan might have a sequence of 20 to 50 important decisions. And if you can make 20 correct decisions in a row, you should be a gambler in Las Vegas. That's why you frequently say, I've done enough, I don't care what color the carpet is. It's normal. It is a function of scale, of the lens through which you assess the problem and its solution.

At small scale, the deductive method is absolutely appropriate. The history of architecture and the history of landscape architecture are full of examples. The idea—let's make a white garden, let's make a round building—these are appropriate inspirations. But at large scale, the inductive methods are better. Why? Because if you make the wrong decisions in the beginning, you have created the likelihood of a very high risk. Early, high-risk choices require the most serious assessment methods.

In making a design at large scale, you have four fundamental considerations. One of them is history. You must know the history of the place, and especially the history of the plans for the place. I have never in my life worked in a place that didn't already have past plans. And the people who made them were not stupid.

The next things are facts. Facts will not change in the life of your own plan and your own study. I might work toward 20 years or 30 years in the future, and the bedrock geology is not going to change (if it is not volcanic).

Then there are constants, which are the things that are going to happen during the course of your plan. You must find out about them, because if you don't, your plan will never be implemented.

And then there are the contingencies, the things that could happen, and here it is really important to capture the major generating assumptions and their alternative choices. You have to be able

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On Scale and Complexity

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to say, either here, here, or here. The beginning assumptions in the scenario chain are the most important, because if you make the wrong first steps, you will end up wrong. If you make the right first steps, you still may end up wrong, but you have a better chance. (See figure 2.)

Complexity

My second theme, complexity, interacts with scale. It represents the level of complexity that the analytic methods underpinning any design must achieve, especially in its understanding of process models. I think there are six questions that must be asked in any design problem and at any scale. They are

- How should the state of the landscape be described in content, space, and time? This question is answered by representation models, the data upon which the study relies.
- How does the landscape operate? What are the functional and structural relationships among its elements? This question is answered by process models that provide information for the several assessments that are the content for the study.
- Is the current landscape working well? This question is answered by evaluation models, which are dependent on the cultural knowledge of the decision-making stakeholders.
- How might the landscape be altered, and by what policies and actions, where, and when? This question is answered by the change models that will be tested in the research. They are also data, as assumed for the future.
- What difference might the changes cause? This question is answered by impact models, which are information produced by the process models under changed conditions.
- How should the landscape be changed? This question is answered by decision models, which, like the evaluation models, are dependent on the cultural knowledge of the stakeholders and responsible decision makers.

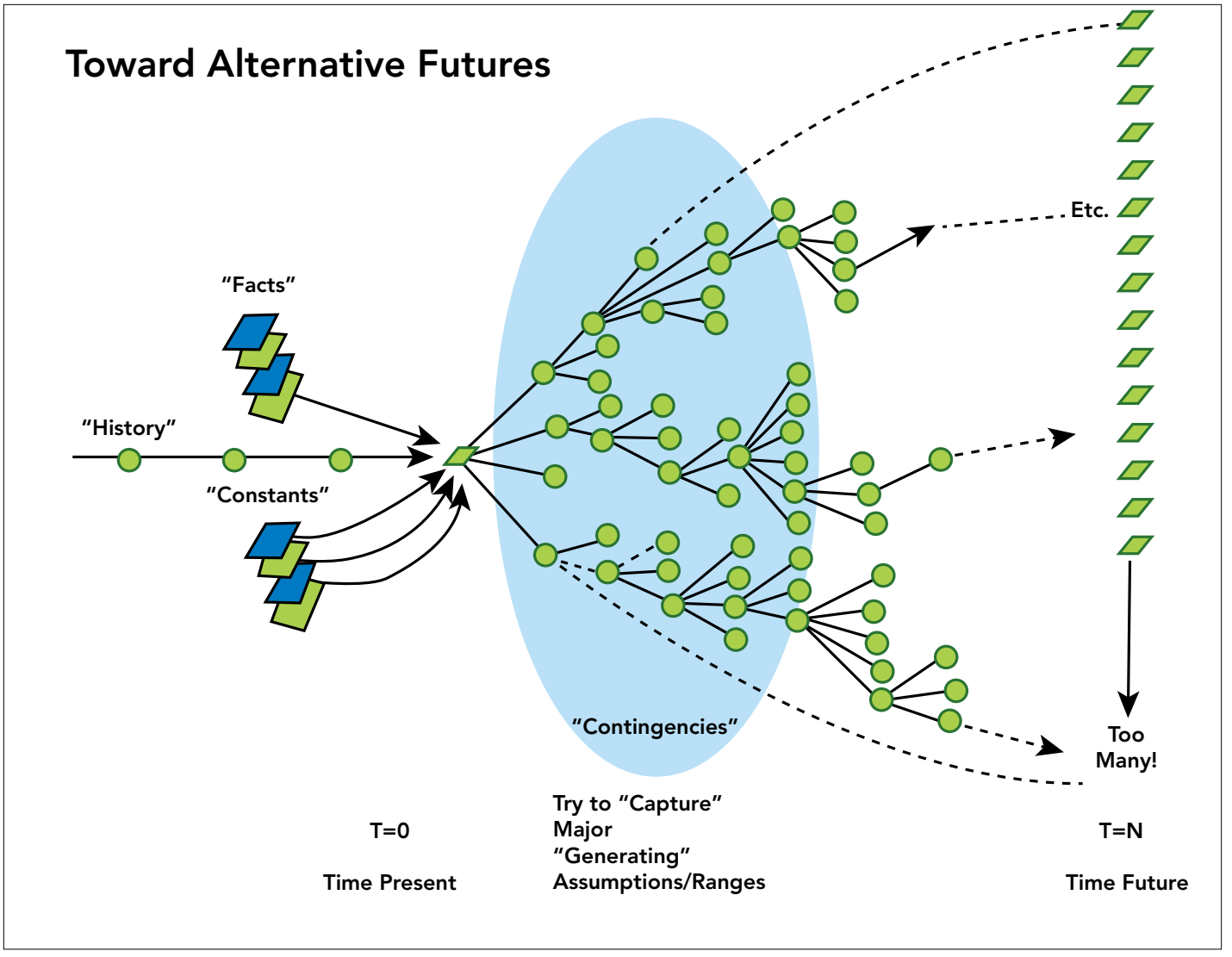


Figure 2

Furthermore, I believe that there are eight levels of analytic complexity associated with process models. Each of the eight levels is organized to answer a cumulatively more complex set of questions. I think that the larger the scale and the consequent greater risk, the more the analytic methods should aim to achieve more complex levels. At smaller scales and with less risk, simpler analytic levels may suffice.

- Direct models ask, What is here? They are based on direct personal experience. If your feet are wet, don't build here.
- Thematic models add, Where and how much?
- Vertical models add, What else?
- Horizontal models add, What size and shape?
- Hierarchical models ask, What happens at different nested scales?
- Temporal models add, What if . . . and when?
- Adaptive models add, From what and where to what and where?
- Behavioral models add, From whom and where and when to whom and where and when?

Finally, the Bottom Line

What are the spatial-analytic needs of designers? It all depends on scale and complexity. There cannot be one answer. At its simplest, and frequently at smaller scales, the direct personal experience of the designer may be sufficient, and without *any* formalized analysis. At the other, large-scale, extreme, it will frequently require a

very complicated and costly effort, and yet it also may suffer from a lack of public understanding. Answering this dilemma and deciding on the appropriate methods and their level of complexity requires judgment and experience; there is no other way at this time. (See figure 3.)

However, there is a potentially important research study that can be derived from this situation. There are many models of processes, such as erosion, hydrology, forest succession, traffic, air pollution, noise, and visual preference. Comparing the efficiency and efficacy of process models across scales and levels of complexity might result in a better understanding of which combinations are the most appropriate fit for any design problem. This comparative research, and the resultant ability to categorize the applicability of the many analytic models that already exist, would be a significant step toward the theme of this article. It would certainly help the very broad-ranging community of designers. (See figure 4.)

"It is the mark of an instructed mind to rest satisfied with the degree of precision which the nature of the subject admits, and not to seek exactness where only an approximation of the truth is possible."

—Aristotle

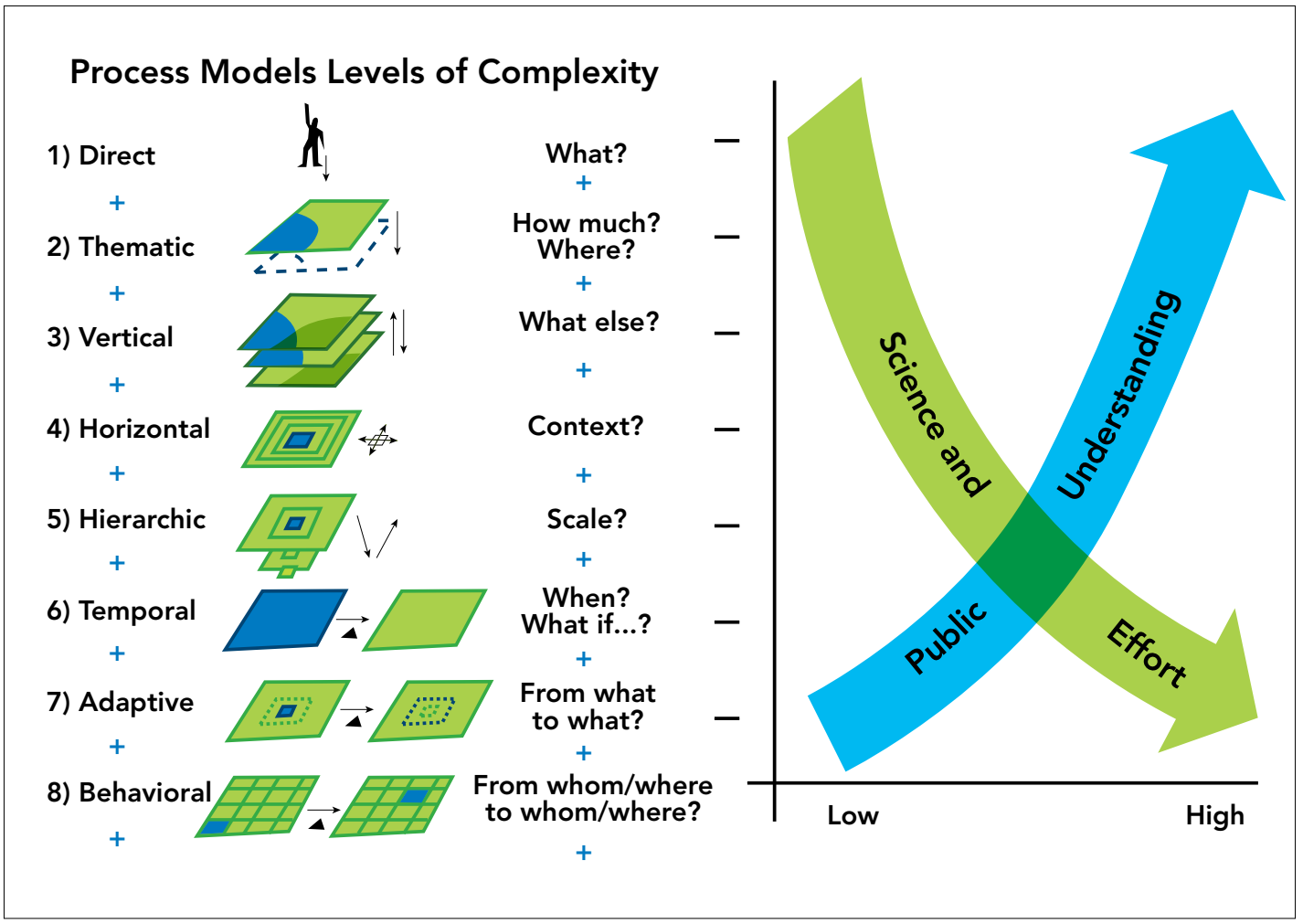


Figure 3

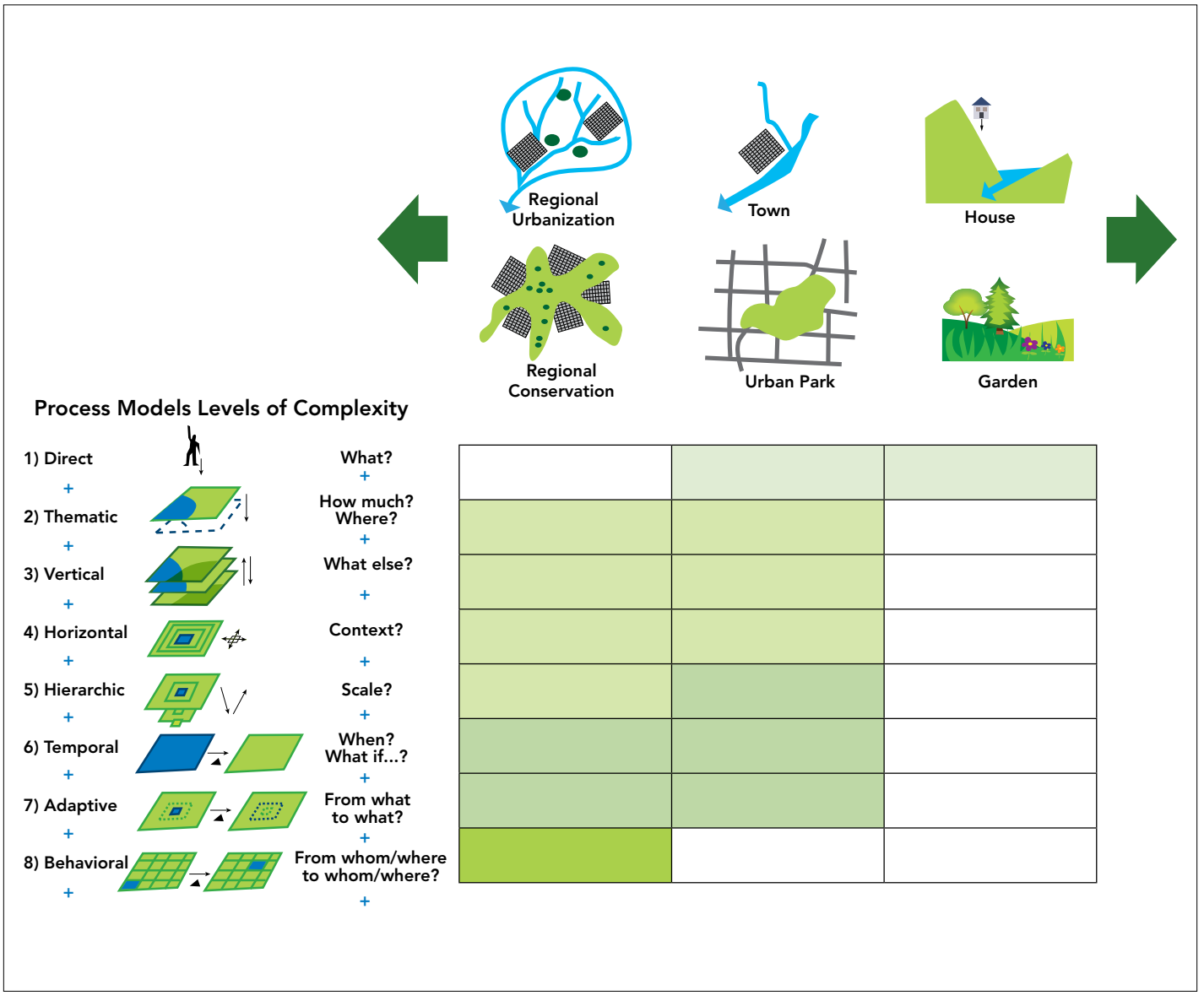


Figure 4

About the Author

Carl Steinitz is Alexander and Victoria Wiley Professor of Landscape Architecture and Planning, Emeritus, at Harvard University Graduate School of Design and Honorary Professor at the Centre for Advanced Spatial Analysis, University College London.

He began his affiliation with the Harvard Graduate School of Design as a research associate in the Laboratory for Computer Graphics and Spatial Analysis in 1966. He has held the position of Professor of Landscape Architecture and Planning at the Graduate School of Design since 1973.

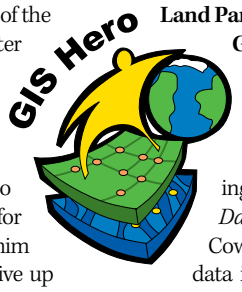
Professor Steinitz has devoted much of his academic and professional career to improving methods to analyze large land areas and make design decisions about conservation and development. In 1984, the Council of Educators in Landscape Architecture (CELA) presented Professor Steinitz with the Outstanding Educator Award for his "extraordinary contribution to environmental design education" and for his "pioneering exploration in the use of computer technology in landscape planning, especially in the areas of resource management and visual impact assessment." In 1996 he received the annual Outstanding Practitioner Award from the International Society of Landscape Ecology (USA). In 2002, he was honored as one of Harvard University's outstanding teachers. Professor Steinitz is principal author of *Alternative Futures for Changing Landscapes*, Island Press, 2003. He is presently writing a book for Esri Press.

For more information, contact Carl Steinitz (e-mail: steinitz@gsd.harvard.edu). This article was adapted from a presentation given at the Santa Barbara, California, Specialist Meeting on Spatial Concepts in GIS and Design, December 15–16, 2008.

Saving the World, One Parcel at a Time


David J. Cowen

Since 1967, Dr. David J. Cowen—the current chair of the National Geospatial Advisory Committee (NGAC)—has focused his research and teaching interests on the development and implementation of GIS in a wide range of settings. A distinguished professor emeritus and former chair of the Department of Geography, University of South Carolina (USC), he established one of the first academic programs in GIS. Before chairing the Department of Geography, Cowen directed the College Computing Center and served as interim vice president for computing. The university became Esri customer number seven, one of the first to use Esri software. His management of the College of Liberal Arts computer center and teaching placed USC in a leadership position as computers and computer programming became ubiquitous in everyday business and academic life. When he was asked to be the permanent vice president for computing, his wife Sandy reminded him where his heart lies: "'You'd have to give up your GIS stuff,'" Cowen laughs as he remembers her words of advice that kept him on a path paved with accomplishments.



Throughout his career, Cowen has been involved in many projects ranging from decision support systems, economic development, and school performance to land-use changes and real estate. Even in retirement, Cowen continues in his advocacy of GIS, serving as the chair of the Department of the Interior's NGAC and as a member of the National Research Council (NRC) Board on Earth Sciences and Resources and as a national associate of the National Academy of Sciences, consulting with the US Census Bureau on its modernization program, as well as serving as an adviser to Pennsylvania State's Geospatial Revolution Project.

Seeing Areas Through the Lines

Cowen began his long and storied career receiving both bachelor and master of arts degrees in economic geography from the State University of New York at Buffalo. He went on to earn a PhD in geography from Ohio State University in 1971. His dissertation research in 1969 provided the impetus for his career in GIS. Motivated by the need for tools to map and analyze the movement of manufacturing firms, he wrote his own FORTRAN routines to calculate measurements and generate maps on pen plotters.

Afterward, Cowen moved to South Carolina, where he devoted time and energy to teaching students and evangelizing the use of GIS in the state. His vision helped promote the adoption of the technology throughout South Carolina. "Computer programmers would look at coastal maps and see just a bunch of boundaries," says Cowen. "I saw these not as lines but as areas that could be calculated, shaded, and analyzed." As a result, the State of South Carolina implemented one of the first Coastal Zone Management Plans with a complete inventory of existing land uses.

Cowen has influenced many people, as Tim De Troye, GISP, state GIS coordinator for South Carolina and president elect of the National States Geographic Information Council, explains: "I have known Dave Cowen for 16 years. My first exposure to him was as a master's student at USC, where I took an independent study course with him on GIS. When I decided to return to school to pursue my PhD, my one condition was to have Dave as my dissertation adviser. Our paths still cross, and I appreciate the valuable insight he provides. I'm continually amazed by the great number of people in the profession I run across who have been positively impacted either by working with him directly or by reading his work."

Doug Calvert, chairman of the South Carolina GIS Coordinating Council, agrees: "Dr. Cowen has been referred to by many as the 'father of GIS' in South Carolina. His influence will persist through the multitude of students he taught now working in GIS, as well as his tireless efforts promoting GIS solutions for state and national issues. He has been a longtime champion for GIS coordination here in South Carolina."

Land Parcels Represent the Critical Geographic Dimension

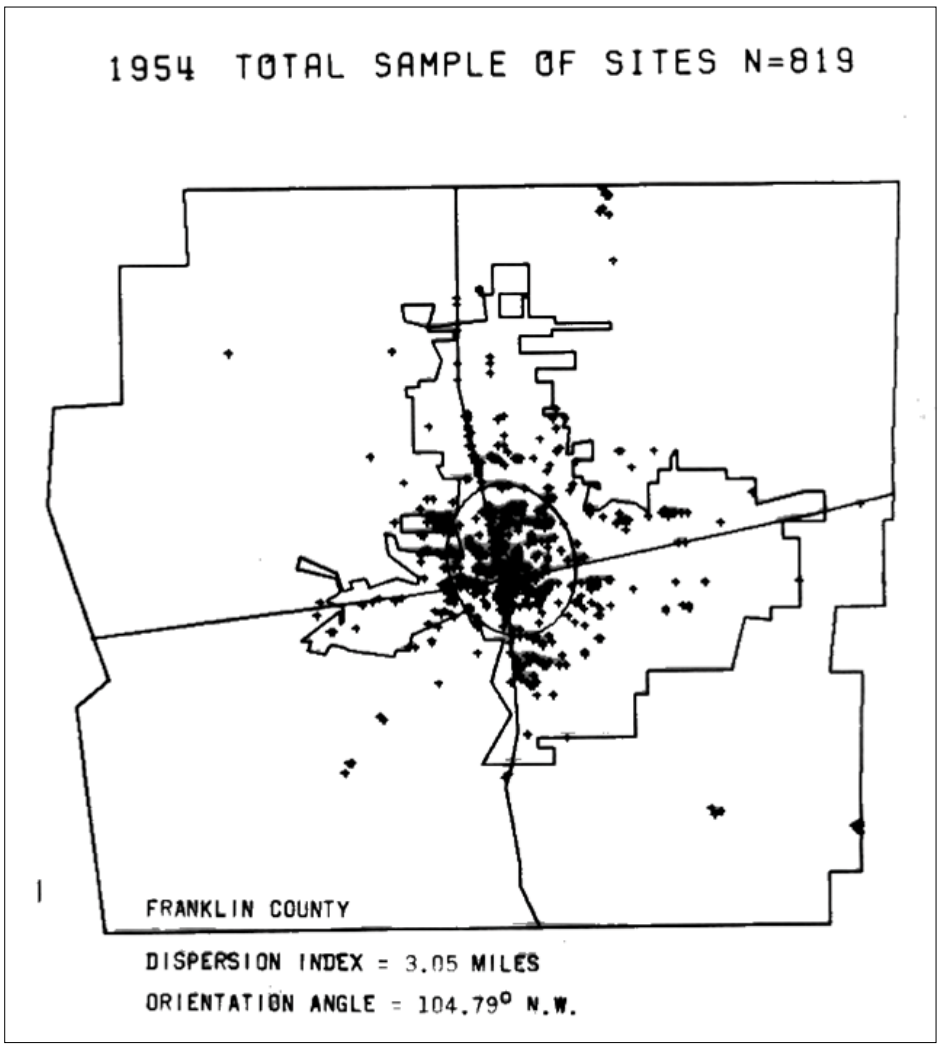
Cowen's impact and desire to apply GIS analysis earned him Esri's Lifetime Achievement Award in 2005. Afterward, Cowen devoted time chairing NRC's study *National Land Parcel Data: A Vision for the Future*. For the study, Cowen examined the status of land parcel data in the United States. He believes that land parcels represent the critical geographic dimension to analyze the use, value, and ownership of property. Cowen's interest in this subject is particularly important, as the public sector questions whether it is technically or economically feasible to integrate parcel data. Several private-sector firms, including insurance and real estate firm CoreLogic, have raced to complete just such a system. Today, businesses are finding that parcel data is critical to their business applications.

Under Cowen's direction, the committee of 12 experts from all levels of government and the private sector developed a vision and series of findings and recommendations. The committee envisioned a system employing modern, distributed database concepts and practices similar to those employed in many local governments or businesses. Conclusions from the study were that a nationally integrated land parcel database is necessary, feasible, and affordable.

Opportunities Arise out of Crisis

Since the recent mortgage crisis in the United States, the need for federally mandated parcel data was again investigated, and Cowen served on the Cadastral Subcommittee Mortgage Study Team Steering Committee. The Federal Geographic Data Committee (FGDC) Cadastral Subcommittee met with the International Association of Assessing Officers in 2009 to explore the potential uses of land parcel data for more effective management of mortgage and financial oversight programs and activities.

The recommendations from the steering committee pointed again to a national parcel database and included the need to add local parcel ID numbers to Home Mortgage Disclosure Act data that would serve as a link to a wide range of attribute information. This information could be used in a parcel early warning system, much like that used at the Centers for Disease Control and Prevention to track early warning indicators for public health. This national system would detect early indicators of a financially distressed housing and mortgage market. As a result, the Dodd-Frank Wall Street Reform and Consumer Protection Act includes amendments to the 1975 Home Mortgage Disclosure Act. FGDC also made a national perspective on land parcels the focus of its 2009 Annual Report.



Motivated by the need for tools to map and analyze the movement of manufacturing firms back in the early 1970s, Cowen wrote his own FORTRAN routines to calculate measurements and generate maps on pen plotters.

Think Globally, Act Locally

During his tenure at USC, Cowen directed 45 master's students and 11 PhD students, many of whom are now leaders in the academic and public- and private-sector GIS industry. "It is always great to have a teacher, mentor, and friend all wrapped into one person," says Anne Hale Miglarese, a principal with Booz Allen Hamilton and past chair of the National Geospatial Advisory Committee. "Through the years, Dave has always stayed on the edge of the technology, curious and energized by driving innovation. This intellectual curiosity has served us all well, and I, for one, continue to learn from him."

Even in retirement, Cowen continues to educate those around him in the capabilities of GIS. These days, he can be found at the USC Columbia campus evangelizing the use of GIS not for mapping parcels across the United States but focusing on the university itself. Through his guidance, facilities managers are looking at how GIS can create a comprehensive geospatial database that includes everything aboveground, on the ground, and underground.

"We saw the need to have emergency medical services, police, and our maintenance team know where everything is on campus, so campus safety and protection have driven our desire to map out all the utilities," says Don Gibson, assistant director of maintenance services. "We have all this talent in the university, and we have a world-class program in GIS studies. Fortunately for us, Dave Cowen is available to assist us on this project."

For more information, contact David Cowen (e-mail: cowend@sc.edu).

GISP and Esri Technical Certification Programs Are Complementary

By Sheila Wilson, PhD, Executive Director, GISCI

In January 2004, the GIS Certification Institute (GISCI) introduced GIS Professional (GISP) certification as a way to promote competent and ethical professional practices. Since then, nearly 5,000 practitioners from across the United States and around the world have earned GISP certification. This year, Esri announced its Technical Certification Program by which GISPs and others can demonstrate proficiency with Esri technologies. By comparing the features of the two programs, this article shows how the GISP Professional and Esri Technical Certification programs complement each other and advance the GIS profession (see table 1).

Comparing Certification Criteria

GIS professionals earn GISP certification by documenting relevant educational achievements, professional experience, and contributions to the profession and by affirming their commitment to ethical practices. Esri Technical Certification requires a passing score on an examination that demonstrates expertise in desktop, developer, or enterprise software.

Comparing Evaluation Procedures

Applicants for GISP certification submit to GISCI detailed portfolios containing official transcripts, employer letters, and other original evidence to confirm that applicants have fulfilled the requirements outlined in table 2. Both GISCI staff and volunteer GISPs review applicants' portfolios to determine eligibility for certification.

Portfolio-based certification made sense when GISCI was established, since no authoritative specification of geospatial competencies existed at that time. In July 2010, GISCI announced a GISP Certification Update Initiative that could add an examination to GISP certification requirements. The US Department of Labor's new Geospatial Technology Competency Model, also released in 2010, provides an unprecedented foundation for professional certification based on competency. Meanwhile, however, GISP certification remains a portfolio-based process.

To achieve Esri Technical Certification, candidates must pass a rigorous, computer-based, multiple-choice-format examination. Esri worked with a leading testing industry consulting group to develop the examinations. Content was developed in partnership with subject matter experts from Esri and input from Esri Partners, distributors, and select users. Currently, Esri has five certification examinations, with the remaining eight rolling out later in 2011 and 2012. Exams are offered only in English at more than 5,000 testing locations worldwide. Esri recommends workplace experience combined with GIS education and Esri training courses as the best preparation for its exams (see table 3). Esri training classes count toward education points for the GISP certification, and work experience falls in the professional experience category.

Comparing Certification Levels

Esri Technical Certification exams are offered at two levels: Associate and Professional. Each level reflects a recommended set of skills, knowledge, and experience using Esri technology. GISP certification is offered at one level only—the GIS Professional—although an internal committee has proposed that GISCI add an Associate level as part of its GISP Certification Update Initiative.

	GISP Professional Certification	Esri Technical Certification
Certification criteria		
Documented professional experience	•	
Documented educational achievement	•	
Documented professional contributions	•	
Informed commitment to ethical practice	•	
Proficiency in Esri desktop software use		•
Proficiency in Esri application development		•
Proficiency in Esri enterprise systems design and management		•
Evaluation procedures		
Peer review of professional portfolio	•	
Examination		•
Certification levels		
Professional	•	•
Associate		•
Costs		
Initial certification	$250	$225 per exam
5-year renewal	$115	
Benefits		
Classes and work experience leading to the exam count toward GISP certification.		•
Provides milestones that guide continuing professional development	•	•
Confers distinction on certified individuals and their organizations	•	•
Helps organizations identify qualified workers	•	•
Strengthens the profession and benefits society by promoting competence	•	•

Table 1: Comparison of GISP and Esri Technical Certifications.

	Requirements
Education	A bachelor's degree or equivalent higher education in any field, in addition to some specialized formal education related to the *GIS&T Body of Knowledge*
Experience	A minimum of four years' professional experience
Contributions to the Profession	Substantial contributions to the GIS profession, such as volunteer service to professional or community organizations, presentations, publications, and relevant awards
Professional Ethics	Affirmed compliance with GISCI's Code of Ethics and Rules of Conduct

Table 2: GISP Certification requirements.

Comparing Costs

The initial application fee for GISP certification is US$250. GISPs must renew their certification every five years by documenting continuing professional development. The renewal fee is currently $115. No renewals are required for Esri Technical Certification. Candidates pay a $225 one-time fee for each exam. As the program and software evolve, exams will be evaluated at each version release to determine a need for updates. Having the most current version of a certification will be a personal decision for each candidate.

Comparing Benefits

GISP certification and Esri Technical Certification benefit individual practitioners, their employers, and the GIS profession in complementary ways. While GISP certification ensures breadth of education and experience related to GIS practices, Esri Technical Certification denotes technical expertise with ArcGIS tools and techniques and use of Esri technology.

Bottom Line

In 2010, *Money* magazine (www.Payscale.com) included geographic information systems analyst in the list of the 100 best careers. Also in the past year, the Department of Labor estimated that the geospatial industry will need nearly 150,000 additional GIS professionals by 2018. GISP and Esri Technical Certifications together provide a sound professional development strategy for current practitioners, as well as those who aspire to challenging, rewarding, and meaningful careers in the GIS field.

For more information about GISP certification, visit www.gisci.org. GISCI is a 501(c)(6) nonprofit organization dedicated to the advancement of the GIS profession. GISCI is governed by a board of directors that includes representatives from five member organizations: the Association of American Geographers (AAG), the Geospatial Information & Technology Association (GITA), the National States Geographic Information Council (NSGIC), the University Consortium for Geographic Information Science (UCGIS), and the Urban and Regional Information Systems Association (URISA). See www.gisci.org/PDFs/GISCI_press_release_7-8-10.pdf for more information about the GISP Certification Update Initiative.

For more information about Esri Technical Certification, visit esri.com/certification or e-mail questions to certification@esri.com.

Table 3: Esri Technical Certifications. Certifications in bold are available now.
* Denotes certifications available later in 2011 and 2012.

European Cadastres and National Mapping

Recent Deployments in Ukraine, Russia, and Bulgaria Strengthen Land Information Management Across Europe

continued from cover

Highlights

- Esri's GIS platform technology is used by many of Europe's NMCAs.
- Surveyors are able to submit cadastral data electronically.
- A new case handling system brings both text registers and cadastral index maps into an integrated GIS.

and value of land but may also include information on land use; legal restrictions; regulations concerning how land can be used; and the registration of important assets or infrastructure, such as utilities.

As the demands on Europe's national mapping and cadastral agencies (NMCAs) increase and their role continues to broaden, the fundamental importance and value of using GIS also grows. GIS technology allows NMCAs to not only run their core business national cadastre effectively and efficiently but also integrate it with other themes of information in the national SDI. In so doing, NMCAs can meet many other requirements for land and geographic information, particularly in the context of sustainable development and better land management.

Esri's GIS technology is the preferred platform of many of Europe's NMCAs. Cadastral and land registration systems vary across Europe, reflecting different historical backgrounds, cultures, legal frameworks, and organizational models. The following examples show how Esri is supporting successful cadastral systems across Europe.

Lithuania's Cadastre, Valuation, and Address Management System

Lithuania's State Enterprise Centre of Registers (SECR) is responsible for the nation's real property cadastre and register, address register, and register of legal entities. It also performs real estate valuation for taxation purposes. SECR uses Esri technology for computer-assisted mass appraisal and to update, manage, and distribute cadastral and real estate information for some 2 million land parcels, 700,000 buildings, and 500,000 engineering constructions and utilities.

All of Lithuania's real estate records and cadastral data are integrated into one system. The digital cadastral map contains a wealth of information on administrative boundaries of counties, municipalities, cities, and settlements; centerlines of streets and roads; cadastre units and blocks, land parcel boundaries, and reference point coordinates; centroids for buildings and addresses; centerlines of engineering utilities; valuation zones of real properties; topography; and orthoimagery.

Prior to registration in the real property cadastre and register, SECR's 11 branch offices use the KADAGIS cadastre GIS application to remotely update the cadastral map. Using ArcGIS and the .NET Framework, KADAGIS has more than 50 user-friendly functions that efficiently control and speed up operations, such as data entry, editing, quality control, and updating of the central cadastral database. Updated cadastral parcel boundaries are entered from either coordinates or vectorization of scanned and georeferenced maps. Parcel areas and distances between boundary vertices are automatically checked. Additional attribute information is either entered manually, such as survey type and name of surveyor, or generated automatically, such as cadastral unit and block codes, municipality code, and parcel centroid coordinates. The system supports 700 checkouts for disconnected editing each day.

Providing access to the wealth of information managed by SECR is a critical and important task, as users—including private surveyors, banks, real estate agents, and citizens in general—demand more and better land information services. SECR has taken advantage of ArcGIS Server technology to support a number of applications, from browsing and viewing data to updating and integrating new data in its central registers.

A cadastral maps web application allows users to obtain information on real property cadastre and register data, property addresses, and valuation zones by searching by unique identifier, address, or geographic location. Private surveyors can also use the application to upload new cadastral (parcel) surveys in a variety of formats and compare them with existing registered parcels to ensure that parcel boundaries are correct.

SECR has also launched a lightweight web browser application that allows private surveyors and SECR staff to enter new data directly into the central cadastre database. This ArcGIS Server application eliminates the need for a desktop application to produce cadastral survey documentation. With just a web browser and a variety of editing tools on the web, a surveyor or SECR staff member is able to submit cadastral data electronically without paper cadastral files and manual data input. The system also includes digital signatures, which are already used by notaries who approve real estate deeds and other administrative documents.

Further operational efficiencies are being realized through the Address Register application, implemented using ArcGIS Server—Java, which allows municipalities to update address data, along with coordinates, directly to the central address database.

ArcGIS is also an important component of SECR's mass appraisal system, supporting taxation of real property. Because the system is GIS driven, it is possible to compute property values using a range of different characteristics, such as valuation zones, land use, area, year of construction, and building materials used. Tax formulas can be automatically applied and computed, and periodic revisions due to changes in law or tax fees can be easily accommodated. Through the application of GIS technology, SECR is able to largely automate the process, minimizing human intervention, saving time and costs, and ensuring repeatable and reliable results.

Sweden's Automated Cadastral Workflow

Lantmäteriet is responsible for Sweden's cadastral services, managing information for approximately 3.2 million properties. The Swedish cadastral system is well regarded worldwide for its effective land legislation and administration. Since the late 1990s, ArcGIS has been an important component of the overall system. It supports many aspects of land administration in Sweden, including surveying and mapping; real property formation; production of cadastral maps; public utilities mapping; property valuation and tax assessment; and national, regional, and local planning.

Through the implementation of ArcGIS software with other technologies, such as GPS, and new working methods, Lantmäteriet has been able to improve the efficiency of its cadastral procedures. These efficiency gains have been partly realized through better workflow and job management. Using GIS, the system ensures that legally defined procedures are followed in a unified production line. Users are taken through each stage of the process, from fieldwork and computation through data processing and documentation to the final storage of the data. Commands from a job are automatically stored to be available the next time the job is opened.

Recently, Lantmäteriet initiated a new project to deliver further efficiency through the implementation of a new case handling system that brings all property information together—both text registers and cadastral index maps—into an integrated GIS. The goal is to create an efficient cadastral procedure with which most customers can create their own cases (subdivisions) and automatically validate them against the property formation rules stored in a GIS database.

This new cadastral case handling system is part of a service-oriented architecture, whereby more general systems (e.g., financial and document systems) are connected. A central component of the system is the process engine, which has the ability to hold a cadastral case together throughout the process. The GIS solution is based on ArcGIS. The data in the GIS database comes from different sources and is validated among other controls with the topology rules built into the GIS database environment. In parallel with building up the new case handling system, an ongoing project at Lantmäteriet stores and delivers object-oriented land and property information in a central database. The new cadastral case handling system

Green represents European cadastral and national mapping organizations using Esri technology.

will, along with other registration systems, deliver changes to and retrieve them from the central database.

Once the new system is in full-scale production, it is anticipated that process times will be reduced by 20 to 30 percent and that maintenance costs for the more integrated system will be lower.

Belgium's National Cadastre Supports E-government

The national cadastral system of Belgium is maintained by the Patrimony Documentation Department inside Federal Public Service (FPS) Finance. It contains the records of the country's 9.4 million land parcels and 1 million registered strata or condominium units. Its cadastre was initiated more than 200 years ago during the French Revolution, when Belgium's land tax and the general cadastre procedures for governing land information were created.

In 2003, FPS Finance began implementing a new cadastral system called CadMAP. The purpose of CadMAP was to migrate from old analog cadastral map sheets to a digital cadastral map files system, supporting the update and management of the vector cadastre map files and improving the quality of the cadastral maps.

To meet these goals, ArcGIS was deployed in FPS Finance's central office, as well as 10 provincial cadastre offices and 300 local survey offices. FPS Finance set up a web software solution using ArcGIS to give users intranet access to digital cadastral maps inside the new centralized file management system.

With a customized GIS application at their fingertips, staff at local offices can now create and update local cadastral plans and submit them to the provincial offices. Concurrently, provincial offices can use a customized interface to make extensive modifications and quality enhancements to the plans submitted by local offices. Meanwhile, the central office uses its own customized interfaces for official cadastral extraction and cadastral sheet printing.

Attributes and layers in CadMAP include cadastral boundaries, parcel numbers, buildings, administrative boundaries, streets, rivers, bridges, parcel monuments, and municipality monuments. Managing a database with 39,000 cadastre map sheets, 200,000 changes per year, and several hundred users was a challenge, but CadMAP was successful, and FPS Finance migrated from the old paper management to the new digital system while updating and continually enhancing the quality of the cadastral data.

Following the success of CadMAP, FPS Finance launched the second phase of the project. This extension to CadMAP involved migration from the desktop file system of separate map sheets to an ArcGIS geodatabase with extended web solutions, providing improved access for existing intranet users and wider access over the Internet for external users, such as notaries, surveyors, and the citizens of Belgium.

Bulgaria's Unified Information System of the Cadastre and Property Register

In Bulgaria, the cadastre and property registers are the responsibility of two different organizations—the Agency of Geodesy, Cartography, and Cadastre and the Registers Agency. In some European countries, the two responsibilities are combined within a single agency, but in Bulgaria, a different organizational approach is taken. The two functions continue under different administrations, but through the implementation of an integrated information system for the cadastre and property registers, the two agencies are able to realize many of the benefits of having a unified agency.

In 2003, the Agency of Geodesy, Cartography, and Cadastre selected ArcGIS technology for its cadastral information system and implemented the solution in its central and 28 regional offices. The system supports all aspects of the cadastral workflow, from data input (from CAD files) through data management, visualization, and extraction of statutory documents in either hard or soft copy to ongoing maintenance of the cadastral data, including the full history of changes.

Subsequently, this agency initiated a joint project with the Registers Agency to implement a new integrated cadastre and property register system. The new system combines the cadastral parcel data with the ownership and legal information for each property within one database at the central level while allowing distributed updating from the local cadastre and registry offices.

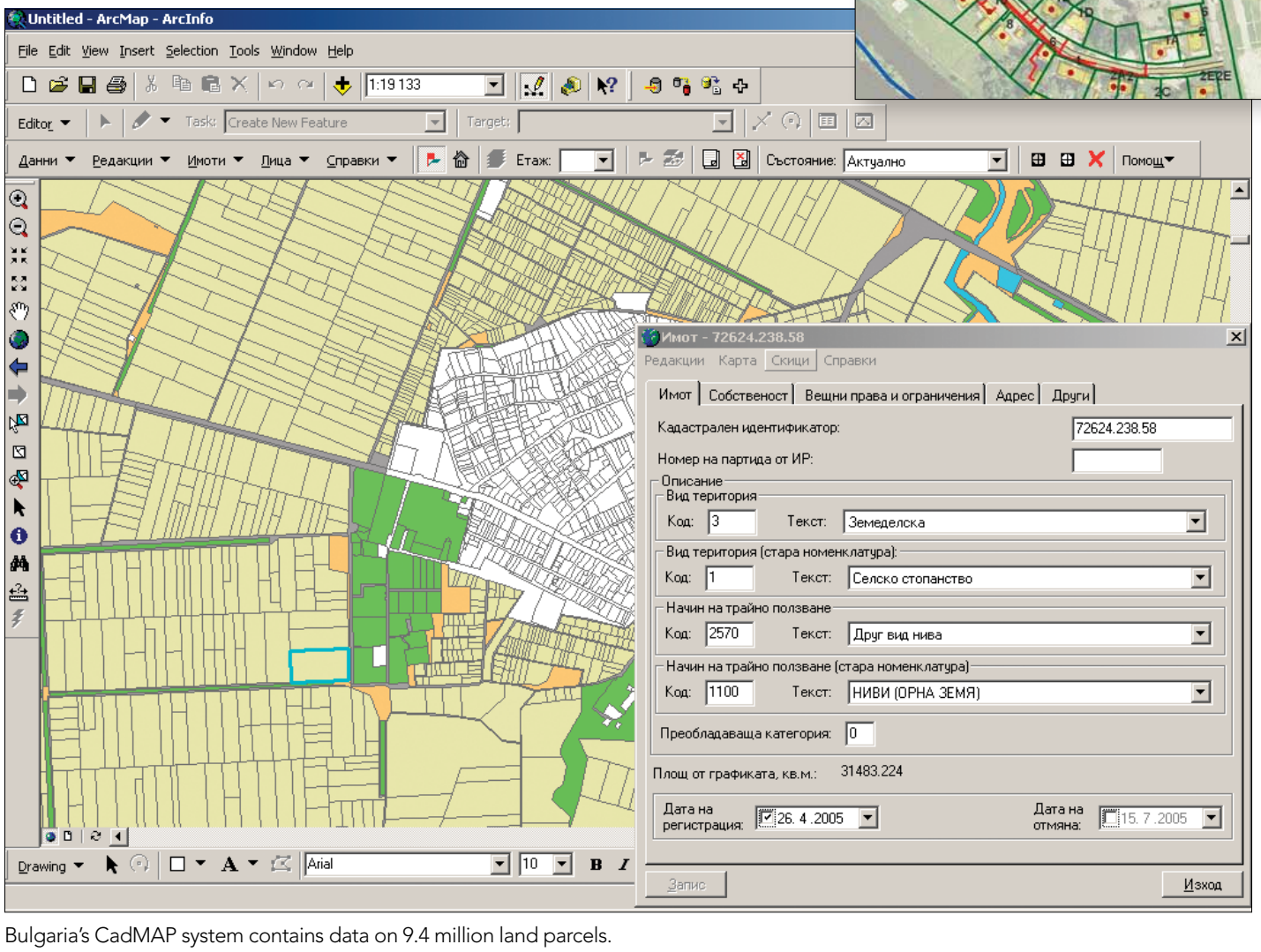
This partnership approach has delivered a number of cost efficiencies and other more qualitative benefits. For example, all users now have access to the same land and property information, and all can be confident that they are working with the latest version of the data. The new integrated system is now of great importance to many GIS developments and users within Bulgaria and is laying the groundwork for much greater cooperation between public administration and private business.

For more information, contact Nick Land, Esri (e-mail: nland@esri.com).

European Cadastres and National Mapping Agencies Using Esri Technology

Albania	France	Netherlands
Austria	Georgia	Norway
Azerbaijan	Germany	Portugal
Belarus	Greece	Romania
Belgium	Hungary	Russia
Bulgaria	Iceland	Serbia
Croatia	Ireland	Slovakia
Cyprus	Italy	Slovenia
Czech Republic	Latvia	Spain
Denmark	Lithuania	Sweden
Estonia	Luxembourg	Switzerland
Former Yugoslavic Republic of Macedonia (FYROM)	Malta	Turkey
	Moldova	Ukraine
	Montenegro	United Kingdom

Lithuania's State Enterprise Centre of Registers relies on its ArcGIS software-based KADAGIS. The system features more than 50 user-friendly functions that speed up operations, quality control, and data entry into the cadastral database.



Bulgaria's CadMAP system contains data on 9.4 million land parcels.

ArcGIS for INSPIRE

New Software Portal Supports Compliance, Data Sharing, and Discovery

"ArcGIS for INSPIRE will mean our users in Europe can help realize the vision of creating a geospatially literate society."

—Jack Dangermond

Highlights

- ArcGIS for INSPIRE helps organizations comply with INSPIRE.
- The ArcGIS system provides a common platform for GIS applications throughout any European organization.
- ArcGIS for INSPIRE helps EU member nations share harmonized geospatial data across Europe.

GIS is valuable to government and is used extensively in many integrated applications, such as natural resources, land management, law enforcement, and economic recovery. Government is evolving to adapt to new technology changes, and more and more services are focused on web and mobile applications. New media, such as real-time data, social networks, mashups, and Web 2.0, are speeding up this change. Those who are ready embrace these changes and see new opportunities.

One change emerging in this new information society is the Infrastructure for Spatial Information in Europe (INSPIRE), the legal framework created to guide Europe's spatial data infrastructure. INSPIRE addresses pan-European issues surrounding standardized data models, services, and metadata that need to be resolved to create a geospatial platform that supports a large community of users and applications. Essentially, it will provide a road map to authoritative datasets, geospatial services, catalogs outlining content, an application program interface (API) for developers to create value-added applications, and core geospatial applications that can be used throughout Europe.

Through the INSPIRE framework, European Union (EU) member nations hope to better address issues and challenges they face in the environment, through climate change, in maintaining the health and safety of their populations, with transportation issues, and more. The ability to create these new solutions through this framework will be open to everyone: government, data infrastructure developers, the research community, application developers, data infrastructure innovators, and the general public. INSPIRE aims to integrate all levels of government by supporting open access, collaboration, and harmonization and is the core pillar of the European geospatial information society driving the adoption of geospatial data.

To support this community, Esri has adapted the ArcGIS system to provide a common platform for GIS applications throughout any European organization. This solution, ArcGIS for INSPIRE, extends ArcGIS and provides discovery, view, and download services for INSPIRE-compliant data, as well as the ability to create metadata and data models for those who need it.

Sharing Geospatial Data Across Europe

ArcGIS for INSPIRE helps EU member nations share harmonized geospatial data across Europe. Sharing can take place between countries, at various levels of government, and in the private and research sectors. The economic benefits of creating data once, sharing it, and using it multiple times are exponential and can be done easily through collaboration and mashups available via modern technology. ArcGIS for INSPIRE upholds the vision of INSPIRE not as an isolated activity but as a baseline that supports the geospatial enabling of a variety of domains. Using ArcGIS for INSPIRE, data can be available when it is needed in an interoperable manner. This helps streamline decision-making processes and allows organizations to react helpfully to situations where it is needed, such as environmental emergencies. For example, the European Environmental Agency (EEA) is able to share data, as well as reports, as it provides information that supports policy making across Europe. Such reports as EEA's "Mapping the Impacts of Natural Hazards and Technological Accidents in Europe" addresses hazards and offers an explanation as to why they occur based on research. Researchers and others can in turn take this data and do their own research for a more intimate look at regional challenges.

While exciting, INSPIRE compliance can also be challenging. Data owners must publish their data, and member nations are responsible for organizing their data so others are able to apply it to their own needs. Specifications for data publishing can be complex, and there are strict conformance requirements. ArcGIS for INSPIRE helps organizations more easily and quickly comply with INSPIRE.

INSPIRE is very diverse, covering data, metadata, and discovery of the data, as well as access, sharing, monitoring, and reporting. Data themes can be open ended depending on the needs of those who create the data. EU member nations are required to have metadata and discovery views of their data according to INSPIRE regulations by the end of 2011. The next milestones in the INSPIRE implementation road map include the download and transformation of data, as well as the ability to create INSPIRE-compliant Annex I data. The INSPIRE Directive addresses 34 spatial data themes needed for environmental applications. These themes are subdivided into three annexes for the directive. Down the road, the ability to continue supporting new iterations of data, e.g., Annex II and III data, will be required for INSPIRE compliance. ArcGIS for INSPIRE provides a GIS foundation for the INSPIRE platform, evolving to continue to meet requirements, that can support the entire supply chain, from data providers to consumers. Taking the complexity out of INSPIRE compliance means that more business needs can be met as extensible INSPIRE-compliant solutions are delivered.

Helping European Organizations Become INSPIRE Compliant

ArcGIS for INSPIRE meets the core requirements of INSPIRE, including

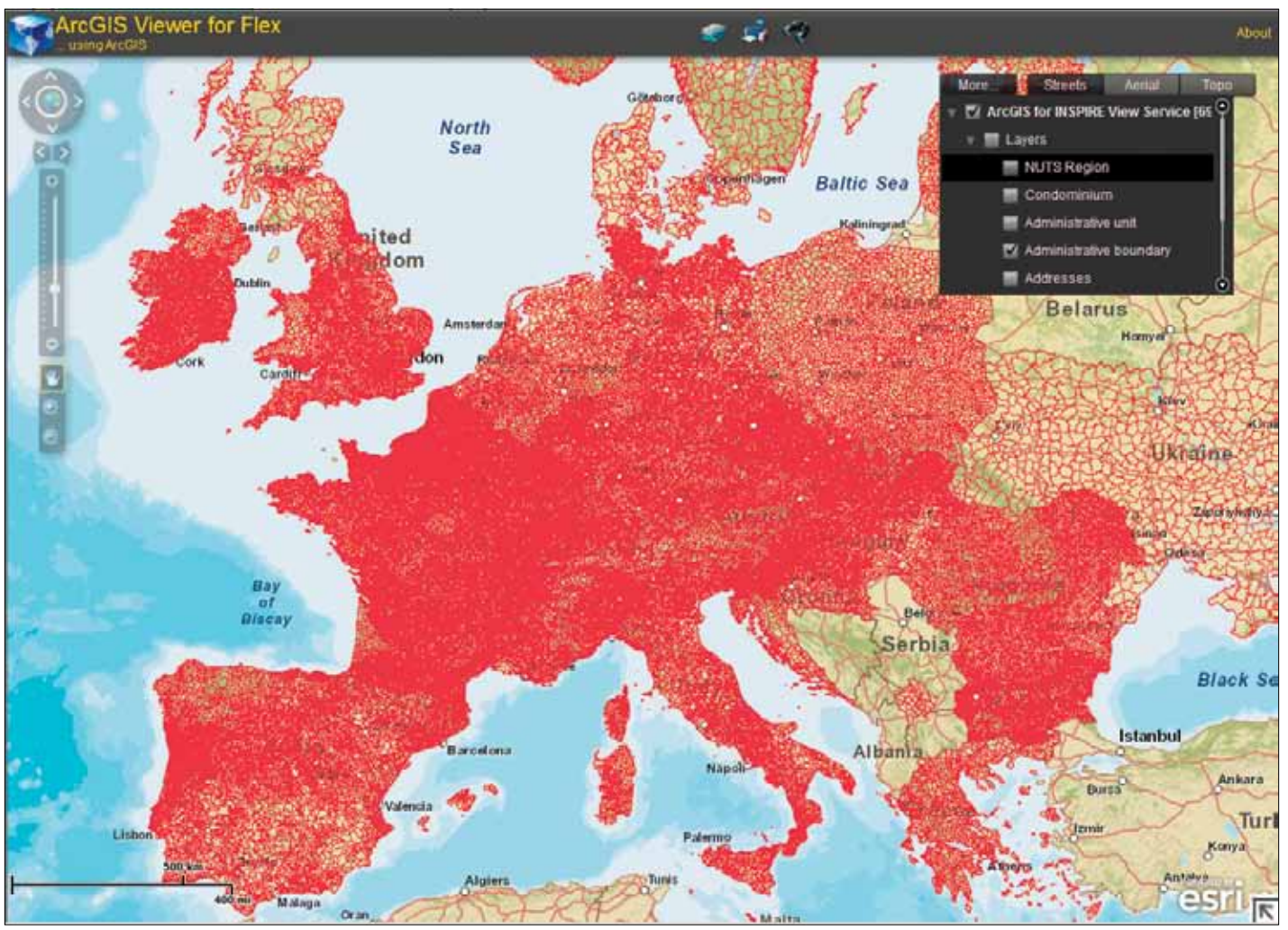
- Managing and publishing INSPIRE-compliant data
- Managing INSPIRE-compliant metadata
- Transforming existing data into INSPIRE-compliant data
- Providing INSPIRE-compliant view services
- Providing INSPIRE-compliant discovery services
- Consuming INSPIRE-compliant geospatial data and services

ArcGIS for INSPIRE is an extension to ArcGIS software. ArcGIS for INSPIRE includes INSPIRE data models and allows organizations to manage INSPIRE data, metadata, and web services in the ArcGIS Desktop environment. ArcGIS Server includes INSPIRE view and download services, a geoportal solution, and INSPIRE discovery services and provides a means to manage INSPIRE metadata. ArcGIS Server client APIs are available to create and customize web applications that consume INSPIRE services.

ArcGIS for INSPIRE also facilitates data sharing. Existing information from storage systems can be integrated into business processes and transformed into INSPIRE-compliant data by using ArcGIS for INSPIRE data models and web services in a data repository for spatial datasets optimized for INSPIRE data specifications. This INSPIRE-compliant data can then be delivered via INSPIRE network services through what is, in essence, a European spatial data infrastructure.

Discovering data using ArcGIS for INSPIRE is straightforward as well. Using multiple discovery services, ArcGIS for INSPIRE supports harvesting or federated searches. These discovery services are part of the software and include an open source geoportal solution. Rich desktop and web-based editors support INSPIRE metadata. Discovery service client add-ons and widgets included in the software connect producers and users throughout Europe. ArcGIS for INSPIRE also consumes INSPIRE services by allowing users to view INSPIRE services in ArcMap and various web clients.

For more information, read "ArcGIS for INSPIRE: A Collaborative Geospatial Information Sharing Solution for the European Union" at **esri.com/news/arcnews/fall10articles/arcgis-for-inspire.html**, "INSPIRE Geoportals Bridge Producers and Consumers" at **esri.com/news/arcnews/fall10articles/inspire-geoportals.html**, and "Building INSPIRE: The Spatial Data Infrastructure for Europe" at **esri.com/news/arcnews/spring10articles/building-inspire.html**.



Flex Viewer consuming an INSPIRE view service displaying INSPIRE data. (This product includes intellectual property from European national mapping and cadastral agencies and is licensed on behalf of these by EuroGeographics.)

Colleges and Universities Participate in Community Maps Program

Esri's Community Maps Program is seeing growing participation from colleges and universities around the globe. Through this program, GIS users and organizations around the world are contributing their local geographic content to a community basemap published and hosted by Esri on the web. These community maps can be freely used by GIS users and provide the entire GIS community with cartographically rich and detailed, ready-to-use, high-quality basemaps for their GIS projects. *(Please also see the Community Basemap Program article on page 15 and the center poster in the Summer 2010 issue of* ArcNews.)

When the program initially launched in spring 2010, local government authorities were the main parties interested in contributing basemap content. Cities, counties, states, and national mapping agencies that build GIS content were recruited to participate in workshops and training. As these clients were developing their content for the ArcGIS Online topographic basemap, many reached out to colleges and universities in their respective areas to gather large-scale map content for the campuses. Many of these colleges and universities were able to provide content for the online basemaps that also satisfied their own unique needs.

Universities and colleges are approaching the program from an academic perspective, as well as for campus facility management. Departments of urban and environmental planning, geography, earth sciences, and information technologies are finding that they have a stake in the Community Maps Program. The development of freely available online basemaps provides the foundation for class projects, showcasing real-world map production technologies that give students valuable, hands-on experience right in the classroom. Not only do they learn map production from start to finish, but their contribution is also published so that anyone can use it. Facility management departments on these campuses are able to integrate their map data into the surrounding city or county basemap to extend their basemap, as well as use the services from ArcGIS Online in their campus viewers. For departments, academics, and facilities, the contribution to the large-scale campus basemap is a win-win proposition: it supports campus GIS application needs and supplies the GIS community with trusted basemaps down to campus-scale details.

City of Carson, California, and Cal State, Dominguez Hills

When the City of Carson, California, joined the program, it saw a direct fit for the California State University, Dominguez Hills, campus in its map. Alex Rocco, the City of Carson GIS administrator, has a great relationship with the geography department at the Cal State Dominguez Hills campus and knew of the large-scale content the campus maintained. Immediately following the Esri Community Maps Program workshop Rocco attended in August 2010, he contacted GIS analyst and lecturer Michael Ferris at the university's Department of Earth Sciences to partner in the basemap development.

"Our campus is relatively small, and our facilities people maintain their data in a CAD format," says Ferris, "so most of the community map data had to be created from scratch. After discussing the Community Maps Program with Alex at the City of Carson, we decided that mapping the campus would make a great student project. Most of the students involved had little or no GIS experience at the beginning of this venture. The campus was divided into segments, and then each of the students was assigned a section. The students were given guidelines and base data for creating the necessary layers. Each of the sections was then merged into its respective feature class and imported into a geodatabase. The final step was to make sure all the unassigned or incomplete areas were filled in and adjusted, and then the final product was given to the City of Carson."

Large-scale basemap content contributed by Harvard Capital Planning of Harvard University in Cambridge, Massachusetts.

The Twin Cities campus provided by the University of Minnesota in Minneapolis, Minnesota.

Rocco adds, "The campus sits within the city limits and makes a terrific AOI [area of interest] in our city basemap. The university data in the campus template is very eye-catching and great for drawing attention to the community basemap."

University of Minnesota

The University of Minnesota (U of M), Twin Cities, with campus areas located along the Mississippi River in Minneapolis, Minnesota, supplied GIS data to the basemap developed by the City of Minneapolis. Daniel Sward of the University Services department maintains the GIS data for the Twin Cities campus. Sward was eager to share content for the GIS community but also has plans for using the ArcGIS Online map services within U of M campus web maps and mobile applications.

"I fully support the idea of sharing basemap data for the Community Maps Program," says Sward. "I feel the program has many advantages to GIS professionals and demonstrates one of the things I love about the GIS profession—that there is a real sense of community and an understanding that sharing resources can lead to better things for all."

University of North Carolina at Chapel Hill

The Town of Chapel Hill, North Carolina, and the Energy Services department of University of North Carolina (UNC) worked together to integrate data into a seamless basemap of the area. Esri's Charlotte, North Carolina, regional office worked with the two organizations to identify the map elements and create a plan for map production. Katherine O'Brien, the UNC Engineering and Information Services GIS coordinator, states, "The meeting with Esri was helpful because we drew attention to iconic features that were missing on other online maps. We felt very integrated into the process."

"While focusing on the quality of the data, we sometimes neglect the cartography," says O'Brien. "The community map approach to pulling together the definitive sources of the data was very appealing. We were nearing the end of a huge bond project, and demolished buildings are displayed and new buildings are missing on many popular online maps. It was refreshing to have someone come to us and ask for data. The Community Map project combines current and accurate data with good cartographic principles."

As Lisa Huggins, the GIS coordinator in UNC Energy Services, says, "I don't want any other backdrop for my services than our Community Map. That's a pretty map."

Harvard University

Harvard University in Cambridge, Massachusetts, has contributed large-scale topographic basemap content to the program with the mission to provide trusted data to departments within the university, as well as to outside data consumers. GIS manager Parvaneh Kossari and her team at the Harvard Capital Planning and Project Management department maintain the facility GIS data for the campus. She attended a brief seminar on the Community Maps Program at a regional Esri conference and contacted her Esri account manager to get involved. Kossari states that the department has a great deal of highly detailed data and was drawn to the look and feel of the cartography in the World Topographic template. Working with the City of Cambridge and Esri, Kossari contributed GIS data for the four largest scales of the World Topographic map service. This map was integrated with the neighboring City of Boston content, and a seamless urban topographic map was published on ArcGIS Online.

"Within the campus boundaries, we maintain the GIS basemap and operational data," says Kossari. "We already host services of our data, and in the past when a customer wanted basemaps extending into Cambridge and beyond, we would need to stitch data layers together. The Community Map allows us to be part of the global community and reach a broader audience with our content. Our operational map services will still be maintained on our system and serve our clients, but we recognize the audience is far larger with the topo map."

Upsurge in Collaboration

Michael Gould, director for higher education at Esri, adds, "These campus mapping initiatives are spreading across the USA and to other nations and are great examples of how volunteered geographic information [VGI] is created and curated in a controlled manner and not as an uncontrolled contribution of pieces that do not fit together. And we are very excited to see the upsurge in collaboration between campuses and their surrounding local governments." *(See VGI article on page 40.)*

To learn more about the Esri Community Maps Program, visit the web page at **esri.com/communitymaps**.

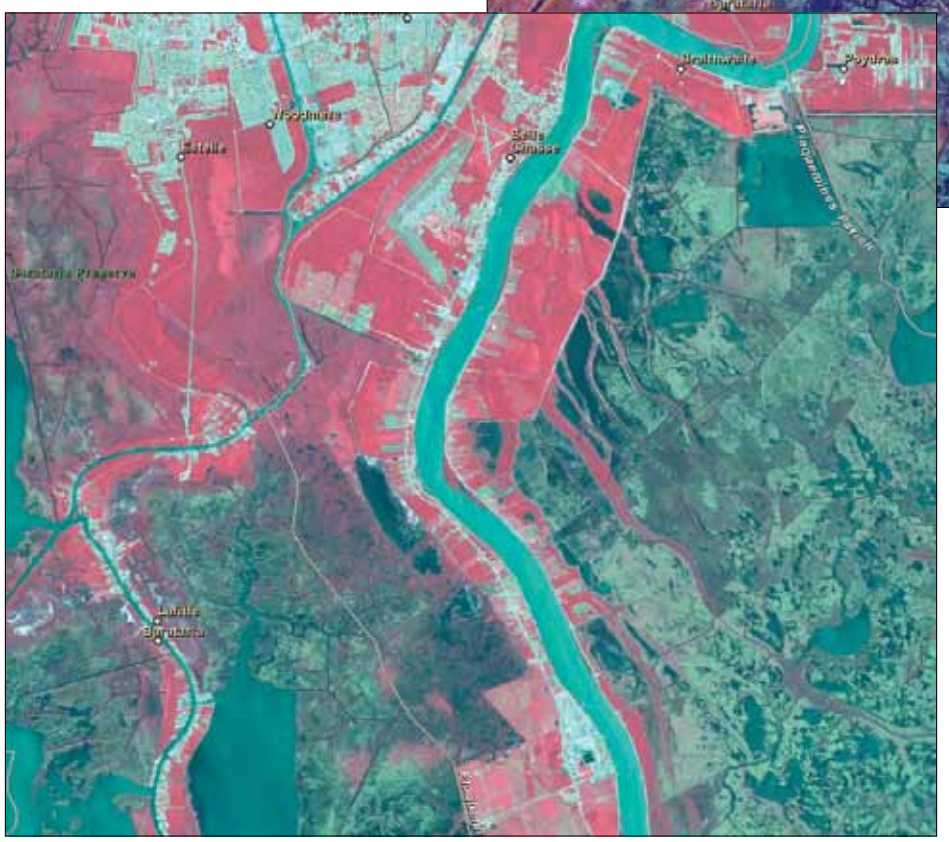
Esri Introduces Landsat Data for the World

Free Multitemporal, Multispectral Global Image Services

Highlights

- Access to online dynamic Landsat image services
- Easy-to-use interactive tours, web maps, and a lightweight web application
- Image change analysis spanning 30 years

In 2008, the secretary of the US Department of the Interior (DOI), Dirk Kempthorne, addressed the audience at the Esri International User Conference and announced that as part of a larger US government initiative to make its data more available, all Landsat scenes in its archives would be available for free. This includes the Landsat Global Land Survey (GLS) datasets, which provide the best worldwide imagery data for how our earth is changing. Last year, Esri announced that it would make this imagery data accessible for free on ArcGIS Online.



Images on pages 12 and 13: The Landsat viewer provides access to the GLS datasets, which include some of the best worldwide imagery available, span multiple decades starting from 1975, and are multispectral (courtesy of the US Geological Survey).

Working in close collaboration with DOI, Esri is pleased to announce the release of the Landsat imagery services. These image services enable fast and easy access to 30 years of Landsat imagery as part of ArcGIS Online. Esri is providing this data (more than 8 TB) on ArcGIS Online and serving it as over 20 different dynamic, multispectral, multitemporal image services that provide access to the full image information content, along with change detection capabilities. In addition, Esri has created web maps and an interactive web application that leverage these image services, providing even greater access.

The image services being provided on ArcGIS Online are not just "pretty pictures." They provide dynamic access to all the spectral and temporal information in this massive collection of imagery. These dynamic image services represent on-the-fly processing of the original Landsat scenes that contain all the multispectral, multitemporal information available in the imagery. This enables all the data contained within the imagery to be immediately available for use in maps to provide greater understanding and analysis. Users can define what processing is to be performed on the imagery, and the server performs this directly on the source images, returning the information required for the area of interest. The services are available in different standard band combinations. These band combinations include false color (bands 4,3,2)—useful for vegetation studies and crop growth monitoring, natural color with atmospheric penetration (bands 7,4,2)—best suited for analysis of urban studies, and vegetation analysis (bands 5,4,3)—providing the most information for agriculture and forest management. Since these services are also multitemporal, users can turn back the clock and easily analyze how things have changed in their region over the past 30 years.

These image services are available as standard services through ArcGIS Online. Users will be able to build web maps utilizing this information and share their analysis for better understanding and collaboration. Esri has also provided a series of web maps in ArcGIS Online that highlight the usage of these new services and help explain the measurement of change over time and space using the Landsat data. For example, users interested in looking at the change in coastal landforms could access and use the Land Water service in ArcGIS Desktop or ArcGIS Online applications, then use the temporal slider or service properties to define the epoch of greatest interest. Directly using these image services removes the requirement for users to store, manage, or process these large datasets themselves; instead, they can directly use these services as if all the different image products were stored locally.

In addition to providing access to the image services, Esri has created an easy-to-use web-based Landsat viewer for visualizing, analyzing, and detecting change using these image services. This viewer accesses the Landsat dataset as image services. Informative screens make it simple for everyone to understand what they are looking at and how to navigate through the information. The interface enables one-click access to a wide

Using Landsat Image Services

The new Landsat image services will benefit anyone interested in visualizing and analyzing the world around them.

- Environmental organizations—Immediate access to image services that provide over 30 years of land-cover information to aid in detecting change and help with regulations and enforcement
- Forestry—Reports and monitors the changes in habitat for species and changes in a wide range of natural and man-made forests
- Higher education—Used as a tool to teach the science of remote sensing and access to the information content available in remotely sensed imagery beyond that in the visible spectrum
- K–12 education—Provides a fascinating component to social studies classes in enabling students to see how the earth has changed over their parents' lifetimes, as well as their own, and giving them a great perspective on the effect mankind has on nature
- Natural resources—Source for multispectral imagery used to investigate the possible existence of minerals or geologic features that aid in prospecting for new resources
- Nongovernmental organizations—Reviews the impact of change over the last 30 years on current projects, for example, deforestation and desertification in parts of Africa

For more information, visit esri.com/landsat.

range of various information products with the ability to quickly zoom and pan to anywhere in the world and visualize similar information and trends. Behind the scenes, ArcGIS Server performs all the required processing on the fly. ArcGIS API for Flex was used to build the application.

The Landsat viewer contains fast, easy-to-use change detection tools. Where change occurs, it is easy to visualize the differences by looking at them spectrally over different time periods. The change detection tools enable users to conduct multitemporal image analysis for change through image differencing. The Landsat viewer automatically calculates this information based on the user's selections and displays the resultant information on a change detection map. Users can quickly understand the change that has taken place by visualizing and interacting with it on the change detection map.

People worldwide are trying to solve complex environmental challenges, and access to Landsat datasets through ArcGIS Online can make a difference.

For more information, visit esri.com/landsat.

Define Political Districts Quickly and Easily with Esri Redistricting

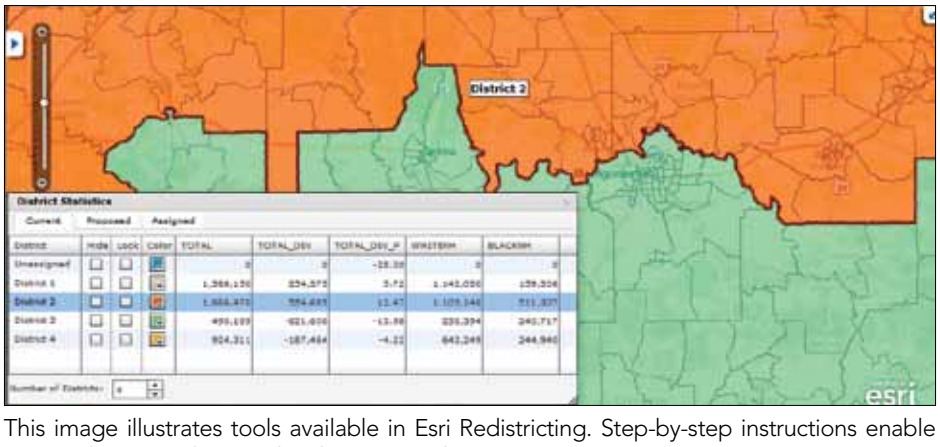
Create and Share Redistricting Plans on the Web

Government officials, advocacy groups, consultants, and citizens require sophisticated, easy-to-use tools to define their districts and, more importantly, understand the changes in population that have occurred during the last decade. Area population gains or losses will greatly impact legislative representation and funding for projects. To outline districts correctly and achieve proper representation and funding, officials must equalize each area's population as closely as possible and ensure that the new boundaries do not fracture a district. Providing additional transparency into this process has become increasingly important in 2011. Legislators and other entities must create redistricting plans; share them with selected groups for feedback and edits; allow submission and evaluation of alternatives; make the final output available to agencies, election officials, and the public; and be prepared to defend their analysis.

Esri Redistricting contains the tools and data that users need to fulfill all these requirements. Working via the web enables entities in numerous locations to quickly and easily collaborate and communicate on redistricting plans. Esri Redistricting is a Software as a Service (SaaS) solution hosted and managed by Esri that enables users to quickly begin creating redistricting plans.

Built on the powerful foundation of Esri's ArcGIS system, Esri Redistricting gives users a better perspective of their districts by including access to preprocessed Census 2000 data, 2010 TIGER files, and the soon-to-be-released Census 2010 Public Law 94-171 data in 2010 geography. The solution includes demographic maps; basemaps, such as streets, imagery, and topography; and a basemap created using the 2010 Census TIGER data. Users can also add data from previous censuses, along with proprietary information and existing legislative district boundaries, into maps for easy comparison and analysis. Security options allow them to establish user roles and lock or unlock district assignments to selected geographies. Editing tools provide undo and redo options for district assignment histories in previous versions of district plans, along with the ability to add comments and map notes to support collaboration within organizations.

Esri Redistricting also allows users to incorporate the exact boundaries of a district; review plans by using plan comparison tools and reports; share and collaborate on plans within their organizations and with the public; add user-defined notes, shapes, and graphic image files; and use integrity checks to validate contiguity, dual assignments, district counts, null assignments, and population summary.



This image illustrates tools available in Esri Redistricting. Step-by-step instructions enable users to begin work immediately in Esri Redistricting.

After plan areas have been mapped, users analyze population gains or losses by district; create, manage, and maintain the redistricting plan; effect public policy based on user results; and, if necessary, defend the plan to government agencies and elected officials. Users can also test district boundaries to see if they comply with federal and state redistricting guidelines, generate reports that summarize district statistics, share the results, and receive feedback from selected groups and/or the public.

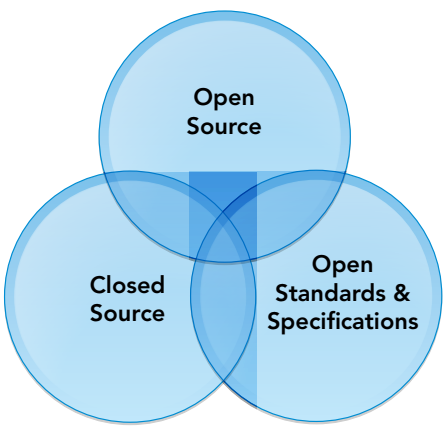
For more information, visit esri.com/redistricting, where users can also sign up for a free 30-day trial. Esri can also host a custom version of Esri Redistricting or configure and install it at an on-site location. Both of these options include the ability to integrate an agency's custom data, such as polling points, historical voting statistics, and incumbents' residences. To discuss redistricting needs, interested parties should call 1-800-447-9778 or contact the Esri regional office in their area.

Open Source Technology and Esri

Highlights

- Open source technology means that its source code is freely available to use, modify, and redistribute.
- Esri encourages a hybrid model for open source technology depending on users' needs.
- Esri Geoportal Server and ArcGIS Editor for OpenStreetMap are examples of Esri's open source projects.

Open source technology is a growing trend in GIS, but what is it? Open source software is software in which the source code used to create the program is freely available for the public to view, edit, and redistribute. Any type of software program can be open source, including operating systems (e.g., Linux), databases (e.g., PostgreSQL), applications (e.g., OpenOffice.org), games, and even programming languages (e.g., Python).



A hybrid relationship.

Open source software is identified by the type of license it is released under. These licenses include the Apache 2.0 license, the Microsoft Public License, and the GNU General Public License. While there are some variations, most open source licenses require that the source code be freely available and users are free to modify the source code and redistribute the software and derived works.

Non-open source software is called *closed source* or *proprietary* software.

The open source license encourages a shared community approach to the development, extension, and patching of open source software. Most open source projects have a dedicated group that moderates and directs the core software development and ensures that needed new features are being developed, bugs are being fixed, and the supporting documentation remains current. Sometimes an open source project will "fork," meaning a group of developers will lead the development of the software that is independent of the original project. Improvements in the "fork" project could either become incorporated into the core project or evolve into a completely new project.

Isn't Open Source Free?

A common misconception is that open source software is free, meaning without cost. While often true, that is not always the case. Open source only requires that a program's source code be freely available; the program itself may still be sold commercially. So what's the difference between a program's source code and the program itself?

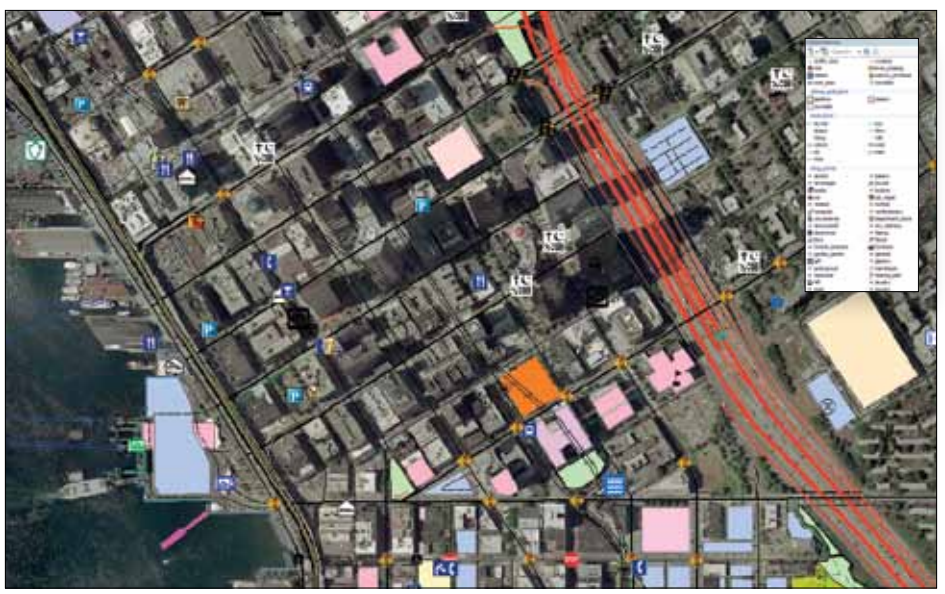
Developers create a software program by writing its source code using a computer programming language, such as C++ or Java. The source code is a series of commands, processes, and interfaces that tell the computer program how to behave. A computer cannot look at source code and know how to run the program. The source code needs to be translated from the developer's programming language to a machine binary language (0s and 1s) that the computer can read.

The developer does this translation by running the source code through another program called a compiler. The compiler translates the source code into the binary language that the computer can read and execute. Compilers not only make it possible for computers to run the program but also make the programs more efficient by optimizing the file sizes and checking for errors. Since it is often difficult to reverse the translation, compiling helps protect the integrity of the source code.

Open Source vs. Open Specifications

Another common misconception about open source technology is that it is completely open and can freely read and write any data format. However, that is not the case. Formats, specifications, reference models, and procedures that help establish interoperability between programs and devices are called *open specifications*. PNG, RSS, HTML, and Esri's shapefile are all examples of openly published specifications.

The Open Geospatial Consortium, Inc. (OGC), is an international organization for developing open specifications for geospatial data, services, processes, and data sharing. Esri is a principal member of OGC and actively participates in the development and implementation of many of these standards.


ArcGIS Editor for OpenStreetMap allows users to edit OpenStreetMap data using the familiar ArcGIS Desktop editing tools (map data © OpenSteetMap contributors, CC-BY-SA).

Esri Geoportal Server includes add-ons to access and search geoportals from within web apps built with ArcGIS Web Mapping APIs.

Esri continues to advocate the need for open access to geographic data and functionality through support for widely adopted and practical standards and specifications. Esri follows an open system strategy for accessing and using geographic data and functionality. ArcGIS is designed and engineered with interoperability and extensibility in mind and conforms to the open standards and specifications that are necessary to implement enterprise systems. Users can incorporate GIS in any application on a variety of desktop, server, and mobile platforms and use geographic information stored in almost any format, accessed from a variety of databases, or delivered as a web service.

Open Source or ArcGIS?

Deciding between open source and ArcGIS is not an either/or question. Esri encourages users to choose a hybrid model, a combination of open source and closed source technology, based on their needs.

Esri recommends the use of open source technology to enhance users' Esri experience. Esri supports the Red Hat Enterprise Linux and SUSE Linux operating systems. Geodatabases can be created on the open source RDBMS PostgreSQL. ArcGIS Server can use open source web servers, such as Apache Tomcat, to distribute GIS services.

Esri also integrates the best open source components in ArcGIS. Since ArcGIS 9, the software has integrated Python, the open source programming language, and at ArcGIS 10 introduced ArcPy, a Python site package, to simplify and automate Python scripting. The new Python window in ArcMap allows users to simplify and automate their geoprocessing workflows. The ArcGIS Desktop web help includes a list of all open source tools, languages, and libraries used in ArcGIS. In fact, there are over 80 open source components, including GDAL libraries.

Esri has released numerous APIs and Software Developer Kits (SDKs) to improve GIS interoperability. Many of these APIs and SDKs work with open source development environments, such as Eclipse or Sun's Java Studio Creator. Esri's most recent API, the File Geodatabase API, while not yet open source, opens up the file geodatabase for developers to create applications that access file geodatabases from a variety of outside environments without using ArcObjects.

Esri's Open Source Solutions

Esri is increasing its participation in the open source community with several open source products.

ArcGIS Editor for OpenStreetMap is an open source add-on for ArcGIS Desktop that allows users to become active members of the growing OpenStreetMap (OSM) community. OpenStreetMap is an open and freely available database of geographic data. ArcGIS Editor for OpenStreetMap allows users to download data from the OSM server to a local geodatabase and use the familiar ArcGIS editing environment to create, modify, or delete the OSM data. The editor includes the OSM geodatabase schema and symbology template to simplify editing. Users can then upload their changes back to the OSM servers to share with the entire OSM community.

ArcGIS Editor for OpenStreetMap, its documentation, and its source code are available on CodePlex (**esriurl.com/OSMEditor**), Microsoft's open source repository, and released under the Microsoft Public License.

Esri Geoportal Server is a free open source product that helps organizations manage and publish metadata describing their geospatial resources so that others can discover and use those resources. Geoportal Server can act as the nexus for an international framework of spatial data resources for enhanced collaboration and data sharing among various government and private agencies. Geoportal Server does not require an ArcGIS license. The upcoming issue of *ArcUser* will contain a tutorial describing how to set up and manage a geoportal without using ArcGIS Server.

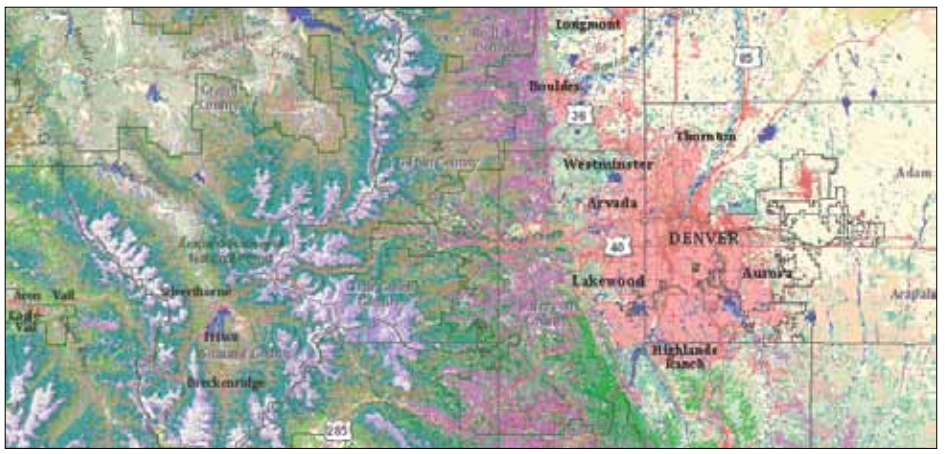
Geoportal Server supports standards-based clearinghouse and metadata discovery applications. It was released under the Apache 2.0 open source license, which allows developers to freely customize and redistribute the software. Esri uses SourceForge (**esriurl.com/geoportalserver**) to host and distribute the Geoportal Server software, documentation, and source code. SourceForge is a familiar platform for open source development, which makes it easy for open source developers to incorporate their changes and improvements to products.

Conclusion

Esri is excited to be part of the evolving open source community, including sponsoring and participating in open source geospatial conferences, such as FOSS4G and State of the Map. These events are opportunities to learn more about the needs of open source geospatial developers and users to enhance and improve Esri's open source offerings and interoperability and, most importantly, build a larger and stronger community of all geospatial developers and users.

For more information, visit **esri.com/opensource**.

New ArcGIS Online Content



Multiple levels of land-cover classifications for the continental United States from the USGS Gap Analysis Program (GAP).

ArcGIS Online keeps growing in popularity, with more and more users contributing their content to share with others. The volume of publicly shared items, as well as items shared through groups, has grown significantly in the last six months. In addition, Esri also continues to publish its own content derived from commercial and other data sources. Users can freely access all this content, including web maps, map services, and layer/map packages, through ArcGIS or a browser.

Users looking for imagery services will be interested in the new NaturalVue imagery, created by MDA Information Systems, Inc., that has been published as a web map and as an ArcGIS Server image service. This provides a nice example of how imagery can be published dynamically for use as an attractive basemap in GIS and web applications or as the source for applications of approximate georeferencing and color correction of smaller-scale imagery. The NaturalVue 15-meter satellite imagery of the world is a natural-color seamless mosaic compiled from more than 8,600 Landsat-7 multispectral images. It's a single, consistent global dataset with a spatial resolution of 0.5 arc seconds and a positional accuracy of better than 50 meters RMSE.

United Nations Second Administrative Level Boundaries (UN SALB) are authoritative datasets published by the UN Geographic Information Working Group. The goal of the working group is to provide the international community with global, seamless, and standardized datasets, country by country, that support comparative analyses for such issues as mapping of the AIDS crisis and development in a particular region or the movement of displaced populations in conflict zones. Changes to borders and internal boundaries are updated frequently by respective national mapping agencies, making this data essential for accurate analyses by international aid agencies around the globe. These datasets have been published under the UN SALB group in ArcGIS Online and are publicly available for download as individual layer packages by country for use in ArcGIS Desktop.

The National Maps for USA group in ArcGIS Online has been created with the federal user community in mind. This group features web maps, map services, and layer packages from several leading government and commercial providers, including i-cubed, National Geographic Society, National Oceanic and Atmospheric Administration (NOAA), Tele Atlas, US Department of Agriculture Farm Services Agency, US Environmental Protection Agency, the US Geological Survey, and more.

The purpose of this group is to provide basemaps or operational layers for use in web mapping applications or to create simple mashups together with other map layers. Some examples include the US Land Cover Map, a web map that presents levels of land-cover classification for the continental United States based on Landsat 2001 imagery; Soil Survey Map of USA, a web map that features the Soil Survey Geographic database by the US Department of Agriculture's Natural Resources Conservation Service; USA National Wetlands Inventory, a web map that presents wetlands and deepwater habitats of the United States and its trust territories based on the National Wetlands Inventory published by the US Fish and Wildlife Service; and USA Thunderstorm Probability Forecasts, a web map that references a thunderstorm probability forecast map service that is updated hourly and published by the National Weather Service.

To find this content, visit **ArcGIS.com** and select Search for Groups or Search for Maps, then enter the group name or keyword, for example, NaturalVue.

Basemaps Now Freely Available Regardless of Use

As of the end of January 2011, ArcGIS Online basemaps published and hosted by Esri are now freely available to all users regardless of commercial or noncommercial status and internal or external use. This means that users no longer have to pay a subscription fee for including ArcGIS Online basemaps in their web applications that were previously deemed revenue-generating applications, or for commercial use. Basemaps that are affected by this new business model include World Imagery Map, World Street Map, World Topographic Map, USA Topographic Maps, and DeLorme World Basemap. The only restriction is a high-volume limit of 50,000,000 transactions in a 12-month period—a volume that most likely very few users will reach. Users who are concerned about reaching the high-volume level in a 12-month period should contact the Esri regional office in their area to discuss alternatives, for example, implementing ArcGIS Data Appliance on-premises. Local, state, and federal government users are not affected by this change. They can continue to make unlimited use of ArcGIS Online basemaps regardless of transaction volume. Developers also have unlimited access to ArcGIS Online basemaps for development and testing purposes via the ArcGIS Web Mapping APIs.

Look for this column in future issues to get regular updates on new content in ArcGIS Online. To start using maps, apps, and other resources, visit **ArcGIS.com**, the web portal for all ArcGIS Online content. To learn more about ArcGIS Online basemaps, visit **esri.com/mapservices**.

The Power of Mapping Right in Your Hands

Free ArcGIS App and API for Windows Phone Now Available

Microsoft Windows Phone users can now access sophisticated mapping capabilities on their devices with the new ArcGIS for Windows Phone app. ArcGIS for Windows Phone extends the reach of a GIS from the office to the mobile web. The app lets users find, use, and share maps, as well as deploy GIS data and functionality on Windows Phone devices.

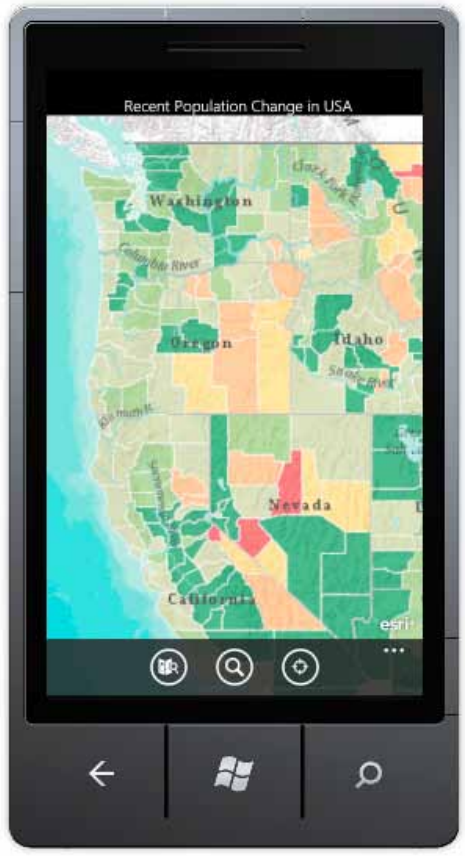
ArcGIS for Windows Phone serves as a mobile gateway into the ArcGIS system to

- Explore and navigate maps.
- Find places and addresses.
- Query map layers and data.
- Collect, edit, and update features and attribute information while performing field data collection and inspection projects.

The free app can be downloaded directly from Microsoft's Zune Marketplace.

In addition to the free application, Esri has also released ArcGIS API for Windows Phone. Using the API, developers can build custom applications for Windows Phone devices. The API can be used to create interactive applications that combine mapping resources, such as maps, locators, and geoprocessing models, with Windows Phone technologies and frameworks, such as the application bar, controls, and location. It is available at no cost from the Esri Resource Center and includes a detailed blog, forum, samples, and support. The API is built on the Silverlight framework of the Windows Phone application platform, which includes existing Microsoft tools and technologies, such as Visual Studio and Expression Blend. Developers already familiar with Silverlight will be able to create new applications for Windows Phone without a steep learning curve. ArcGIS API for Windows Phone and ArcGIS API for Microsoft Silverlight/Windows Presentation Foundation (WPF) have the same architecture; therefore, users can reuse application logic in ArcGIS applications built for Windows Phone, web, and desktop applications.

"This is a very exciting development for the Microsoft developer community," says David Stampfli, technology architect at Microsoft, "because it allows us to use the tools that we're already familiar with to build a new class of applications for Windows Phone quickly and easily. The capabilities of ArcGIS API for Windows Phone are truly impressive and will allow developers to tap into the full power of the ArcGIS platform."



Browse and access a variety of maps using the ArcGIS for Windows Phone app.

ArcGIS API for Windows Phone enables users to go beyond basic mapping. For example, users can

- Develop applications that use their own authoritative data.
- Display data on an ArcGIS Online or Bing Maps basemap.
- Add graphics and markups to a map interactively.
- Search for features or attributes within GIS data and display the results.
- Execute a GIS model using ArcGIS Server and display the results.

The API is designed to work with and use web services available from ArcGIS Server and ArcGIS Online. Developers and Esri partners can easily build applications that work with their own published web services and use the API to create applications that can be deployed within their enterprises or to the public via the Marketplace.

To learn more about the ArcGIS for Windows Phone app, visit esri.com/windowsphone. To download and begin building custom applications using ArcGIS API for Windows Phone, visit the ArcGIS Resource Center.

For Additional Information About Esri Products

Inside the United States, please call Esri at 1-800-447-9778.

Contact your local office:
esri.com/locations

Contact your local Esri reseller:
esri.com/partners

Community Analyst Now Available

continued from cover

Highlights

- Generate instant reports and maps using thousands of data variables.
- Analyze data in any geographic context, including hand-drawn areas and imported shapefiles.
- Leverage the latest demographic, health, economic, education, and business data variables.

Access to thousands of demographic, health, economic, education, and business data variables helps users discover patterns, relationships, and trends and analyze unique community characteristics for any geographic region, including hand-drawn areas. Reports and maps can be customized to a specific location and analyzed in a geographic context as granular as congressional districts, block groups, census tracts, or ZIP Codes.

Users can also visualize the data on a thematic map or aerial imagery and view changes immediately on an interactive map as parameters are adjusted. Customized drive times or rings can be selected to allow users to learn more about the types of people who live in a particular location. For example, the Tapestry Segmentation Profile report reveals the neighborhood types that live in each area, including demographic and socioeconomic characteristics and preferences, such as Internet usage, types of radio programs listened to, and hours of daytime TV viewed. This type of detailed information can be helpful in determining how to best reach individuals living in these areas. For easy collaboration and information sharing, users can also generate and e-mail print-ready reports and maps in PDF or Excel format to other stakeholders.

Community Analyst can help answer the following:

- How should resources be allocated to have the greatest impact?
- How can allocation decisions be communicated to the public?
- What types of people will be impacted by a policy decision?
- What are the demographic trends that will affect a particular area?

With a topo map as a background, users can view separate drive times in Washington, D.C.

Many users can benefit from Community Analyst. For example, health care professionals who need to provide subsidized flu vaccines to low-income households can use Community Analyst to determine the best location for a flu shot clinic to serve the greatest community need. Using the Smart Map Search feature, users can select up to five customizable criteria and easily see all the areas on an interactive map that meet these criteria. The user can search for areas with low household income, a large population of young children, and limited access to public transportation to then make an informed decision about where to place the clinic.

Public officials forced to make difficult decisions regarding infrastructure funding can compare areas side-by-side using detailed employment, age, income, and education variables, including five-year population predictions. Projects can then be ranked in terms of highest priority based on the overall community impact. This information can be made available to constituents for greater transparency and an improved decision-making process that can be understood by the public.

For more information, visit **esri.com/communityanalyst**.

Multinational Mapmaking in the Czech Republic

A Database-centric Approach to Mapping Distant Territories

Highlights

- Esri's Defense Solution produces high-quality military cartographic products quickly.
- Map portrayal and readability are improved with ArcGIS geoprocessing tools.
- ArcGIS projects serve as a place for map composition creation.

The Geographical Service (GeoS) of the Armed Forces of the Czech Republic has produced high-quality national maps for the country for decades. This experience has led the organization to offer its services to the Multinational Geospatial Co-Production Program (MGCP), an international program that brings together 28 participating countries from all over the world to assist in data production for countries where commercial satellite imagery is usually the only data source.

GeoS has been producing the maps, called MGCP Derived Graphics (MDG), since 2007. These maps resemble Topographic Line Maps at 1:50,000 scale (TLM50) and are used to support international humanitarian and peacekeeping operations in these countries.

A longtime user of Esri technology, the Military Geographic and Hydrometeorological Office (MGHO) that serves as the executive body of GeoS chose ArcGIS, including Esri Defense Mapping, to produce the MDG maps. GeoS was looking for a system that would provide a broad range of tools for various military geographic applications. Esri Defense Mapping is used by 25 of the 28 participating nations to help promote standardization of features and maps within the MGCP working group. This, coupled with the capabilities for building and maintaining digital databases and producing high-quality cartography, led the organization to choose Esri Defense Mapping for its military mapping. As a result, MGHO has built its own digital production system based on the ArcGIS platform for the MDG production workflow.

A Workflow for Producing Maps Quickly

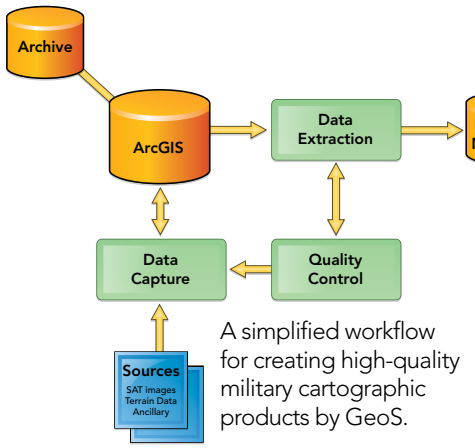
One of the typical operational requirements coming from military and civilian data users is to quickly prepare the TLM50-like map for a distant territory. As most cartographers know, this task is quite complex. The source geospatial data must be obtained in the correct format and a map created according to the specifications, including properly applied symbology. Cartographic noise, such as overlapping text on the map, must be deleted, and surrounding elements need to be refined. Finally, the map needs to be published as either a printed or digital copy. All this must be finished and delivered in a specified time frame, which is usually short.

Using ArcGIS, GeoS has a workflow that resolves several key issues when publishing these maps in such a short time frame. Staff are able to do several important tasks with ease, including creating appropriate symbology sets and harmonizing them, providing administrative boundaries, and determining appropriate map composition and finishing.

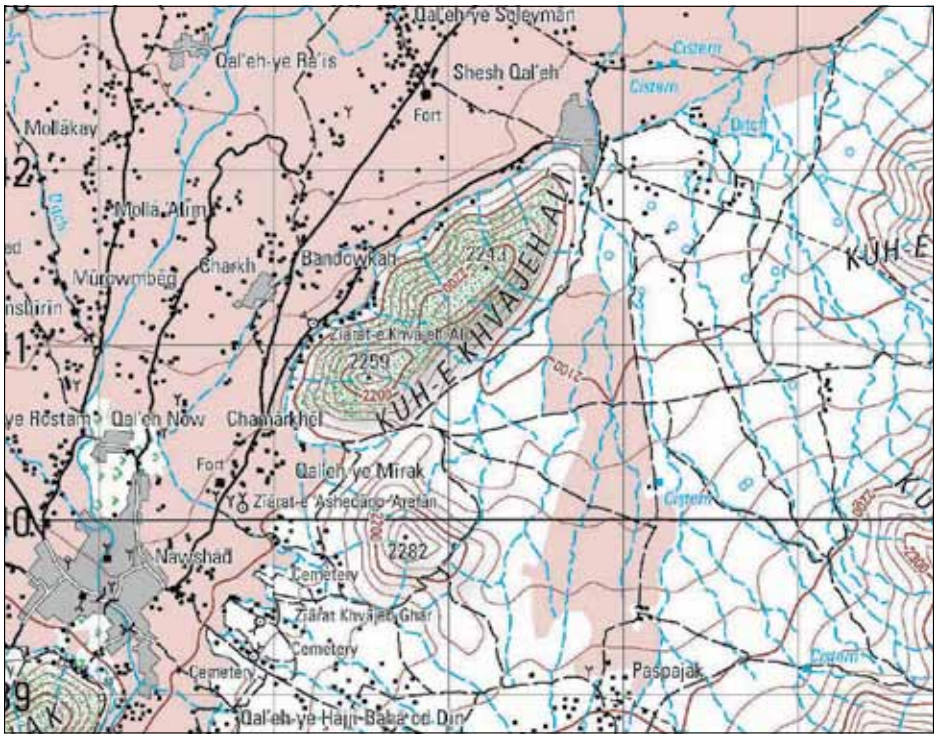
Cartographic Tools Provide Sophisticated Symbology

The cartographic tools in ArcGIS help GeoS create the correct symbology on the generated map. Technically, two new attributes must be added inside each feature class with a cartographic representation definition: the rule and the override. In general, a rule is represented by a symbol and its behavior, while an override serves as a place to store exceptions to the rule. Appropriate symbology rules have been defined for each feature class inside the MGCP database, and each feature is represented by one rule.

Rule matching for each feature is based on properly defined attribute combinations. This database-driven approach to symbolization provides many advantages: Both the digital landscape model and the digital cartographic model can coexist in one dataset. Geometry edits of cartographic representations do not change the original feature geometry. Quick symbology matching based on attribute combinations is achieved through a user-defined Python script that has been compiled for converting the landscape model into the cartographic model. The out-of-the-box MGCP symbology supplied with Esri Defense Mapping enables quick and efficient cartographic production. Improved cartographic refinement tools, both automatic and semiautomatic, can be used, including rotation, visibility management, and shifting.



A simplified workflow for creating high-quality military cartographic products by GeoS.



GeoS produces maps for the Multinational Geospatial Co-Production Program, like this one for the country of Afghanistan.

Since the MGCP program does not provide elevation data and delta features, other data sources must be exploited to fill gaps in the map content. User-defined tools for processing these sources have been established, such as an ArcGIS geoprocessing model for assembling and successfully applying spot height generation. Digital Terrain Elevation Data level 2 was implemented to create contour lines, as well as shaded relief. This helps improve terrain portrayal and map readability.

Esri software has been used successfully in two editions of MDG and will continue to be the technology of choice. Using the software to create MDG data and maps helps GeoS customers receive rapid map output of the highest quality.

For more information, contact Radek Wildmann (e-mail: radek.wildmann@vghur.army.cz); Vladimir Kotlar (e-mail: vladimir.kotlar@vghur.army.cz); Lubos Belka (e-mail: lubos.belka@vghur.army.cz); or Jan Soucek (e-mail: JSoucek@arcdata.cz), ARCDATA Praha, s.r.o., Esri's distributor in the Czech Republic.

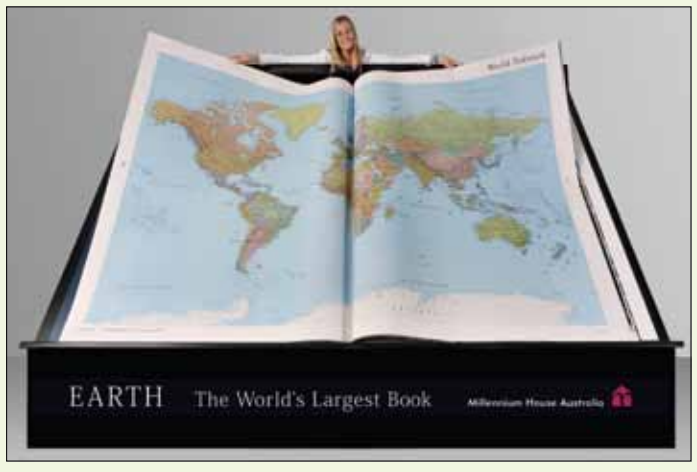
World's Largest Atlas Produced with ArcGIS

Extreme Cartography

The world's largest atlas made its debut at an appropriate venue—the Frankfurt Book Fair, the world's largest trade fair for books, held each October in Germany. The atlas, created by Sydney, Australia, publisher Millennium House and named *Earth: Platinum Edition,* measures 183 by 137 centimeters (6 x 4.5 feet), weighs 120 kilograms (264 pounds), and sells for US$100,000. Only 31 copies will be produced. The atlas contains 128 pages and more than 45 images of the finest contemporary maps, as well as images of famous landscapes, and is considered an artistic showpiece: a time capsule for collectors and institutions, including museums and universities. The last time an atlas close to this size was published was in the 17th century.

With regard to the images, the quality and resolution demanded for a book of this size has resulted in Millennium House sourcing some amazing images for the book. These images are created using the Gigapan process, which stitches together many images (sometimes hundreds) to create one massive image.

A team of cartographers around the world worked together to create the book. This process took two years from data collection to final production. Demap, one of Australia's leading custom mapping service companies, spearheaded the effort. Working as the chief cartographic consultant, Damien Demaj, former director of Demap, oversaw the collection and management of the data. Demaj was able to collect source map data from 60 collaborating cartographers around the world and manage it using ArcGIS—primarily ArcMap and Maplex.



Many cartographers were found through their affiliations with local chapters of organizations such as the International Map Trade Association (IMTA) and the International Cartography Association (ICA). "Just as we go

iPC Develops an Array of Map Content for Japan

Sophisticated Map Editing and Workflow System Developed

Highlights

- iPC uses GIS to quickly and efficiently create up-to-date and highly accurate map data.
- A twin-track approach consists of database building and editing system development.
- Multilanguage maps of Japan are provided to companies that plan to utilize the maps.

INCREMENT P CORP. (iPC), a digital map supplier and software development company owned by Pioneer Corporation, has been creating and compiling map data and developing software since 1994. iPC is responsible for Japan's first map discs for in-car navigation systems, marketing map software for PCs, providing packaging solutions for personal navigation devices, and supplying Japan's first off-board navigation application for the iPhone. Today, the company offers a wide array of map data and map services for use by markets around the world from its head office in Kawasaki, Kanagawa Prefecture, Japan, as well as locations in Shanghai, China, and the United States.

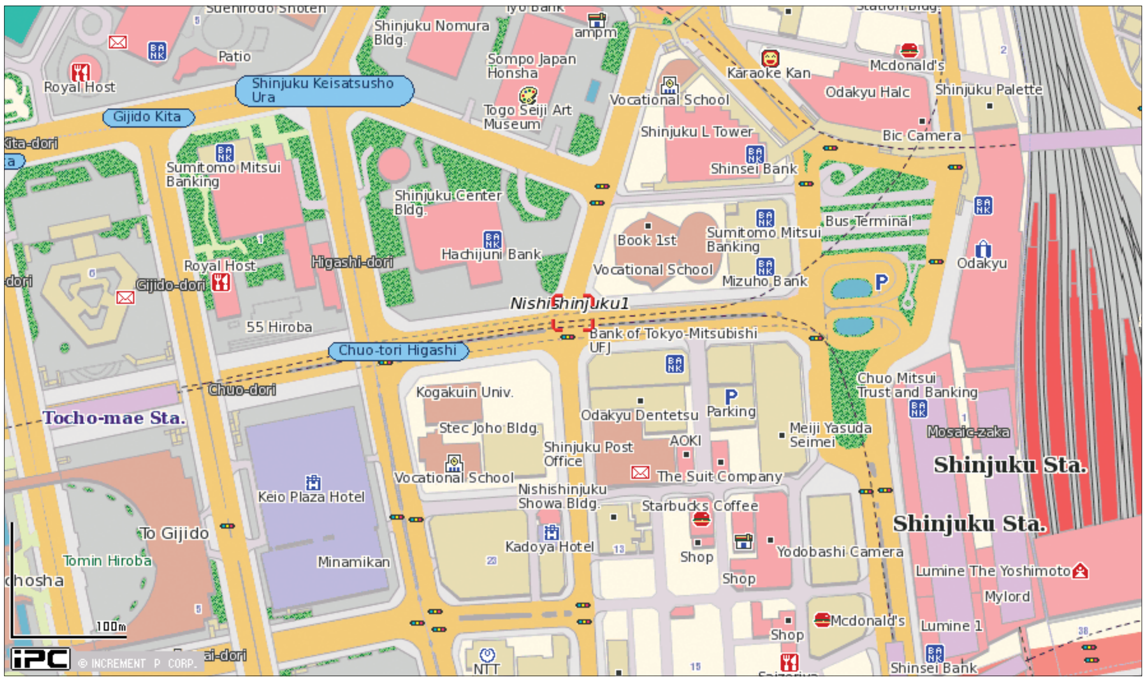
iPC compiles and retains in-house map contents, such as road network, map background, and address data. Also, it developed a spatial database system based on ArcGIS to achieve an environment for quickly and efficiently creating up-to-date and highly accurate map data. The company can make available attractive data to the highly competitive in-car navigation industry and Internet map service market.

In the past, the conventional systems had maps of Japan separated into files by units called meshes, delimited as tiles, and all of Japan was managed as data files consisting of tens of thousands of meshes. Making individual map meshes consistent with their adjacent meshes required much labor and time for alignment work. Only one person was allowed to edit each specific file in the database due to exclusive access control, which made operator work planning and management cumbersome.

Thus, iPC compared and studied a variety of GIS/CAD tools to overcome these problems and make the map editing workflow more efficient. As a result, iPC adopted ArcGIS. A twin-track approach was then taken for the new map system building project consisting of database building and editing system development. The following three goals were achieved with the new ArcGIS integrated spatial database:

- Making maps for all of Japan seamless and integrated
- High-level data modeling
- High-performance, multiple, simultaneous editing

With map editing, up to 200 operators may be editing and saving data at the same time. That could involve hundreds of thousands of transactions a day, and thus high performance was needed to secure work efficiency. Yet iPC released map data created by its new system in autumn of 2003.



A map of the Shinjuku area, Tokyo, with English labels of shopping spots, restaurants, banks, schools, and so on.

The system that was initially developed only for basic map contents has been expanded into a map editing system to handle quickly evolving navigation products and map services, as well as diversifying contents and expanding business. Today, this GIS map editing system carries out work such as information management, including changes to roads and features across Japan and map information from users. This is in addition to work for conventional point of interest (POI) content and new content, such as road height and gradient. iPC has been constantly providing the market with leading-edge and multifaceted map data by making the most of this system. One example of such data is multilanguage Japan map data.

Japan has been actively enticing tourism from abroad, with the public and private sectors working together on projects such as the Visit Japan Campaign. In light of that, using ArcGIS, iPC developed a multilanguage Japan map database in 2009. This database comprises Japanese map data translated into English, Chinese (traditional and simplified), and Korean and covers 84.7 percent of the native or official languages of visitors to Japan. In this way, iPC is contributing to the creation of a variety of mapping solutions required for internationalization, such as navigation systems and websites for foreign visitors and foreign residents in Japan.

The multilanguage map database is made up of map notation, address, and POI data. It encompasses all of Japan and is compiled with multilingual notation in detailed maps (at 1:3,125 scale), assuming pedestrian use especially in major urban areas. That information is translated from Japanese and includes public facilities, shops, and the like, required by foreign visitors, as well as sightseeing location names and embassies.

Multilanguage Japan maps created with ArcGIS are provided to companies that plan to utilize the maps themselves either in shapefile format or by Multi-language MapFan onPage on web ASP services. Maps can be included with commercially available or in-car navigation products, mobile phones/smartphones, fleet management systems, and more, for use in a variety of environments and applications. Data is compatible with the World Geodetic System in anticipation of global usage. Some major implementations of the products are multilanguage maps for services such as Japan National Tourism Organization's (JNTO) JNTO Travel Planner (**www.jnto.go.jp**) on its website and Kinki Nippon Tourist's Japan Traveler Online (**Japantraveleronline.com**) hotel reservation website for foreign visitors to Japan.

For more information, visit **www.incrementp.co.jp/ml/en** or, for details on the multilanguage database, see **www.incrementp.co.jp/english/multi_language**.

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to a person who lives in a particular location for a recommendation about a great restaurant in that place," explains Demaj, "we went to the local cartographers, since they know both the physical and political data of their regions the best."

Production of the atlas started from scratch. Cartographers were given style sheets and instruction booklets for how to prepare the data. Detailed questionnaires were prepared to understand the data that was available in each area. Where possible, national mapping organizations (NMO) in each country were consulted. If an NMO did not exist, data was checked against satellite imagery. Any questions that surfaced, such as the placement of political boundaries or correct location names, were brought to the attention of the local cartographer or academic organization for an unbiased decision.

Demaj was able to bring the resultant map sheets, including line work, point data, and labels, together in a tiling process and merge them all using ArcGIS. "This was the best stable environment to use with such a massive amount of data," says Demaj.

The atlas employed ArcGIS to not only prepare the data but do the publishing as well. Maps were given only final touches in Adobe Illustrator then printed. *Earth: Platinum Edition* uses a variety of projections throughout to present maps that are aesthetically pleasing. Working with such large maps presented many challenges, including trying to visualize and gain a perspective on how the design, style, and layout of the maps would look through 22-inch monitors.

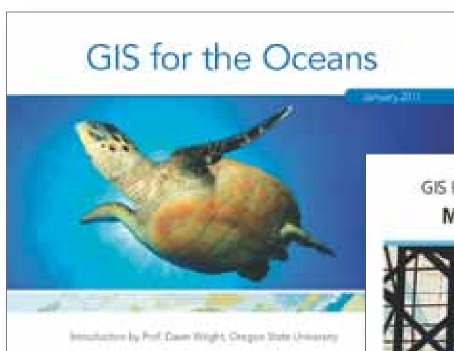
"In the past, the publishing and GIS worlds haven't really understood each other," explains Demaj. "I've found through this process that GIS can be used to produce beautiful cartography and an extraordinary atlas. It's as though the GIS producers are listening to publishers and we are finally meeting in the middle."

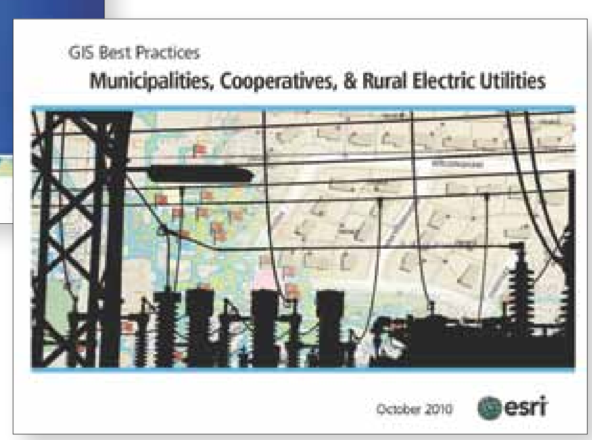
A smaller version, titled *Earth Blue* (610 x 469 millimeters, or 18 1/2 x 24 inches), is also available and is on display in Esri's corporate headquarters.

For more information regarding the cartography, contact Damien Demaj at ddemaj@esri.com. For inquiries about *Earth: Platinum Edition*, contact Millennium at info@millenniumhouse.com.au.

Two New GIS Best Practices E-books

GIS for the Oceans
Professor Dawn Wright introduces the grand challenges in marine science and discusses how GIS can help meet those challenges. A series of case studies illustrates how GIS is being successfully used in these areas.





Municipalities, Cooperatives, and Rural Electric Utilities
This collection of case studies and articles demonstrates how municipalities, cooperatives, and rural electric utilities use GIS to solve problems, from outage and vegetation management to regulatory compliance and design.

Read and download PDFs of these and many other GIS Best Practices books at **esri.com/bestpractices**.

Making More and Better Maps and Charts Faster

GIS is entering a new modality where advances in technology, measurement, software, science, and open data policies are creating a universal geospatial infrastructure. The proliferation of online geospatial information coming from both official and volunteered sources makes the jobs of authoritative content producers at mapping and charting organizations more critical. These organizations make up the core of the geospatial infrastructure, creating the foundational spatial information for GIS systems. They have the responsibility of providing the quality, accurate geospatial data and maps or charts that other organizations—and sometimes even lives—depend on.

In this fast-paced online, on-demand environment, the primary challenges faced by mapping and charting organizations are time, resources, and a difficult economic climate—the conundrum epitomized by the phrase "good, fast, and cost-effective—pick two." For authoritative content producers, ignoring "good" is not an option, so they are caught between the seemingly opposing choices of producing data, maps, and charts quickly or doing so cost-effectively.

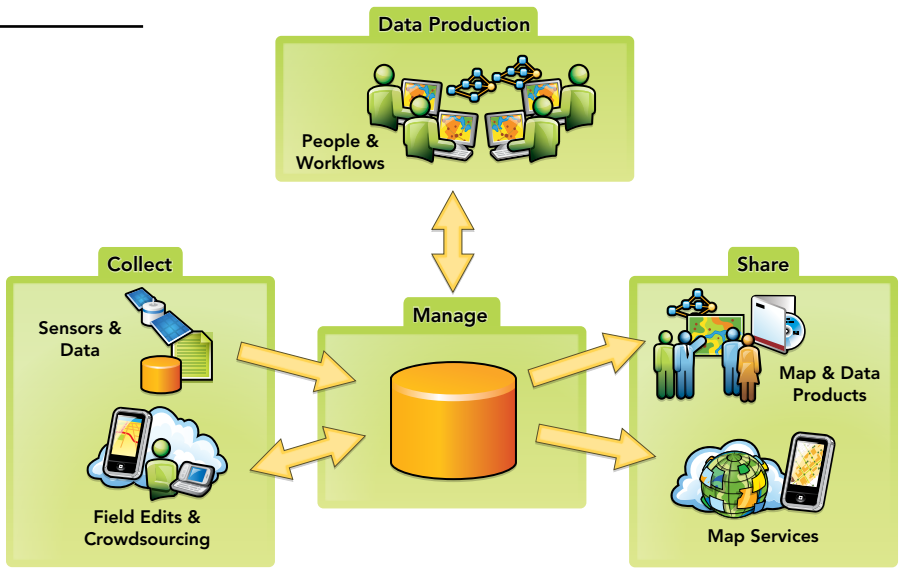
This challenge applies regardless of the size of the organization. While in many countries, *mapping and charting organization* is synonymous with *national mapping agency*, any group responsible for producing geospatial data, maps, and charts with exacting quality and output requirements faces the same challenge, whether it's a commercial entity; city, county, or state department; small GIS consultancy shop; or outsource contractor. All must produce more and better maps or charts faster than in the past while incorporating more sources and types of information (including volunteered geographic information, or VGI).

As demonstrated in the articles presented in this mapping and charting special section, mapping and charting organizations rely on GIS to help them, leveraging geodatabase technology to support the workflow of collecting, managing, producing, and exploiting data. Commercial GIS has evolved to further support these organizations and allow them to achieve both fast *and* cost-effective production. The ArcGIS system and ArcGIS software-based commercial off-the-shelf solutions have been designed to optimize production processes, orchestrating an organization's GIS to support standardization, efficiency, and repeatability. They support a collaborative shared work environment to ensure that teams follow the same rules whether sitting in the same room or across the world from each other. This means that organizations working with contractors can impose the same workflows, quality rules, and production standards on those contractors as used inside the organization. It also means that even the smallest departments can collaborate effectively with their stakeholders or contractors in such a way as to operate like a much larger one.

ArcGIS offers solutions for topographic, aeronautical, and nautical organizations, supporting industry-specific standards for those organizations. ArcGIS also provides extensions for managing GIS workflows or automating the data quality process. All are easily configurable for organization-specific standards and help mapping and charting organizations achieve economies of scale by better managing, validating, and incorporating the increased variety and volume of information available. By putting focus and emphasis on managing the data content, mapping and charting organizations are able to generate multiple outputs from a single source and achieve significant efficiency and quality improvements over traditional "stovepipe" production lines.

The geospatial world is moving increasingly toward an open geospatial infrastructure that connects producers and users of authoritative source datasets via the web. Commercial GIS is evolving to support mapping and charting organizations in their missions and in their participation in this new world by enabling them to improve the speed and accuracy of their data, maps, and charts without increasing resources—good, fast, *and* cost-effective.

For more information, visit esri.com/map-chart-dataproduction.



Commercial GIS has evolved to help mapping and charting organizations efficiently manage, validate, and incorporate the increased variety and volume of information available. By putting focus and emphasis on managing the data content, these organizations are able to generate multiple outputs from a single source and achieve significant efficiency and quality improvements over traditional "stovepipe" production lines.

NATIONAL GEOGRAPHIC™

"Geo Learning"

A column by Daniel C. Edelson,
Vice President for Education, National Geographic Society

Left: Students at Alta Vista Elementary School in Los Altos, California, take a well-earned break after traveling from Florida to Alaska on the Giant Traveling Map of North America (photo: Scott Schilling).

Below Center: Two Middlebury, Vermont, third graders explore the Atlantic coast of South America (photo: Dan Beaupre).

Scaling Up Classroom Maps

Usually, when you talk about the scale of a map, you're talking about the ratio of distances on the map to distances in the real world. These days, however, when educators working with National Geographic maps talk about scale, they may be talking about how big the map is. For example, a teacher may have her students working on a map at the "scale" of a tabletop, a large wall, or even a basketball court.

So what's going on with all these big maps? Well, we've learned that kids find large maps to be magnetic. And not just young kids. Teens and adults find large maps irresistible as well.

Imagine walking into your school gym and finding half of the floor covered in a glorious, full-color, National Geographic map of Asia. If your school is one of those that has signed up for a visit from one of National Geographic's Giant Traveling Maps, you could.

Most people find they can't just look at these maps. They *must* walk on them. They count how many steps it takes to get from Beijing to Moscow. They lie down to see if they can reach from the southern tip of India to the northern tip. They find the maps amusing, just like the oversized cereal boxes at Costco.

Students use markers to illustrate data on National Geographic Education's NatGeo MapMaker Kits (photo: Mark Thiessen, NGS).

Students record data about tourist impact on different countries in Europe using National Geographic Education's NatGeo MapMaker Kits (photo: Mark Thiessen, NGS).

Frankly, people find the scale of these maps fascinating. And educational. Unlike regular-sized maps, you can see lots of detail and a large portion of the earth's surface at the same time. Similarly, you don't shift your eyes or turn the page if you want to look at a different location. You move your whole body, like you do in the real world. These maps allow people to interact with a map kinesthetically, experiencing scale and direction as physical sensation.

Now imagine taking 136 sheets of 8.5" x 11" paper and putting them together to form a mosaic map of the world that is 17 sheets wide and 8 sheets tall. If you download one of the free NatGeo MapMaker Kits, you could. These "megamaps" are only 10 feet wide and 7 feet tall, but they still take several strides to walk across. And, since they are made of regular printer paper, you can draw or paste things on them. You can even cut them up.

These "scaled-up" maps have great educational potential. They break down the usual barriers between people and maps. They draw people in, and they encourage them to interact.

Both the Giant Traveling Maps and the MapMaker Kits are packaged with a variety of hands-on (literally) activities. When a Giant Traveling Map arrives at your school, it comes with a trunk full of materials that transform it into a giant game board, including giant dice, traffic cones, plastic building blocks, and beanbags. The MapMaker Kits are designed as basemaps for students to draw, glue, or overlay information on.

In fact, some of the most engaging activities for these oversized maps are essentially low-tech versions of geospatial analyses. Have you ever represented a buffer with a hula hoop? Measured a linear distance in units of arm spans? In a classroom down the street, students may be symbolizing data by pasting construction paper circles of differing sizes and colors on a map. Or they may be creating contour maps with yarn and delineating watershed boundaries with a crayon.

Some of the best educational ideas are just slight twists on conventional practice. What we've discovered is that blowing up maps to unusual sizes is one of those ideas.

For more information about the Giant Traveling Maps, visit **www.nationalgeographic.com/giantmaps**. For more information on the NatGeo MapMaker Kits, visit **www.natgeoed.org/mapping**. Follow Daniel Edelson on Twitter @NatGeoEdelson.

Swiss National Mapping Agency Breaks New Ground in Geodata Products

Highlights

- Using GIS and photogrammetry in an integrated way, updating spatial information takes less time.
- The workflow implemented using ArcGIS streamlines production processes.
- Data is collected and stored in 3D, allowing z-values to be leveraged.

TOPGIS successfully marries GIS and digital photogrammetry, providing the infrastructure for the production of the TLM and DTM (images and maps courtesy of swisstopo, © 2009 swisstopo).

Traditionally, the key task of national mapping agencies like swisstopo (the Swiss Federal Office of Topography) has been the production of national map series. In recent years, the need for digital topographic base data has continued to increase because it is used to produce printed paper maps, as well as a variety of products, including digital multimedia products, digital elevation models, and 3D city models. For swisstopo, the increasing demand for better, more up-to-date, and more diverse digital data has meant that the generation and rapid updating of such products has taken on a high level of importance.

To create this new type of topographic data products, swisstopo established a production infrastructure called TOPGIS. This system is used to create, manage, and update the new Topographic Landscape Model (TLM) of Switzerland, as well as update a corresponding digital terrain model (DTM).

The TLM serves as the base landscape model for Switzerland's spatial data infrastructure and is a central dataset from which many products can be derived. Every feature of the TLM is stored in a geodatabase with better than one-meter accuracy in all three dimensions. Using this process has a number of advantages for swisstopo: processes are streamlined, the time to market for products is reduced, data is more accurate, and a 3D model is created.

TOPGIS Streamlines Data Production

TOPGIS is used to capture, update, and administer the TLM and DTM. The system was created by ESRI Schweiz AG, a distributor of Esri's products in Switzerland, and is based entirely on ArcGIS, including desktop, server, and mobile GIS components. Stereo photogrammetry is fully integrated through Stereo Analyst for ArcGIS from ERDAS, Inc., which gives swisstopo stereo collection capabilities inside the ArcGIS environment.

TOPGIS was designed to solve the challenges swisstopo faces in data production. Workflows need to be addressed because up to 50 users may be working on several delivery versions of TLM in parallel. Operator productivity and system performance are crucial. Compared to the previous VECTOR25 landscape model used at swisstopo, the operators need to capture significantly more detailed data in a shorter amount of time. The production of a primary 3D model must also be addressed. This means that each vertex of each object must have accurate z-values.

As the national base landscape model, the TLM is seamless and covers all of Switzerland. It consists of 10 thematic categories ranging from land cover to man-made objects and, once complete, will contain approximately 20 million objects. These objects and all related information are stored in a geodatabase. Every vertex of the TLM objects has x-, y-, and z-coordinates, so objects in the TLM can and should stay consistent with the DTM. Originally captured by a lidar sensor, the DTM includes mass points and breaklines and is photogrammetrically updated simultaneously with the updating of the TLM.

3D Data Capture

The third dimension of the TLM is captured either photogrammetrically based on high-resolution ADS40/ADS80 stereo imagery or, alternatively, by monoplotting using orthophotos and the DTM.

Twenty-inch planar stereo screens are used for stereo viewing. The polarized left lens of the glasses blocks light from the top monitor, while light from the lower monitor is blocked by the right lens. This technology allows flicker-free operation under any office's ambient light.

Three-dimensional stereo mode is used in many situations, such as when capturing objects that form or shape the terrain, for example, waterways, roads, and railways; to edit the DTM; and to capture the heights of objects, such as roofs, electric poles, and bridges.

Although the TLM is 3D, not all objects are edited in stereo mode. This is because they "sit" on the terrain, so they assume their z-values from the underlying DTM. Some examples include hiking trails, land cover, and boundaries.

In TOPGIS, mono and stereo capture are seamlessly integrated. To change modes, the operator simply moves the cursor from the 3D screen to the 2D screen or vice versa. All objects are always visible on both screens.

TLM data overlaid on an orthophoto (© 2009 swisstopo).

Parallel-Release Cycles of Products Are Possible

Using the geodatabase allows swisstopo to create and maintain multiple parallel-release cycles of the TLM. Within each release cycle, the operators' work is organized into work units that define a perimeter within which a defined set of layers can be edited. Automated batch jobs reconcile the operators' daily work with the release cycle during the night, which helps prevent uncontrolled growth of the database state lineage tree.

During the reconciliation step, conflicts may be detected between the edits of different operators. For example, a road object extending over more than one work unit may have been edited by several users. The system will first try to automatically resolve conflicts. If automatic resolution is not possible, TOPGIS assigns the conflicts to a work list that is subsequently checked and manually resolved by an administrator.

Periodically during data collection, and particularly when a release cycle is completed, a multilevel, rule-based quality assurance system

ensures that a predefined level of quality is met. This modular, high-performance QA system was built especially for TOPGIS and includes 3D tests.

One step in the TLM production chain is improving and completing the TLM data in the field using ruggedized handheld Tablet PCs and GPS receivers. The data is checked out from the central database in the office and subsequently edited in the field. Because Tablet PCs are used, the full functionality of ArcGIS is available to the field topographer. The GUI differs only slightly from the office mono clients. Support for GPS data capture and GPS postprocessing is supplied by the GPS Analyst for ArcGIS extension from Esri Partner Trimble Navigation Limited.

Increased Productivity

To minimize the number of mouse clicks, mouse movements, and menu calls, special tools and mechanisms were built.

All relevant edit tools are available on a configurable toolbar for direct access. This toolbar can also be displayed as a pop-up menu at the current cursor position. A number of specialized tools were developed, for example, for automatically adjusting complex geometries to each other.

As the user selects which object to capture next, TOPGIS automatically sets all the edit properties, e.g., snap settings, z-capture rules, and default attributes, based on the type of object behind the scenes. These settings are predefined by an administrator and loaded automatically depending on the actual context. The operator can override the defaults if needed.

A rule engine enforces a set of consistency rules at each edit operation, helping the user prevent errors while editing. The rule engine is designed in a way that the user is not distracted by any delay.

Because TOPGIS integrates desktop, server, and mobile GIS, as well as digital photogrammetry, no data conversion steps are necessary to traverse system boundaries, as it used to be with previous solutions. Conversion is only necessary when data from third parties is imported, such as road authorities or national mapping agencies of neighboring countries, or when products are exported for customers. An individually developed component called DataHub, based on Esri Partner Safe Software's FME, is used to do import and export jobs.

The hardware and software infrastructure supporting the productivity of TOPGIS is designed to ensure short response times even with the large data volumes used. To ensure availability, a DBMS failover mechanism is used. (Failover is the capability to switch over automatically to a redundant standby database.)

In operation since 2008, TOPGIS successfully marries GIS and digital photogrammetry, providing the infrastructure for the production of the TLM and DTM. This modern infrastructure has a strong emphasis on productivity and workflows, allowing swisstopo to efficiently produce an up-to-date, primary 3D dataset designed to serve as the basis for a variety of products—not just maps.

For more information, contact Martin Suter, ESRI Schweiz AG (e-mail: m.suter@esri.ch).

Making a New Road Atlas for Tourists and Travelers

Established in 1984, Mapping Specialists, Ltd., began as an offshoot of the cartography lab at the University of Wisconsin, Madison. Since that time, the private company's cartographers have provided quality maps for encyclopedias, street-mapping companies, and educational publishers for textbook maps and a wide array of materials for preschool- through college-level students. The company also assists many federal, state, and local governments in producing quality publications for their agencies. "Maps can sometimes look deceptively simple to create," says Adam Derringer, manager of GIS Services at Mapping Specialists. Cartographers and researchers both have a hand in the maps that are created both freehand and digitally. Each map means doing a large amount of research, whether the maps are created as illustrations to an author's text or used as a guide to find a location.

From Guides to the Ultimate Atlas

While Mapping Specialists has historically used Esri's GIS to create and manage map layers for its cartographic work, GIS didn't become a make-or-break prospect until the company began working with Rand McNally on the Thomas Brothers' road guides. This series of paperback, spiral-bound atlases features detailed street maps of many large metropolitan areas in the United States. With each book containing hundreds of pages, maintaining this data in a graphics-only package became prohibitive. If a feature changed on one page, ensuring that it was updated on all other referenced pages was an arduous task. That is where using GIS became imperative; with a geodatabase, features could be edited once and the change would be reflected on all pages where the particular feature was shown.

Having this experience allowed Derringer to take on another large project—a 224-page *Ultimate Road Atlas* designed for tourists and travelers as they explore the United States' vast network of highways. The atlas presents complete, updated road information and thousands of points of interest, such as a 24-page Traveler's Guide, including information and maps of national parks, as well as top picks for outdoor adventures, natural wonders, entertainment, culture, discovery, and unique examples of Americana—all highlighted on the atlas pages. Unique among American road atlases, the top of each map page describes several easy-to-find points of interest.

While the print market for maps has taken a hit since the dawn of GPS-laden mobile phones and inexpensive personal navigation devices, Derringer explains that the atlas market has held up well. *Ultimate Road Atlas* contains details such as a shaded relief map for the entire country; city inset maps; and a comprehensive, small-scale map of the Northeast Corridor of the United States. This gives a complete picture of roadways and tourist sites in the country. Each page features complete latitude and longitude, making the atlas the perfect complement to a personal navigation device. "You can't see all that information on a three-inch GPS screen," explains Derringer.

"We Couldn't Have Done This Project Without GIS"

ArcGIS with a Microsoft SQL Server database was used to store and edit data for the atlas. A team varying in size from 4 to 12 people created and edited more than 300 cartographic layers with the solution. Explains Derringer, "Cutting, editing, then reseaming hundreds of map pages would have been terrible—likely impossible—without ArcGIS."

Data collection and editing took 18 months, with the first year focusing on data collection. The data was largely created by Mapping Specialists staff using available data from Esri and state and local governments as reference. Place points are located on each map page by GPS coordinates down to the second. Since many features are maintained in multiple datasets for different mapping scales, using an ArcGIS geodatabase was necessary to ensure there were no conflicts in edited features and the versions used were the most accurate and up-to-date at all times. Working from the seamless geodatabase meant that all data was available and could be used for multiple pages. This cut down on both data errors and file size.

A senior cartographer guided each group as the data was scrubbed and readied for placement on the map pages. Most editors had ArcGIS experience, but for those who didn't, training was straightforward and quick. "We spent more time on the rules for cartographic production than we did on how to run the software," says Derringer.

Esri's Maplex software was used to carefully place labels in areas with dense information, such as around Seattle in Washington State.

Label placement in *Ultimate Road Atlas* was the largest effort. Mapping Specialists created custom symbols for different feature classifications. Roads alone had six different classifications for how they were symbolized on the maps. Esri's Maplex software was employed for placement, but most text still needed to be touched by an editor. "In many cases, it was simply hitting the Maplex OK button," says Derringer, "but in others, the text needed to be moved. Maplex made what could have been a very time-consuming job into something that was manageable."

Mapping Specialists gained many efficiencies with ArcGIS on such a large project. "We used staff who hadn't done production work in more than 15 years," Derringer explains. "It took them only 45 minutes to get up to speed with the software. ArcGIS is a pretty effective tool for people, especially those who come from a graphics background."

Editors maintain they couldn't have completed the project without GIS to handle the many page spreads and features. Having a complete geodatabase of features will make new editions of the atlas an easier task to manage. Much of the unique symbology created can be licensed to or used by other agencies for map production, from small publishers to national mapping organizations in need of creating a national atlas.

For more information, contact Adam Derringer (tel.: 608-274-4004, e-mail: adamd@mappingspecialists.com). For more information on Esri's solutions for cartography, visit **esri.com/cartography**.

The Local Government Resource Center

This is a place where you can communicate and collaborate with other local government users, partners, and teams within Esri supporting local governments. It's also a place where you can find ArcGIS® maps and apps that help you implement GIS in your local government.

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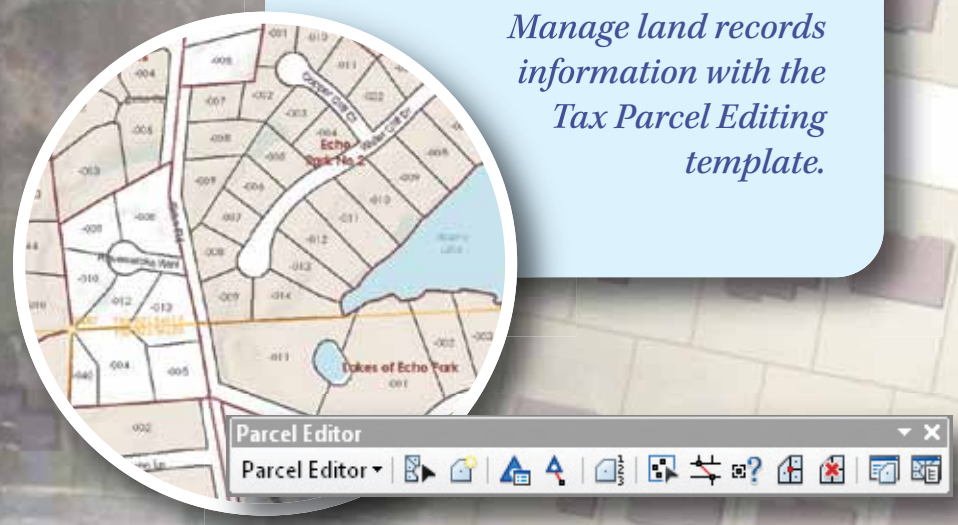

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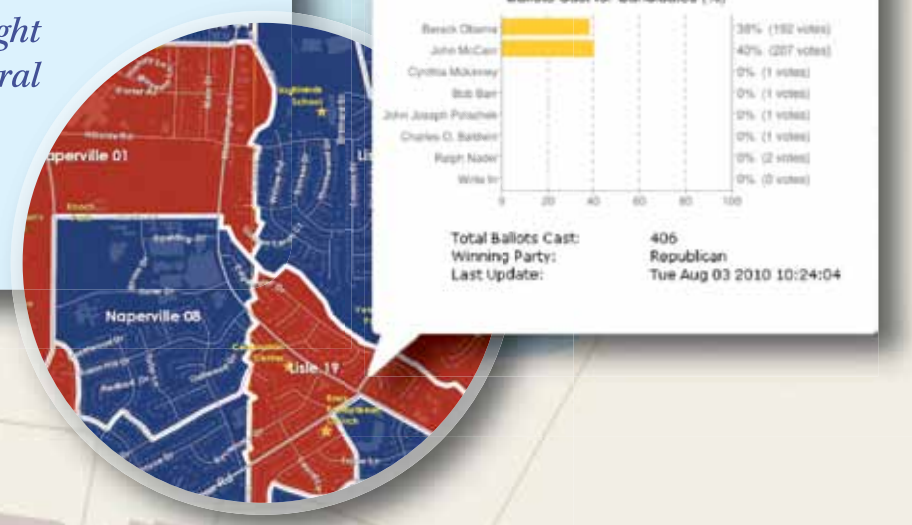

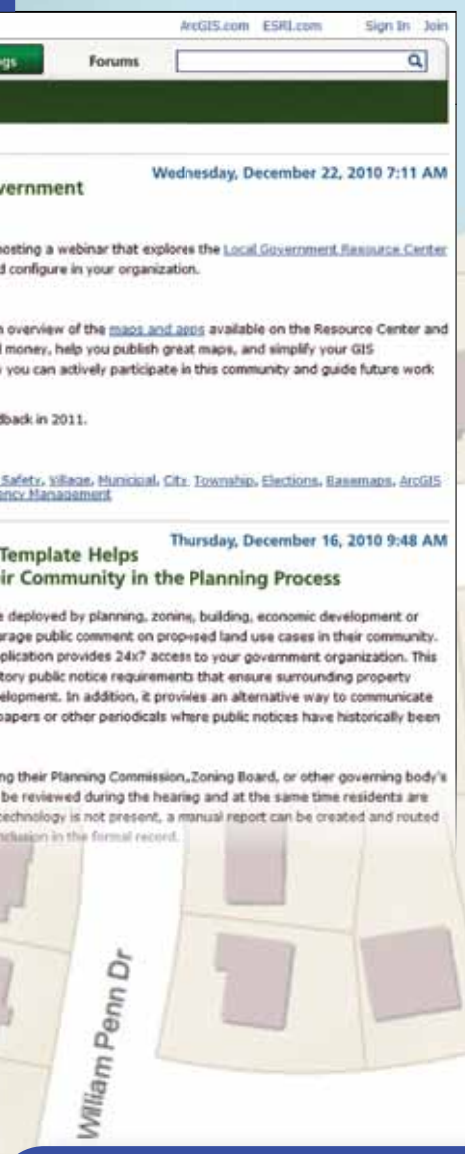

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Insuring America's Farmland

The USDA's Risk Management Agency Uses Actuarial Maps for More Equitable Premium Pricing

Highlights

- GIS helped RMA save $20 million a year and lower premiums for regular rated land.
- In cases of suspected fraud or abuse, the agency uses imagery to examine a producer's crop and reconstruct the growing season.
- RMA uses GIS to drill down past the county designation to evaluate designated subcounty insurance offers.

The United States Department of Agriculture's (USDA) Risk Management Agency (RMA), based in Washington, D.C., helps food producers manage their business risks through effective market-based risk management solutions. As part of this mission, RMA manages the Federal Crop Insurance Corporation (FCIC) to provide American farmers and ranchers with crop insurance. RMA develops and approves the premium rate, administers premium and expense subsidies, approves and supports products, and reinsures the private-sector insurance providers through the Standard Reinsurance Agreement. In crop year 2009, RMA managed nearly $80 billion worth of potential liability.

FCIC relies on actuarial maps for crop insurance to designate different areas within a county that have varying amounts of risk due to factors such as flooding or highly erodible soil based on type. These maps are used by 16 private-sector insurance companies that sell and service FCIC policies. While RMA has been using hard-copy actuarial maps for decades, it had no way to validate whether an agent or insurance company was reporting accurate claims or the claims reported were in the correct areas.

Inaccurate reporting skews the adjustment of the risk rate for producers and can create unnaturally high premiums in areas where it is not necessary. Because of this, RMA incorporated GIS to manage the information and analyze the program. Using GIS has helped RMA save $20 million a year and lower premiums for regular rated land, which in turn reduces the government subsidy on insurance across all acreage.

Saving Money and Time

Since most federal agencies are standardized on Esri software and data formats, RMA chose to incorporate Esri software in the early 2000s to begin the FCI-33 Actuarial Map Digitizing Project to convert hard-copy maps, using aerial photos and USDA Common Land Unit data, into GIS. This process took several years, and at the end, RMA's 10 regional offices digitized more than 1,500 maps into shapefile format.

Managing such a large number of digital maps was difficult, prompting USDA to upgrade to ArcGIS when it was released and use a personal geodatabase to manage the digital files. The geodatabase allowed it to aggregate the maps into 10 more manageable feature classes instead of the 1,500 stand-alone maps. In 2008, RMA upgraded to ArcGIS Server, which allows it to more easily share the data throughout its regional offices using a central server without keeping copies of maps on regional office computers.

RMA uses the digital actuarial maps to cross-check and approve maps generated by the regional offices. "The ability to validate these automatically instead of by hand has saved us so much time," says Greg Oetting, risk management specialist, USDA-RMA, Topeka Regional Office.

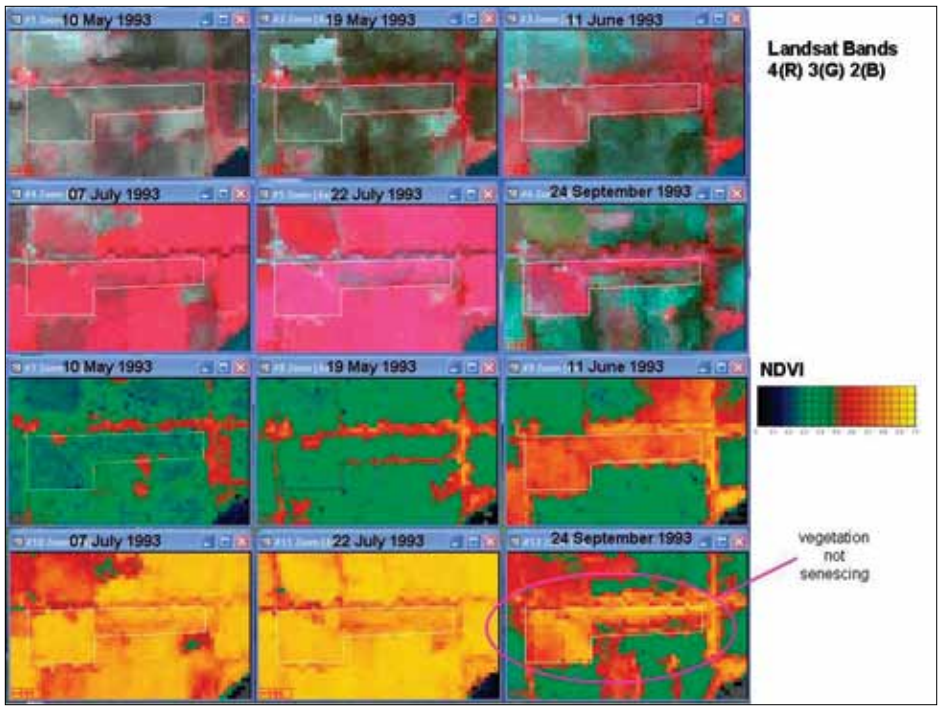
The actuarial maps for 2010 and previous years are published as PDF files on the Internet for the insurance companies to view. In 2011, RMA rolled out an interactive map viewer that is hosted publicly. Insurance companies have access to the data and can host it internally. "This will be a real time-saver to RMA," says Oetting. "Creating the map viewer means we don't have to spend time and man-hours building out and proofing 1,500 individual PDFs."

Analyzing the Crop Insurance Program

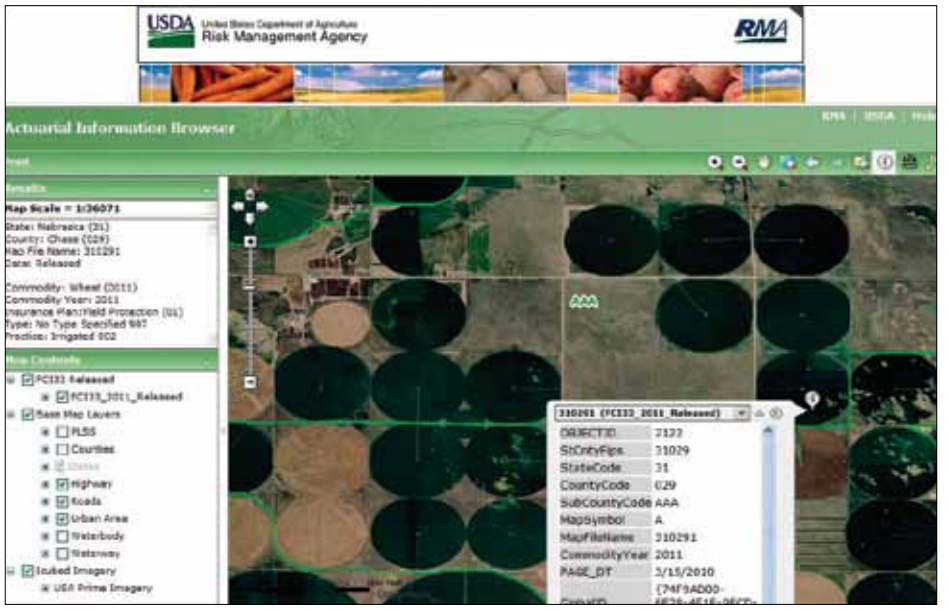
Over the last few years, RMA has been incorporating more satellite imagery into the program. "A majority of the maps we create are located in flood-prone land, which has a higher risk than any other insurance peril," states Oetting. Unlike a Federal Emergency Management Agency map, however, where land is designated as a flood risk or not, RMA is interested in whether a certain land floods only during the specified growing season. Floods that occur in the winter months on a producer's land won't have any impact on the insurance policy for crops planted in the spring because the land is not being used for crops at that time.

Satellite imagery provides a good source to find the extent of floods. "Flooding near major rivers like the Mississippi and Missouri are easy to determine," says Oetting. "But it's harder to determine flood extent and frequency on smaller tributaries. Using GIS to overlay satellite imagery provides an accurate visual of where exactly the flood happened." RMA can check areas that might be designated as high risk when, in reality, they weren't flooded during the actual growing season.

GIS is also used to update maps quickly and help RMA with the appeal process. If a producer doesn't agree with a particular rating class, he can appeal it. For example, a producer may argue that the land he is cultivating is not flood prone. The ability to pull up satellite imagery for the day the river was at its highest during the year and see that, in fact, there was no water on the producer's land allows RMA to rectify the misclassification.



The United States Department of Agriculture Risk Management Agency (RMA) uses forensic remote sensing to examine the growing conditions, crop health, and vigor within fields.



The RMA Actuarial Information Browser map viewer is used by farmers, crop insurance agents, approved insurance providers, and RMA to view insurance offers at a subcounty level.

Transparency Leads to Equitable Pricing

Having the maps standardized across the country also helps with creating fair and equitable pricing and makes the process transparent to the producers. RMA has created handbooks for each office so it can standardize editing performed on maps.

This is important, since where crops are physically located dictates the type of coverage farmers are offered. Insurance offers are based on the crop yield for a particular parcel of land. This information is garnered from the producer's production history, the harvest-time futures price set at a commodity exchange before the policy is sold, and the type of crop planted. The policy will pay an indemnity if the combination of the actual yield and the cash settlement price in the futures market is less than the guarantee.

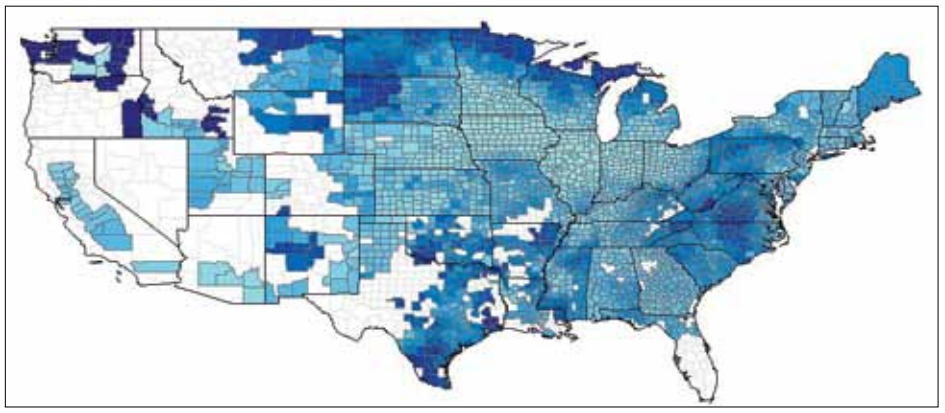
Using GIS to drill down past the county designation, RMA can designate subcounty insurance offers that are considered high risk, which excludes the insurance history from the calculations that are used to determine the premium rates for the entire county. The end result is a premium rate decrease for most producers, as more high-risk acreage gets reported correctly.

In the past, reviewing premium rates involved colored pencils and large pieces of construction paper on which RMA staff would manually write down all the components of the premium rate by county. Now, GIS can be used to thematically map areas and look for the anomalies. For example, if rates are going down all over Kansas except one county, RMA can not only see the discrepancy quickly but also investigate why. "Trying to answer the *why* was impossible before," says Oetting. "We would have to find all the documents and papers and then send someone out for a manual check just to chase down the answer. With GIS, everything is linked and very easy to find."

In cases of suspected fraud or abuse, RMA uses imagery to examine a producer's crop for a particular time frame and reconstruct the growing season. Using imagery allows RMA to perform, in essence, forensic remote sensing at any location to see what actually happened on the ground. RMA can pull up the imagery and overlay the digitized map of the farm field boundary. RMA agents can see if the land has been planted as the producer said it would. Since images are captured every 16 days, gathering this visual evidence is important because it provides the evidence needed in a sound, scientific protocol.

"The vast majority of farmers follow the rules," says James Hipple, PhD, physical scientist, USDA-RMA, Office of Strategic Data Acquisition & Analysis. "Remote sensing and GIS are part of the toolbox RMA utilizes in creating an actuarially sound agricultural safety net for America's producers while simultaneously minimizing the amount of fraud, waste, and abuse in the program."

For more information, contact RMA's External Affairs office at **rma.cco@rma.usda.gov**.



Using its rate review mapping tool, RMA can easily visualize how rating components flow across the nation.

Perth Airport Flies High with Geospatial Intelligence

Australian Airport Gains Enterprise-wide Access to Location Intelligence Tools

Highlights

- With GIS, Westralia Airports Corporation effectively disseminates and manages location intelligence data between multiple departments.
- Staff is better informed and empowered to make better business decisions.
- Location intelligence through GIS is important for planning the airport infrastructure and the construction or relocation of services.

Westralia Airports Corporation effectively disseminates and manages its data throughout multiple departments, creating workforce efficiencies through time-saving and near real-time information sharing processes.

Strategically located in relation to Southeast Asia, Europe, and Africa, Perth Airport is Australia's fourth largest airport in terms of passenger traffic. Under a 99-year lease arrangement with the commonwealth government, the airport is operated by Westralia Airports Corporation Pty Ltd (WAC). The Perth Airport estate encompasses more than 2,100 hectares and is the premier international, domestic, and regional gateway to the province of Western Australia.

Western Australia is home to a strong economy led by natural resources, and since Perth is Australia's most isolated capital city, Perth Airport is a critical infrastructure component in the state. The airport has recently experienced the highest passenger growth rates of any Australian capital city airport, reporting a 7.5 percent increase in passenger numbers for the 2009–2010 financial year. More than 10.4 million passengers traveled through Perth Airport in 2009–2010, and total passenger movements per year are forecast to more than double to 18.9 million by 2029.

To meet this growth projection and prepare for the expansion of terminal facilities, WAC sought to gather more data across the airport estate, taking multiple safety and security, operational, environmental, customer service, commercial, and service infrastructure factors into account. WAC wanted to be able to integrate data from this range of complex interrelated areas and understand how the location of various factors was influencing their use and constraints.

To achieve this, WAC required a solution that provided more enhanced spatial information management. During the research and investigation process, WAC contacted ESRI Australia Pty. Ltd., Esri's distributor in Australia, which had developed a technology that could help Perth Airport find a corporate-wide location intelligence solution, and the two companies decided to work together on the project.

The team's key goals were to create a solution using ArcGIS technology that would

- Provide a single authoritative source of spatial information.
- Add value to the business and decision-making processes.
- Improve efficiencies in repetitive or complex tasks.
- Provide an intuitive way to locate information held in business systems.
- Ensure that adequate and reliable technology is deployed to support location-based systems and business activities.

At the heart of WAC's location intelligence solution was Esri GIS and Dekho software, which was developed by ESRI Australia. Based on ArcGIS, Dekho helps WAC integrate information from databases that have a location element, including property and asset management. The software enables WAC to effectively disseminate and manage this data throughout multiple departments, creating workforce efficiencies through time-saving and near real-time information sharing processes.

WAC is a significant service provider, managing the power, gas, sewer, water, fuel, drainage, and communications needs of two terminals and more than 200 tenants. It is also effectively the landlord, retail hub, and conservation authority within the Perth Airport estate. The corporate-wide solution enables WAC staff throughout the entire organization to access essential location-related data to support operation of the airport.

"Before we implemented GIS, all spatial information requests were submitted to the Design Office to generate the relevant maps and data," says Shannon Browne, GIS administrator at Perth Airport. "This meant that departments did not have real-time access to information, and the Design Office could become bogged down fulfilling the myriad of simple requests rather than utilizing [staff] skills for design and spatial information management.

"Through the implementation of GIS, we now provide all staff with access to self-serve maps," Browne continues. "These can help with anything from planning the location of a new vending machine to scoping the environmental impacts of building a new warehouse on the estate. With so many stakeholders using location intelligence to get a greater insight into their working area, staff are better informed and therefore empowered to make better business decisions."

Beyond the ability to create maps and visualize where assets are, location intelligence is playing a major role in planning and development of the expanding airport precinct.

"Location intelligence is vital in planning the airport infrastructure for the construction or relocation of services and the maintenance of airport assets," says Browne. "Through effective use of location intelligence, we will be able to move to a more proactive maintenance schedule and more efficiently allocate and plan resources, resulting in significant cost savings and a better running suite of assets."

WAC has many more plans for using location intelligence at Perth Airport to optimize workflows and better understand the dynamic nature of the site, for example, further integration with the asset management and maintenance processes, detailed land-use reporting, enhanced utilization of location intelligence for operational activities, and mobile access to GIS.

For more information, contact Shannon Browne, Westralia Airports Corporation (e-mail: Shannon.Browne@wac.com.au).

Planning for a Polder in the Netherlands

Geodesign Project Integrates Water Management and Land-Use Planning

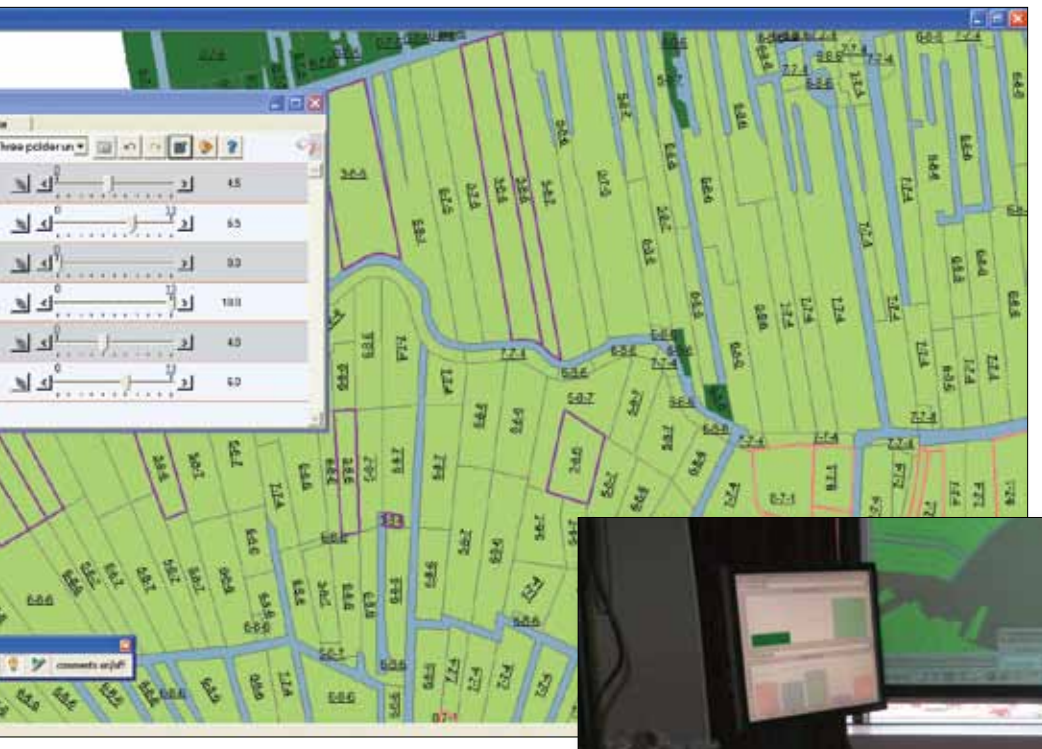
Highlights

- Land tracts surrounded by dikes (polders) were modeled with quantitative and qualitative trade-offs regarding water and land-use plans.
- With ArcGIS and CommunityViz design tools, land-use stakeholders work together on new plans, sketching ideas and receiving fast feedback.
- The project combined GIS mapping and scenario planning tools, which allowed the team to integrate expert knowledge into the decision process.

The Dutch are familiar with polders—low tracts of land typically enclosed by dikes—and their characteristic hydrologic and land-use challenges. The Bodegraven polder, located in the province of South Holland, is a low-lying peat meadow area of some 4,672 hectares (11,545 acres) in the Netherlands, where water tables are controlled to enable multiple land uses. While Bodegraven has been predominantly used for commercial dairy farming, it is also important for its high natural, cultural, and historical value.

Bodegraven is currently facing a number of problems that will affect the sustainability of its land uses: ground subsidence, preservation of the peat meadow landscape, inefficient water management, poor water quality, and the changing economics of dairy farming. Multiple stakeholders are thus involved, including the local water board, the City of Bodegraven, the Province of South Holland, farmers' organizations, and nature conservation organizations, as well as individual farmers, residents, and recreational visitors. Consequently, the provincial authorities have started a planning process to review and adjust both water management practices and land uses in the area. The

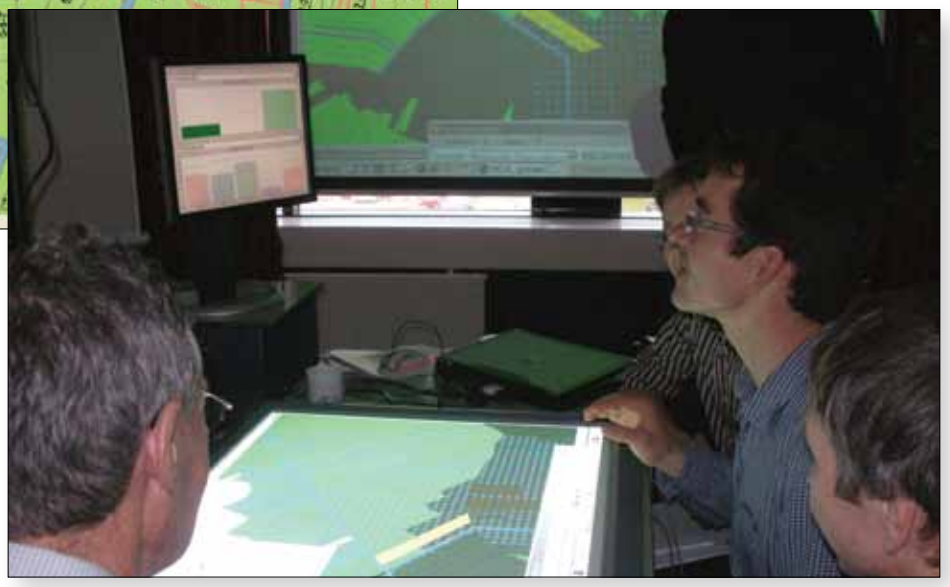
The project study area is the Bodegraven polder, located in the Province of South Holland in the Netherlands (photo copyright Frank Stroeken from Terra Incognita).



Quantitative trade-offs of the project were identified by selecting polygons that would profit from a land-use swap based on their actual MCA value.

Spatial Analysis and Decision Support Department of the Institute of Environmental Studies worked with stakeholders to develop and test participatory tools to support integrated land-use planning and water management within this region despite conflicting objectives.

The project team structured the planning process for Bodegraven into a series of three interconnected stakeholder workshops: design, analysis, and negotiation. In the design workshop, the team defined three reference plan alternatives, stakeholder objectives, and evaluation criteria. For scenario planning, the team used ArcGIS and CommunityViz, an ArcGIS extension, extensively during the analysis and negotiation workshops to visualize maps and scenarios. The team was already familiar with Esri software, as it uses it for most of its mapping and cartography work, and it chose to continue using the software for this project. Additionally, the team chose to work with CommunityViz because of its compatibility with ArcGIS and its versatility for application to a wide range of planning studies. The software's calculation speed also made it suitable to support geodesign and conversations around an interactive device, such as a touch-enabled interface, or touch table. The combined solutions allowed "spatial discussions to be clearer and better supported," comments Aletta van der Zijden, regional coordinator of landscape management in South Holland.



A large touch table acted as the main map interface for the project. It facilitated stakeholder participation in the three project workshops.

The touch table supported stakeholder participation in the workshops and acted as the main map interface for the geodesign software. A separate screen was also set up to view additional information, such as charts and tables. In the analysis workshop, the project team used ArcGIS to present maps with thematic information about the region to increase the understanding of participants, who included both experts and stakeholders with varying backgrounds. Next, the project team used Scenario 360, a component of CommunityViz, to create scenarios. Each scenario consisted of a polygon-based suitability map in which the weights of each criterion were set according to participants' values. Participants could change the weights interactively using the touch table to adjust assumption settings in the software.

As the weights were changed, the results were dynamically updated and presented both on the touch table as a map and on the separate screen as a bar chart showing aggregated scores for various criteria and objectives the participants had established. A set of weights and the corresponding set of value maps constituted the main product of this phase. Ton Verdoorn, a project manager from the Province of South Holland, remarks that the combination of GIS and planning tools made it "possible to quickly and clearly see both spatial and numerical consequences of changing variables on the map."

The negotiation workshop supported the process of collectively changing the current land-use pattern of the polder into a new, negotiated plan. Participants were the institutional stakeholders: the water board, the City of Bodegraven, the Province of South Holland, and nature conservation organizations. To support negotiation, the project team used multicriteria methods to show trade-offs among stakeholder objectives. Stakeholders used Scenario 360 to adjust two kinds of trade-offs: qualitative and quantitative. Qualitative trade-offs were identified by selecting polygons that were "very suitable" or "very unsuitable" for each potential land-use type based on their summed area and ranked multicriteria analysis (MCA) value.

Quantitative trade-offs were identified by selecting polygons that would profit from a land-use swap based on their actual MCA value. The next step was to change the plan. Stakeholders used their hands with the software's sketch tools to change land-use patterns on the touch table as they discussed the changes. A land-use palette allowed participants to assign new land uses to target parcels. As soon as the participants agreed on changes, MCA results were updated and displayed as bar charts on a separate screen in real time.

This project ran for four years, from 2006 to 2010, and ended with a positive result that satisfied all the project stakeholders. The combined use of GIS mapping and scenario planning tools allowed the team to integrate expert knowledge with stakeholder perspectives into the decision process of Bodegraven.

For more information, contact Gustavo Arciniegas, PhD, researcher, Institute for Environmental Studies, VU University Amsterdam (e-mail: Gustavo.Arciniegas@ivm.vu.nl). Visit the Institute for Environmental Studies website at **www.ivm.vu.nl/en**. Visit the Province of South Holland website at **www.zuid-holland.nl/foreign-visitors.html**. Learn more about CommunityViz at **www.placeways.com/communityviz** and the DiamondTouch table at **www.circletwelve.com/products/diamondtouch.html**.

Sea Predators Guide Scientists to Vital Ecosystems

Highlights

- ArcGIS was used to process the remote-sensing georeferenced data, shapefiles, and raster grids.
- WCS uses GIS to create a composite view of Patagonian Sea ecosystems.
- Researchers used GIS to process the remote-sensing tracking data and generate distribution density maps.

The presence of top predators is an indicator of a food chain that supports them and the ecosystem necessary for that food chain to thrive. The southern seas and coastlines of Argentina and Chile, known as the Patagonian Shelf, are a habitat to albatross, colonies of Magellanic penguins, and pods of right whales. The hints provided by these and others predators, along with scientific analysis and GIS depictions, help nongovernmental organizations (NGOs) better understand and conserve the ecosystems of these waters.

Non-Governmental ngo Organization

Wildlife Conservation Society (WCS) and Birdlife International have collaborated to create *Atlas of the Patagonian Sea*, which contains maps showing key migratory corridors for top predators such as albatross, petrels, penguins, fur seals, sea lions, and the southern elephant seal. More than 25 scientists from other research institutions and conservation organizations contribute their experience and data to the project. Esri and Aeroterra S.A. (Esri's software distributor in Argentina) donated GIS software and support for visualizing and analyzing data.

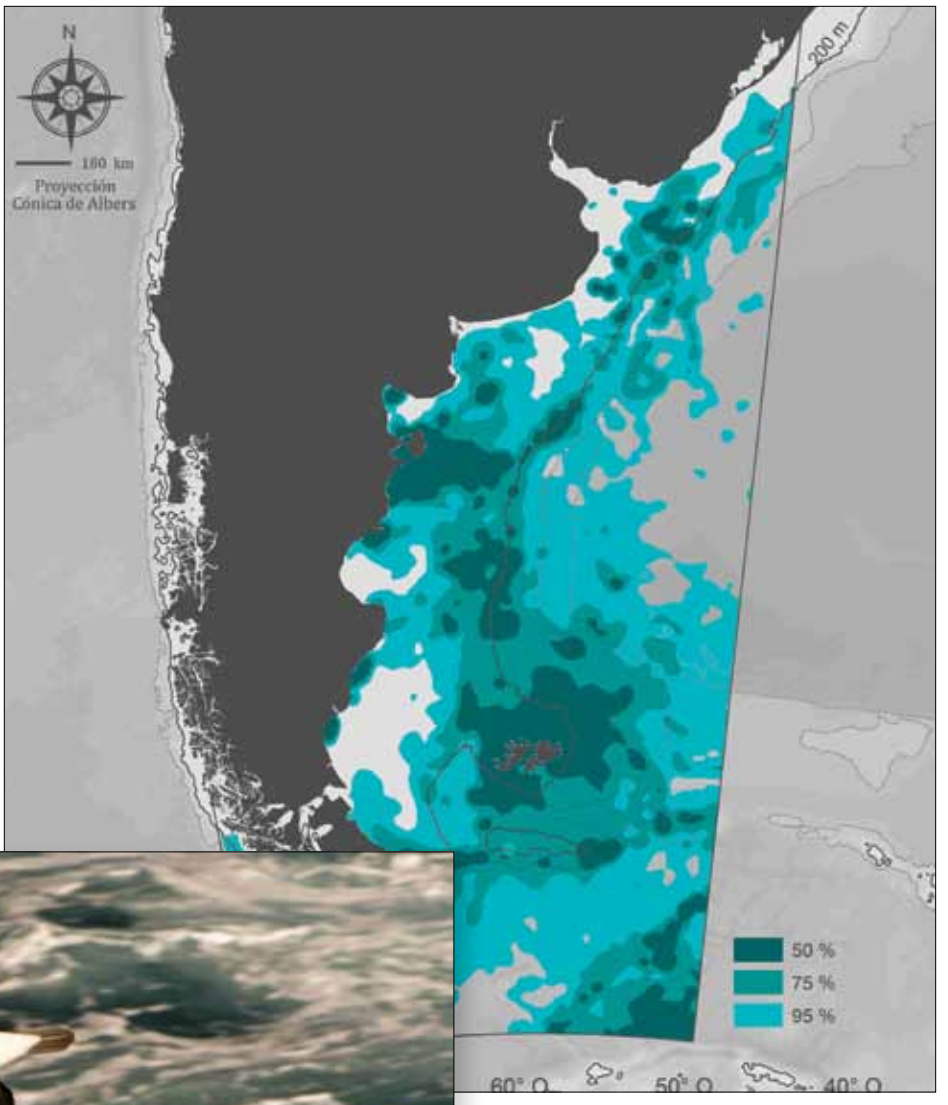
In an effort to conserve the biodiversity of the Patagonian Sea, WCS launched its Sea and Sky project. "This unprecedented atlas was essentially written by the wildlife that lives in the Patagonian Sea," says Dr. Claudio Campagna, who runs the WCS Sea and Sky initiative. "It helps fill in many gaps of knowledge and should serve as a blueprint for further conservation efforts in the region."

Researchers used satellite transmitters, geolocators, and recorders for GPS to track predators during foraging trips. They then used ArcGIS to process the remote-sensing georeferenced data, shapefiles, and raster grids. In addition, they used ArcGIS Spatial Analyst to analyze spatial relationships and build spatial models, ArcGIS 3D Analyst to view a surface from multiple points and drape data over a surface, and ArcGIS Geostatistical Analyst to study multiple phenomena.

WCS Sea and Sky's GIS database contains more than 283,600 geographic positions (localizations) of 16 species of seabirds and marine mammals. The majority of the data was obtained by satellite transmitters. Fifty percent of the localizations are in the Patagonian Sea and correspond to approximately 1,300 migratory or foraging trips.

WCS used GIS to answer guiding questions, such as

• Where are the areas of the southwest Atlantic with the highest concentration of foraging top predators?



The use of the Patagonian Sea (off the coast of South America) by 16 species of top predators is mapped.

The southern seas and coastlines of Argentina and Chile, known as the Patagonian Shelf, are a habitat to albatross, colonies of Magellanic penguins, and pods of right whales.

• Based on the location and timing of the foraging phase of a sea animal's annual cycle, how can we improve the protection of that species?

Researchers used GIS to generate a map showing the localization data of elephant seals, as well as their density distributions and utilization distribution contours.

Contours indicate the distribution range of the animals studied and identify areas with similar probabilities of occurrence. Researchers quantified the duration of time that a species stays in a location. Zones identify where individuals spent 50 percent of their time. The 50 percent contour reveals the areas of highest density or probability of the species being in that location.

WCS integrated data from all 16 of the study's targeted species into the GIS to create a composite view of Patagonian Sea ecosystems.

The Study Conclusions

The most important areas are the waters adjacent to the Malvinas Islands, Staten Island, Diego Ramírez Islands, and the Valdés Peninsula, as well as those stretching from the south of the peninsula to the north of the Gulf of San Jorge.

The most important pelagic areas are the oceanographic front associated with the slope of the Patagonian Shelf, the ocean environment adjacent to the Malvinas Islands, the shelf-slope region at the latitude of the Gulf of San Jorge, the areas influenced by the outflow of the Río de la Plata, and the vicinity east of the Burdwood Bank.

Relevant areas of importance are the waters of the polar front at the southeast end of the target area and a coastal-pelagic corridor between the Valdés Peninsula and the shelf-slope.

Researchers could readily see that none of the pelagic areas identified as important for top predators is under a regime of special management for conservation biodiversity. The study provides insight for the biological zoning of the ecosystem and gives scientific credence to policy recommendations for open ocean marine protected areas.

"GIS has been one of the most important tools that the project has used to identify relevant ocean areas and promote the conservation of the Patagonian Sea," says Valeria Falabella, a marine biologist and the assistant director of WCS Sea and Sky. "WCS has been promoting the concept of landscape species and conservation at the landscape dimension, integrating species and spaces in a unique methodology to guide conservation all around the world. Esri and Aeroterra have been fundamental to these efforts by providing software, training, and technical support to the project."

The *Atlas of the Patagonian Sea* web page is an excellent tool for research and education. Site visitors can interact with maps and download high-resolution maps. See it at www.atlas-marpatagonico.org.

For more information, contact Valeria Falabella, marine biologist and assistant director of WCS Sea and Sky, Wildlife Conservation Society (e-mail: vfalabella@wcs.org), or visit www.atlas-marpatagonico.org. The completion of *Atlas of the Patagonian Sea* is due in large part to the generosity and long-standing support of the Liz Claiborne and Art Ortenberg Foundation for the WCS Sea and Sky initiative, as well as support from Judith H. Hamilton, James M. Large, Christopher B. Hockett, and Isabella Rossellini. WCS's conservation work in this region also receives support from the Mitsubishi Foundation for the Americas and Mr. and Mrs. James M. Large, Jr. Falabella also provided information for this article.

NOAA Geoportal Speeds Data Discovery at National Climatic Data Center

Highlights

- The open source format of Esri Geoportal Server allows users to directly contribute features and fixes that support real-world work.
- NOAA uses the geographic data portal platform to share its own datasets and registered data from thousands of organizations.
- Standardized protocols, such as REST and CSW, speed discovery and provide direct access to metadata.

The National Climatic Data Center (NCDC) houses the world's largest collection of weather and climatic data. As the climate data steward of the National Oceanic and Atmospheric Administration (NOAA), NCDC has the federal government mission to describe the climate of the United States and report climatic trends and anomalies observed in the data. Because of the benefits derived from that mission, there is a large demand by earth scientists and users around the world to access data from many fields of study for research purposes. Recently, NCDC completed the first phase of integrating a system for organizing and sharing data resources more efficiently.

Efficient Discovery Platform

Managing data to keep it searchable, accessible, and shareable is an important practice of any research organization. The processes associated with managing and disseminating large volumes of data have the potential to slow a system and result in an unnecessarily high workload for system administrators. Supported by the right technology, however, these challenges can be overcome.

Recognizing that its technology will be used in distributed and heterogeneous environments, Esri supports the definition of a number of the Open Geospatial Consortium, Inc. (OGC), specifications and has implemented them in its ArcGIS family of products. Esri Geoportal Server (formerly known as the ArcGIS Server Geoportal extension) applies those standards to help organizations create and manage geoportals where data producers can register their geospatial web services, data files, and applications for discovery by consumers. In 2009, NCDC moved its datasets into ArcGIS Server and used the Geoportal extension to make them available through a geoportal called the NCDC Geodata Portal (**gis.ncdc.noaa.gov/geoportal**).

NCDC's decision to leverage Esri's geoportal technology was the result of much investigation and the maturation of Esri's geoportal software. In 2007, a NOAA GIS Committee working group received a funding allocation through the High Performance Computing and Communications Office to investigate innovative technology for organizing and sharing its data resources. As a result of this effort, NCDC determined that Esri's geoportal technology would support the creation of a site to serve and share data. At the time, Esri geoportal technology seemed promising, but it relied on older technology that made it a challenge for NCDC to install and configure. By 2009, NCDC had already planned to move to ArcGIS Server, and the center determined that the Geoportal extension had been enhanced to the point to meet its needs.

Protocols Simplify Search

Esri's geoportal technology gives organizations the capability to aggregate geospatial resources for improved discovery, use, and collaboration. It does that by using standards such as OGC's Catalog Service for the Web (CSW), which simplifies the cataloging and inventorying of metadata. Before implementation of CSW, data producers submitted their metadata to data clearinghouses, such as Geospatial One-Stop. However, since clearinghouses couldn't update metadata records as frequently as the owners of that metadata, information quickly went stale. CSW changed that by allowing datasets and metadata to be virtually centralized in data portals maintained by users. Using geoportal technology implemented with CSW gives users the ability to search both other geoportals from within the NCDC Geodata Portal interface and the NCDC geoportal from ArcGIS Desktop, ArcGIS Explorer, and Flex-based mapping applications.

REST supports geoportal users in crafting custom searches for resources and calling those searches from other applications. For example, the NOAA site (**www.climate.gov/#dataServices/dataLibrary**) calls search results from the NCDC geoportal using REST-formatted URLs. REST and CSW are powerful communication and integration points for organizations like NCDC that have decentralized offices, data repositories, and user bases.

US Snow Monitoring Snowfall Maps present recent and historical snowfall analysis for the United States (gis.ncdc.noaa.gov/maps/snowfall.map).

Many data-producing organizations use Esri geoportal technology to improve knowledge sharing, reduce duplication of effort, and direct people toward the best available data. Recently, the ArcGIS Server Geoportal extension was redeployed as Esri Geoportal Server and released as an open source project on SourceForge (**esriurl.com/geoportalserver**). Being open source, Geoportal Server will continue to evolve as users have more direct input in how to integrate cutting-edge technologies to better catalog, discover, and use geospatial data.

For more information, contact Rich Baldwin, GIS Projects lead (e-mail: Rich.Baldwin@noaa.gov).

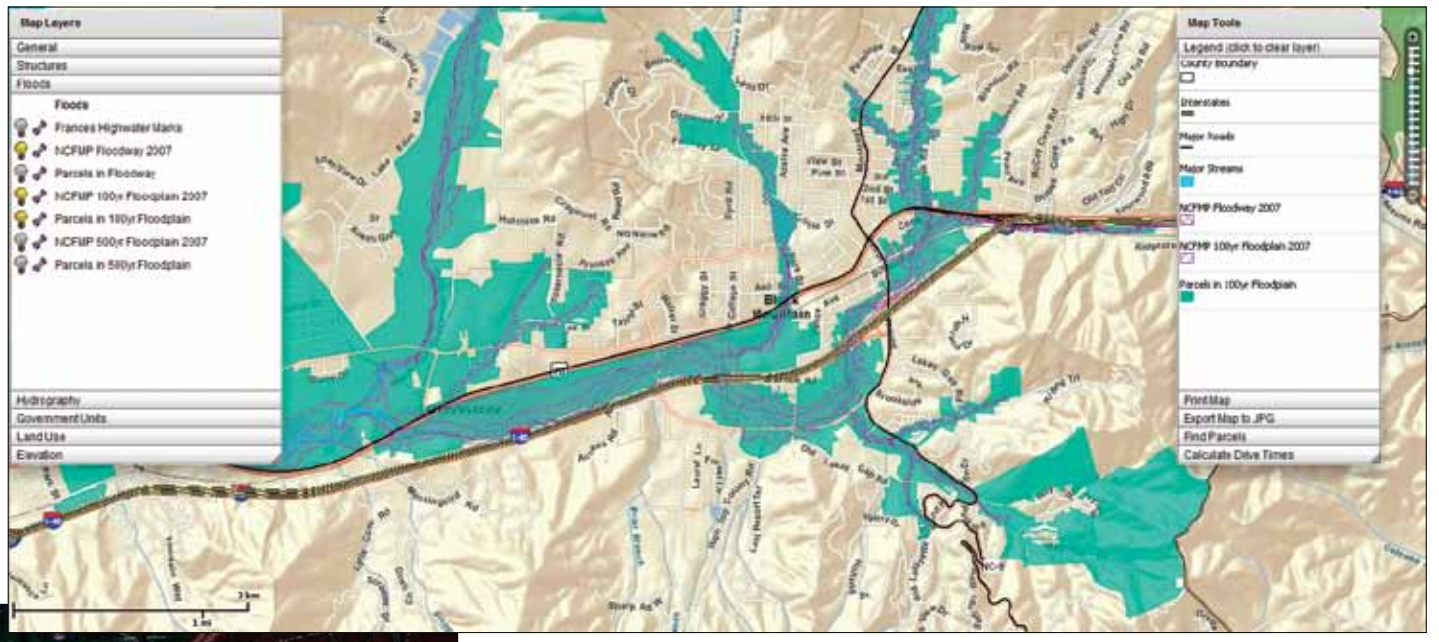
NCDC's Geodata Portal provides metadata search results for popular climatic data products.

Buncombe County Creates Multi-Hazard Risk Tool

By Todd Pierce, Senior Research Scientist, RENCI Engagement Center, University of North Carolina at Asheville

Highlights

- The risk tool provides parcel-based risk information on floods, wildfires, landslides, dams, and winter storms.
- This tool helps Buncombe County generate maps and reports required for hazard mitigation plans.
- The Internet application was developed with ArcGIS API for Flex.



The Buncombe County Multi-Hazard Risk Tool uses GIS to show parcels affected by natural hazards; here, the Risk Tool displays the parcels in the 100-year floodplain.

Flooding in the Biltmore Village area of Asheville, North Carolina, after rainfall from the remains of Hurricane Frances in September 2004.

In September 2004, the Asheville, North Carolina, area experienced severe flooding from heavy rainfall caused by the remnants of Hurricanes Frances and Ivan. Portions of the Asheville area received up to 20 inches of rain, leading to extensive flooding and inundating many roads, bridges, houses, and businesses. The large volume of water also damaged the main water line in Asheville, resulting in much of the city being without water service for several days. A federal state of emergency was declared in North Carolina; the damage in Asheville, surrounding Buncombe County, and nearby counties in the western half of the state was estimated by the US Federal Emergency Management Agency (FEMA) to exceed 240 million dollars.

The 2004 flood is just one example of the many natural hazards that affect Buncombe County and the City of Asheville. The area is also threatened by landslides, wildfires, high winds, and winter storms. To plan for disaster mitigation and response, the Buncombe County Emergency Operations Center (EOC) is required by FEMA to submit an updated hazard mitigation plan every five years.

The Buncombe County staff is a longtime user of ArcGIS, which it uses extensively for mapping and reporting needs in several areas, including tax parcel management, planning and zoning, emergency response, and soil and water conservation. While the Buncombe County GIS staff is very responsive to EOC requests, EOC staff desired a solution that would let it view hazard datasets and generate maps and reports from the desktop. In particular, EOC staff needed a tool that would show the areal extent of each hazard, the total value of property parcels at risk from each hazard, and the key infrastructure and critical resources at risk during a hazardous event.

To meet these needs, the Buncombe County EOC teamed with the Renaissance Computing Institute (RENCI) engagement center at the University of North Carolina at Asheville to develop the Buncombe County Multi-Hazard Risk Tool. The RENCI engagement center is a unique collaboration between the university, multiple government agencies, and the public sector. Formed in 2006, the center focuses on decision support tools related to natural hazards, such as floods and landslides; community and regional planning; and economic development issues.

RENCI staff met multiple times with staff from Buncombe County and the City of Asheville to determine the user requirements and needed datasets. RENCI staff then used Esri technology to develop the Multi-Hazard Risk Tool. An enterprise geodatabase for the risk tool stores more than 140 layers, including roads, utilities, and key structures; future land development scenarios; geographic extents for each hazard; and the parcels at risk from each hazard. Risk maps for each hazard were created with ArcGIS by intersecting a map of property parcels with maps of hazard extents obtained from trusted sources, such as the North Carolina Department of Environmental and Natural Resources, the North Carolina Floodplain Mapping Program, and the Southern Group of State Foresters. ArcGIS serves these spatial layers to the web.

The user interface for the risk tool is a rich Internet application created with ArcGIS API for Flex. The application includes a map showing the data layers, with navigation controls for zooming and panning. The tool has a set of reports summarizing parcel counts and values for each hazard grouped by parcel classification and vacancy status, with documentation explaining the assumptions and models used to determine hazard risk. In addition, there is a toolkit with functions for identifying map features, finding parcels, controlling map layer visibility and transparency, obtaining map layer metadata, and creating a printer-ready version of the map.

With the tool, EOC staff can answer targeted questions, such as, What is the total property value at risk from a 100-year flood? Could a flood block access to a new planned subdivision? Could a dam failure cause damage to a planned rail hub? Is there any land expected to be developed that also has a high risk of wildfire? and How many parcels have unstable land that is prone to landslides?

The risk tool was released to Buncombe County in 2009 with improvements implemented throughout 2010. Reports and data from the tool were incorporated into the county's latest FEMA plan update. According to Angela Ledford, the deputy director for the county EOC, "One of FEMA's requirements for the Hazard Mitigation Plan is to express hazard vulnerabilities in terms of dollars. The best available data at the time the original plan was written only covered flood vulnerability, and reviewing at-risk properties and calculating potential losses took days. With the Multi-Hazard Risk Tool, we are able to run reports on additional hazards, such as landslides and wildfire, and those same reports now take only moments to produce."

The risk tool was also provided to the Asheville Fire Department, which is using it to identify potential fire station locations. According to Scott Burnette, fire chief of the Asheville Fire Department, "The Buncombe County Multi-Hazard Risk Tool has been extremely beneficial as we make difficult resource decisions. This tool has also benefited us greatly as we pursue reaccreditation through the Commission on Fire Accreditation International. The planning and goal setting requirements to be an accredited agency are easily met using this tool."

RENCI plans to continually update and improve the hazard models based on new data. In addition to refining its current uses, RENCI would like to upgrade the tool to consider other hazards, including tornadoes, earthquakes, and droughts. RENCI is also working to expand use of the tool to other local counties.

The Buncombe County Multi-Hazard Risk Tool demonstrates an important use of an online GIS. By using Esri technology to serve datasets through the web, the risk tool helped EOC staff update hazard mitigation plans more quickly and efficiently than before. The risk tool also helps provide information to the small towns and municipalities in Buncombe County, where planners do not have extensive in-house GIS resources. By doing this, the risk tool facilitates online reporting and retrieval of geospatial information throughout the county and helps foster a common base of geographic data for hazard planning and response.

About the Author

Dr. Todd Pierce is a senior research scientist with the RENCI engagement center at the University of North Carolina at Asheville, where he creates online GIS and database applications.

For more information, contact Todd Pierce (e-mail: tpierce@unca.edu).

ArcGIS for Local Government

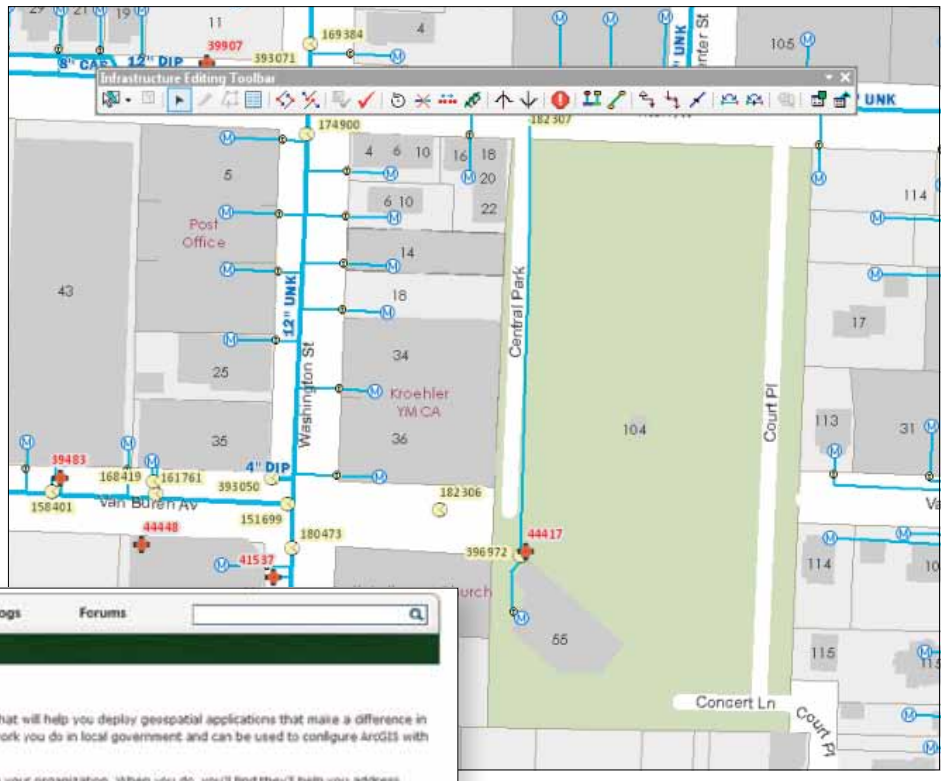
See Poster on Pages 24–25

Esri has long shared a vision that GIS can integrate information between local government departments, increasing communication, creating efficiencies, and providing the basis for collaboration and more informed decisions. At the heart of this vision is the recognition that local governments share common challenges and workflows. By using GIS, these departments can harmonize workflows.

Esri has recently developed a series of maps and apps to help local governments rapidly deploy useful GIS implementations structured around services delivered to their citizens. These maps and apps help local governments configure and use ArcGIS in their organizations.

The Local Government Resource Center

The ArcGIS Local Government Resource Center is the place to easily find and download maps and apps. These resources are free and easy to download for local use. They are organized around the work commonly done by local governments and help manage data, visualize trends, and publish great web maps.



The ArcGIS 10 Infrastructure Network Editing Toolbar is for managing water, sewer, and storm water utility data. It is an editor that can be used by mapping technicians in a water utility, sewer authority, or public works department.

The Local Government Gallery from the ArcGIS Resource Center.

The resource center allows users to share their work with other community participants and communicate with peers, partners, and Esri. Blogs provide implementation steps, best practices, and other information that help implement ArcGIS and enable collaboration with others.

Local Government Maps and Apps

The maps and apps on the Resource Center are organized around common local government workflows. They help users configure ArcGIS to support specific business functions in the following areas:

- **Data Management**—Applications that help automate, maintain, and publish GIS information (Editing applications, like Infrastructure Network Editing, help water utilities, public works, and other agencies responsible for managing infrastructure manage water, sewer, and storm water data [see top image].)
- **Modeling and Analysis**—Applications that help turn data into actionable information
- **Field Mobility**—Applications that help field staff gain access to and collect information on mobile devices
- **Operational Awareness**—Applications that help monitor the performance of an organization and activities within it
- **Citizen Engagement**—Applications that help provide transparent access to data and engage constituents in decision-making processes (Citizen engagement applications, like Citizen Service Request, help local governments deploy a web-based application that can be used by customers to submit nonemergency service requests, interact with local government staff, and share information with the public.)

When a local government downloads any application, it receives several things that help it deploy these apps in the organization, including

- A copy of the configurable application or set of tools that will be deployed for users
- One or more maps that users will interact with to visualize their geographic content
- Some sample data
- A local government information model, which is a set of documentation that helps configure the template so users get started more quickly (The information model is a simple configuration of the geodatabase that incorporates the local government application requirements and the cartographic design elements necessary to produce rich, multiscale basemaps and operational layers.)

Participating in the ArcGIS Local Government Community

Participation in the ArcGIS local government community is easy. Simply visit the website and start using the shared resources. Any local government can download the maps and apps from this online community, deploy them in its organization, and share results with other local government users. In addition, local governments can share feedback through one of the blogs and communicate directly on Twitter. Feedback and communication among local government GIS organizations will help shape the future of GIS in this community.

Esri will continue to add new maps and apps to the Resource Center. In addition, we will continue to provide patterns and best practices that help local governments configure ArcGIS in a simple and sustainable way.

Esri invites users to join this local government community and download the maps and apps. Participation will help local governments everywhere deliver more efficient services and interact with their constituencies in more meaningful ways.

For more information, visit the Local Government Resource Center at **resources.arcgis.com/content/local-government** or contact Scott Oppman, Esri (e-mail: soppman@esri.com). Also see poster on pages 24 & 25 in this issue.

Automating Street Sign Maintenance in St. Johns County

System Helps County Remain Compliant with Government Accounting Standards

Highlights

- The county's computerized maintenance management system is linked with ArcGIS to expedite sign repair and replacement.
- The system locates and references each street sign with traffic device codes and a review of its maintenance history.
- With GIS, the county can track costs associated with assets and their predicted life span.

Founded in 1821, St. Johns County is located on the Atlantic Ocean in northeastern Florida. The many historical sites in the area attract millions of visitors annually, making tourism an important component of the local economy.

Cars and buses provide the primary means of transportation for both residents and visitors, increasing the need for regular road maintenance. To help manage repairs, the county's public works department has implemented a number of GIS-based maintenance programs.

Rocky S. Agbunag, GIS coordinator for St. Johns County, says, "We have used GIS for about four years. Previously, all documentation and work orders were done on paper. It was very time consuming, and work locations for the crews were indicated by specifying nearby intersections or general areas. Performance reports relied on guesstimates."

To automate its roadway data collection, the county invested in a van outfitted with video cameras, still cameras, and computers so that the county's 40,000 roadway signs and 15,000 sign support structures could be regularly inspected and the collected data managed by ArcGIS Server in a SQL Server database. These surveys are supplemented by field crews that use ArcPad to collect the location and condition of newly repaired or installed signs to minimize the loss of data between the time the countywide inventories are completed and when the resultant data is uploaded.

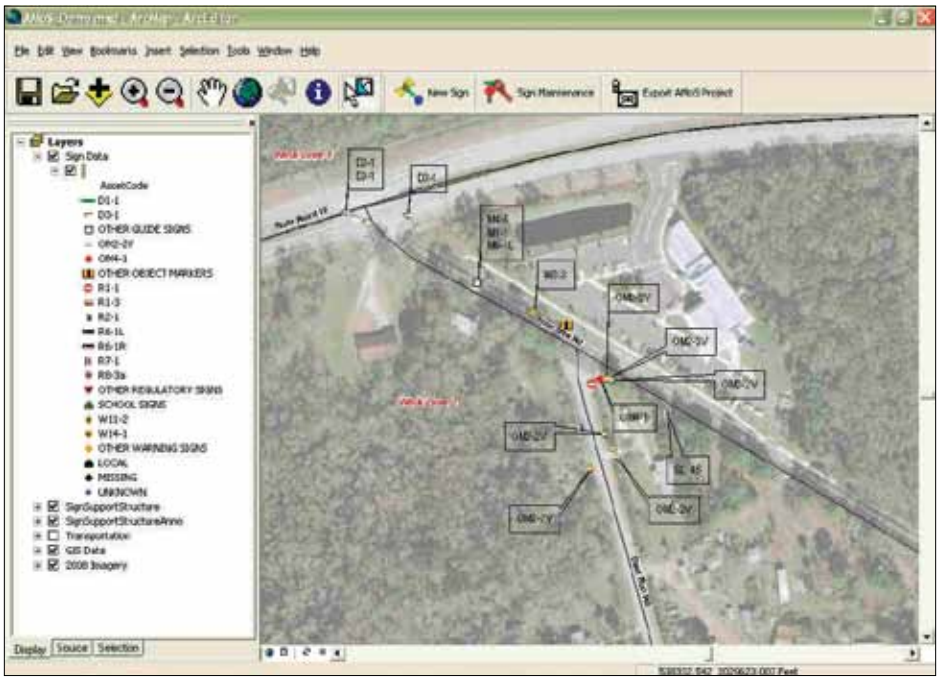
Building on the success of this project, the county hired Esri Partner Woolpert, Inc., of Dayton, Ohio, specialists in transportation asset management, to develop an application to collect, store, and deliver the geospatial data and related imagery of its street sign inventories.

Woolpert developed the Automated Maintenance of Signs (AMoS) application using Visual Basic and the Distributed Geodatabase toolbar in ArcGIS. AMoS extracts a version of the geodatabase to export for field use. The exported geodatabase is available on the field crew's laptops and can be used to validate existing information or create new data. If a new sign is installed, the crew will fill out a form with basic information about the sign, including its corresponding Manual on Uniform Traffic Control Devices (MUTCD) code. The sign is photographed and its file name stored in the attribute table. The photo is later moved to a shared network folder so that it can be hyperlinked to its physical location on the map. Once the maintenance is complete, the field data is imported into the geodatabase for reconciling and posting.

The AMoS system helps St. Johns County easily locate and reference each street sign, determine the MUTCD code for that sign or group of signs, and review its maintenance history. The system is also used to analyze the types of signs used and the quantity the county will need in the future so that it can budget for labor and materials costs.

"By georeferencing all the information related to our county roadway signage, we have realized a quantifiable return on investment with our GIS. It also allows us to remain compliant with GASB 34," says Agbunag. (GASB 34, or Governmental Accounting Standards Board Statement 34, mandates state and local governments to report financial transactions, for example, the value of infrastructure assets.)

Woolpert linked the county's computerized maintenance management system (CMMS) with ArcGIS to expedite sign repair and replacement. The CMMS helps manage public works assets and allocates resources for fieldwork. It records information such as inspection schedules, maintenance, and the reflective capabilities for individual signs. By coupling this information with the GIS, managers not only have an immediate inventory and report on the condition of their assets but also know exactly where those assets are in relationship to the daily maintenance schedules of field crews. In the event of an emergency, this knowledge allows nearby crews to be quickly reassigned to take remedial action, if necessary. Since the CMMS and the GIS are integrated, files can be accessed through either system.



The computerized maintenance management system helps St. Johns County easily locate and reference each street sign, determine the MUTCD code for that sign or group of signs, and review maintenance history.

Because the county does performance-based budgeting with its CMMS, it can track costs associated with assets and their predicted life span. Using the CMMS in conjunction with AMoS is also very useful in determining better budgetary planning estimates for future years.

For more information, contact Rocky S. Agbunag, GIS coordinator, St. Johns County (e-mail: ragbunag@sjcfl.us).

The CMMS helps manage public works assets and allocate resources for fieldwork.

Peoria Public Works Cuts Costs with Mobile GIS

Highlights

- GIS is used to georeference the city's assets, such as street signs, manholes, and light poles.
- Digital work orders accompanying interactive reference maps are displayed on the field crews' devices running ArcGIS Mobile.
- Peoria's public works department is saving money with GIS.

Originally, the town of Peoria, Arizona, was founded by a handful of farmers who journeyed from Peoria, Illinois, to take advantage of the irrigation potential of the newly completed Arizona Canal. By 1970, the population had grown to 12,000. With an expanding regional economy fueling rapid growth, today the population exceeds 150,000.

With this growth came the need to expand the city's infrastructure and implement systems to maintain it. Peoria began its use of ArcGIS in 2001 with the initial goal to automate its mapping procedures. Use of the technology gradually expanded throughout various city departments until 2003, when it was decided to link the GIS with the existing computerized maintenance management system (CMMS) from Hansen Information Technologies of Denver, Colorado.

The city's desktop environment uses Hansen's GeoAdministrator and GeoAssistant to link its GIS to the CMMS database. GeoAssistant lets Peoria users query the GIS and system databases interactively. GeoAdministrator allows the GIS to push new assets into the system. The city can also sync appropriate attributes between the GIS and the system, which lets it manage both databases with a single procedure.

The city's intermediate GIS application is GeoResults from Esri Partner Marshall and Associates, Inc., of Boise, Idaho, which facilitates real-time database connectivity from the field to the GIS and CMMS databases. The application uses ArcGIS to pass information to either the GIS or CMMS, depending on the action type. Asset and attribution updates are performed in the GIS database, while updates to maintenance schedules and service requests are managed by the CMMS. With this implementation, the use of GIS in the city began to expand exponentially, particularly in the public works department.

One of the primary functions of GIS in the public works department is to georeference the city's assets, such as street signs, manholes, light poles, and valves, for use with the CMMS. This allows the implementation of the CMMS-generated maintenance schedules through the work order process that is managed by ArcGIS. The process includes the generation of digital work orders with an accompanying interactive reference map displayed on the field crews' devices running ArcGIS Mobile. The crews use

The Sun Shines on Lake County's Public Parcel Viewer

By Larry Duke, Land Records Manager, Lake County, Florida

Highlights

- The county created an enterprise GIS at an affordable cost even in the current economic climate.
- ArcGIS is the county's new parcel editing platform.
- The GIS of Lake County has been woven into all aspects of county government.

Lake County's interactive map allows queries of parcel data by anyone who has access to the Internet.

Beginning with its inception in 1887, Lake County, Florida, was primarily a rural county that produced citrus; corn; and winter vegetables, such as cabbages, collard greens, and kale. But in recent years, the county's population has significantly increased as it has become a popular destination for retirees, many of whom spend their winters in the region, returning to more northerly climes during the summer months. Regardless of its seasonal population influx, in the last 20 years, the population of the county has doubled, leading to a boom in housing. Many of the area's orange groves and agricultural areas have been transformed into homes and businesses.

With development on the rise, paired with an increase in property values, efficiently managing data on land information became imperative. To help with this issue, the county strengthened the foundation of its GIS by updating several of its data layers, including its parcel layer. But even with more accurate data resting in its GIS, the information was not easily accessible because it was stored in a UNIX workstation environment. Microsoft Windows-based users of the data relied on local installations of ArcGIS and Exceed software from the Open Text Connectivity Solutions Group (formerly Hummingbird) of Richmond Hill, Ontario, Canada, to communicate with the UNIX server. And because the parcel layer dataset was large in size, it had to be stored in tiles. This made it very difficult to see how parcel edits were affecting unedited adjoining tiles. Yet another obstacle was that, for parcel data to be pushed out to users, it had to be merged into a single dataset. Since this merge was primarily a manual process, it was not performed on a regular basis, and the end-user data was not as up to date as possible.

Lake County's data and software interoperability problem was, and remains, a common one for other counties of its size. The common solution, and the one with the greatest return on investment, is to implement an enterprise GIS, which is the route that Lake County chose. With Windows SQL Server as its database; ArcGIS as the basis for its enterprise GIS; and a collection of Citrix servers (known as a farm) from Citrix Systems, Inc., of Ft. Lauderdale, Florida, to serve out the data and software, the county began migrating its data into the new system architecture.

Kevin Willis, the director of the Lake County GIS Division says, "The GIS enterprise implementation is a win-win strategy, as it allows us to better leverage our existing resources with a higher return on investment and adds value to more diverse county functions."

After migrating a number of the simpler data layers, such as structure locations, hydrants, and annexation boundaries, the county tackled the major task of migrating its parcel base layer. Lake County's Programming and Applications Support Services (PASS) Division, part of the Information Systems Department, was an integral part of the conversion process, designing the new geodatabases and schema. PASS made development of the enterprise GIS possible at a cost that the county could afford even in the current economic climate.

To help put the pieces together with respect to the parcels, Esri Partner Panda Consulting was brought on board to review the schema and geodatabases, as well as provide expertise and advice. The Palm Beach Gardens, Florida-based GIS consulting firm also performed the actual parcel data migration and trained the county's parcel editing staff. The guidance allowed a smooth transition from ArcInfo Workstation to ArcGIS Desktop, which became the new parcel editing platform. The selection of Panda was based on its ability to perform the conversion at a reasonable cost and its preference to use ArcGIS tools as the editing environment instead of proprietary third-party software.

Through the efforts of PASS, Panda Consulting, and the GIS Division, the county now provides better GIS services to its staff, as well as better information to its citizens via a GIS-based website at **www.lakecountyfl.gov**. The GIS data is updated through a fully automated process on a nightly basis. GIS data and software can easily be made available to all county staff, and the GIS layers are much more accessible via the web. The parcel editing team now edits a seamless layer that allows team members to see the effects of edits in the same way as the end user views them. This type of visualization promotes more accurate and useful information. In addition, the original parcel layer, which resided in a single feature class, was broken out into several functional areas.

"The GIS of Lake County has woven itself into all aspects of county government," states Frank Royce, deputy county property appraiser. "All departments of city and county government and many of the constitutional officers are now on the same page, all working together with the exact same information. It is current information in an instant that can be shared between agencies and with the public."

Lake County is now in the process of maximizing the benefits of its enterprise GIS.

For more information, contact Larry Duke, land records manager, Lake County, Florida, Department of Information Technology/GIS Division (e-mail: lduke@lakecountyfl.gov).

Traffic signal intersection inventory review in Peoria.

high-resolution orthophotography and GIS data layers including parcel, addressing, and streets. This information allows them to easily locate the assets that are scheduled for repair or replacement and provides them with related information about the asset, such as age, maintenance history, and manufacturer.

According to Timothy Smothers, Peoria's IT GIS supervisor, "Using GIS, our signage inventory group can not only access data from the field to complete their work but also manage their own geospatial information and provide real-time updates to the GIS and CMMS. Because of this, our sign inventory data is never more than one day out of sync with the actual conditions in the field."

The implementation of these procedures has allowed Peoria's public works department to realize a quantifiable return on investment by the sign inventory group. These cost-saving procedures include single data entry for new assets and the simultaneous update of the GIS and CMMS. This has resulted in an average savings of 20 minutes per new sign in data input. In addition, the automation of the work order process gained by linking the GIS and CMMS eliminated the need to generate printed work orders for subsequent manual input into the CMMS.

"Key to the success of our new processes was to involve all interested parties so that we could build a solution that we could agree on," concludes Smothers. "Change can be hard, but when everyone has a voice and the ability to be part of the process, it is a doable, positive, and viable situation. We now have eyes and ears in the field that provide valuable feedback, which is crucial to our business model, because Peoria has a limited professional GIS staff. Our ability to easily update our public works assets on a daily basis with the help of our field crews is a huge benefit and cost savings for us."

For more information, contact Timothy Smothers, IT GIS supervisor, City of Peoria (e-mail: timothy.smothers@peoriaaz.gov).

Better Street Sweeping Management

By Kusi Odomse Akuoko, GIS Analyst, Maricopa County Public Works, Arizona

Highlights

- ArcGIS and GPS work together to process street sweeping data, as well as analyze and monitor the project.
- GPS units are mounted on each truck, with the resultant data processed in the GIS Division.
- Maricopa County GIS staff generate plots on a daily basis using ArcGIS to illustrate the routes.

Maricopa County is located in the southern-central part of the state of Arizona and has a population of more than four million. With its arid climate featuring dust and gravel soils, the county's Department of Transportation faces multiple challenges when it comes to the maintenance of unincorporated roads. To lower costs and improve business processes, the county decided to install GPS units on sweeper trucks that broadcast data when brooms are lowered for sweeping.

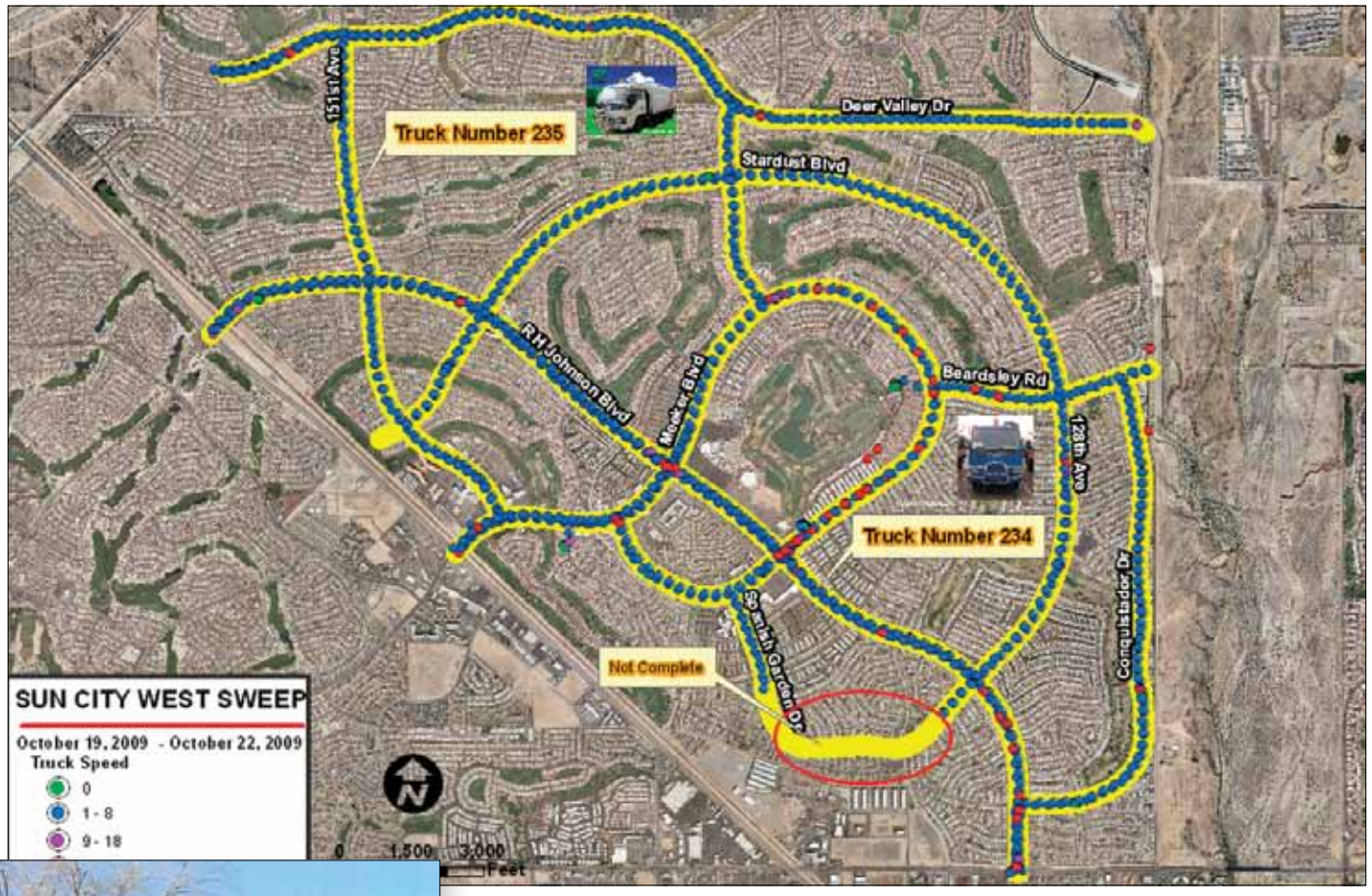
Sweeper trucks are large trucks with rotating brushes and a vacuum on the underside. As the sweeper truck drives down the street, the rotating brushes sweep road debris into the vacuum and off the street. Information is transmitted at 30-second intervals, providing the speed and location of the sweeper. The automated process replaces manual inspection and provides verification of work completed against work invoiced, ensures that speed limits are enforced, and provides support in litigation.

Maricopa County sweeper truck.

The county is responsible for sweeping more than 650 miles of roads. The roads are divided into distinct area units and swept every two or eight weeks depending on the designated cycle. To make sure that the roads are clean after they have been swept, county staff perform random field inspections. The visual inspection takes time, and it is cost prohibitive to perform 100 percent field verification given the large number of roads under contract. Field trips add cost in terms of staff time, wear and tear of vehicles, and fuel consumption. Therefore, the county needed to lower inspection costs while improving compliance with contract specifications. It was determined that ArcGIS and GPS working in concert could process this information, analyze and monitor the project, and publish the results.

Fulfillment of county specifications includes sweeping speeds not to exceed eight miles per hour, invoicing of swept roads per established cycles, and complying with predetermined schedules. With the installation of the GPS units, the county obtains information regarding compliance with schedules and speed limits, as well as a cross-reference of invoices against work performed 100 percent of the time while minimizing field inspections. With up-to-the-minute information, the county can also readily answer citizens' inquiries regarding the date and time when a particular street was swept. This information has been useful to the Department of Risk Management that now has the date and location of the sweepers at all times in case of claims regarding chipped windshields.

The objective of this program is to provide the tools necessary to effectively manage the sweeping contract with 100 percent accountability while reducing inspection costs. To that effect, the sweeping contract was amended to include an automated vehicle location (AVL) system that monitors the location and speed of each sweeper truck assigned to Maricopa County.



Maricopa County Public Works GIS Division used a simple application to track speed compliance of its sweeper trucks.

The AVL system consists of GPS units mounted on each of the sweeper trucks. Each unit receives information from satellites via radio waves using cellular networks, such as General Packet Radio Service or Code Division Multiple Access. Some roads within the county are outside the cellular coverage area of the GPS unit. This, however, is not a problem because the GPS units are capable of storing several thousand historical points when vehicles are outside the covered area. As soon as the vehicle enters an area that has coverage, the stored points are uploaded and transmitted to the main server.

During the pilot project, the GPS units were transmitting continuously every 2 minutes. This process generated a large amount of data but did not provide distinct information when the brooms were lowered to sweep the streets. The 2-minute interval was too long, and small areas, such as cul-de-sacs, were completely missed. In addition to missing small areas, other information, such as driving time to and from job locations, stops during breaks, and detours, was being collected, which the county had no interest in. The process was modified to only transmit data when the broom was lowered for sweeping, and the interval was reduced from 2 minutes to 30 seconds. Under this improved scenario, the county was able to track the speed of the vehicles while sweeping. Currently, the contract allows a maximum speed of eight miles per hour while in sweeping mode. This is a reasonable speed to ensure efficient sweeping and maintenance of neat roads.

After the data is collected by the GPS units, the information is then transmitted via DBF and comma-delimited files directly to the Maricopa County Department of Transportation GIS Division for processing in ArcGIS. This data includes the date and time of data collection, truck name, ignition status, current speed, average speed, odometer reading, total distance traveled, and latitude and longitude, as well as the VIN number of the sweeper truck. The data that is processed in ArcGIS is then converted into streaming data into shapefiles.

GIS staff generate plots on a daily basis using ArcGIS to illustrate the routes. This allows field inspectors to determine the following information at a glance:

- Identification of vehicles assigned to the units on each particular day
- Identification of the driver assigned to each sweeper
- Determination of the speed threshold of each sweeper truck
- Virtual inspection of the roads swept in each sweep circle
- Comparison of areas billed with actual areas swept

Programs created using Visual Basic programming import the GPS data and the invoices submitted by the vendor and convert them into Esri shapefiles. These custom programs extract the data from the vendor's Excel invoices. GIS staff developed automated programs for the generation of the maps, the creation of the database, and the management of the process.

Acknowledgments

Generous contributions to this article were made by Marta Dent, GIO, Maricopa County Public Works GIS Division; Larry Wolfson, supervisor; Jim Smith, supervisor; and Eric Feldman, GIS analyst.

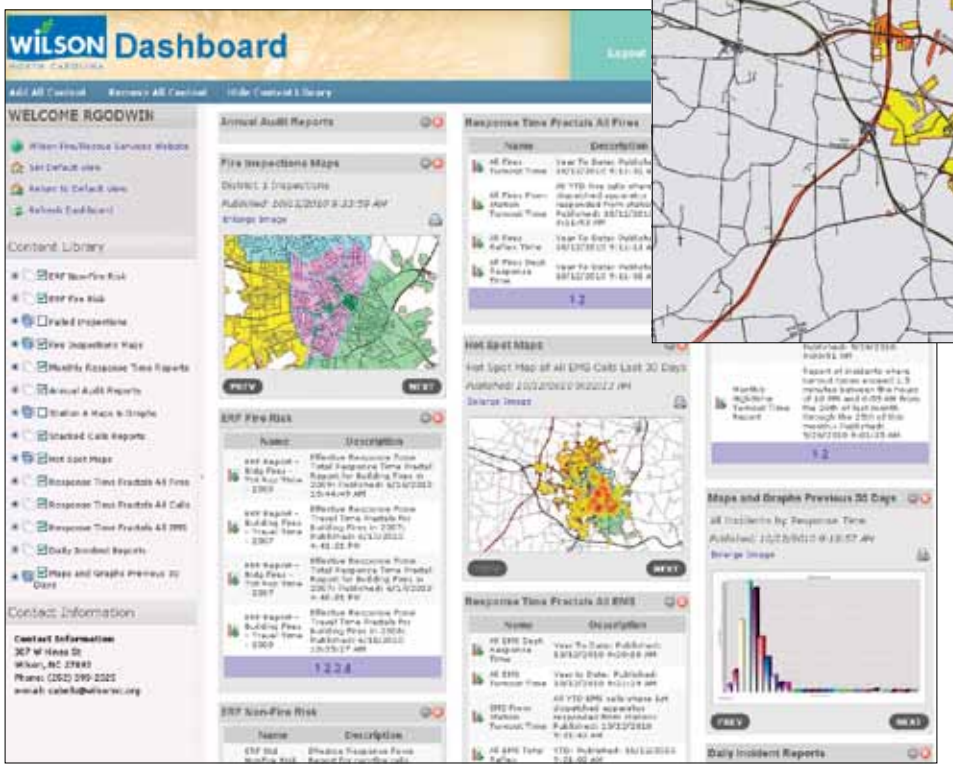
For more information, contact Marta Dent, GIO, Maricopa County (e-mail: mld@mail.maricopa.gov), or Kusi Odomse Akuoko, GIS analyst, Maricopa County Public Works (e-mail: Kusiakuoko@mail.maricopa.gov).

Information as a Weapon to Fight Fire

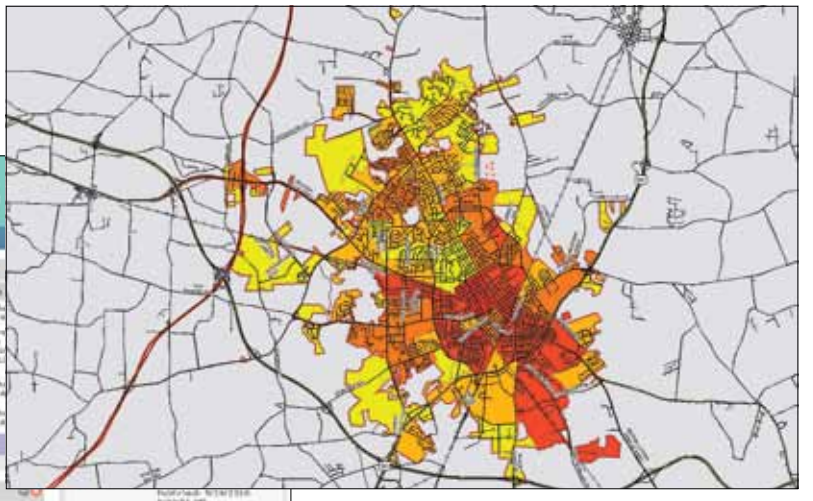
Wilson Fire/Rescue Services Improves Mission Delivery

Highlights

- A GIS-based executive dashboard brings together multiple tabular and geospatial files.
- Mobile data terminals in fire trucks show digital maps and data as soon as personnel enter a truck.
- The county has built an emergency response common operating picture using ArcGIS API for Flex.



Wilson Fire/Rescue Services has a GIS-based executive dashboard that brings together multiple tabular and geospatial files into a single, comprehensive view.



GIS was used to map the locations of traffic incidents. A hot spot map was created by combining vehicle accident data with street and intersection layers.

Wilson Fire/Rescue Services (WF/RS) of the City of Wilson, North Carolina, serves close to 50,000 people living in an area of roughly 30 square miles. It operates out of five stations. The department offers the full suite of fire services, including first responder emergency medical services (EMS) provided by the closest fire company, a technical-level hazardous materials response team, fire inspection programs, and public education. The services are provided to residential, commercial, industrial, and municipal airport sites.

The department has an impressive GIS resumé. Since the late 1990s, the agency has used geospatial technology to carry out its mission of preparedness and protection. The city's technology helps move information previously stored in paper binders and file cabinets into an enterprise environment. Whether it is in a vehicle, on the desktop, or on the web, critical data is now accessible at different organizational levels for better decision making. The agency today is recognized throughout the United States as an advanced public safety GIS organization.

"We've been using GIS information for years," says Don Oliver, chief, WF/RS. "With any emergency response, we have just minutes between the alarm sounding and our arrival on scene. Accurate, instantaneous information about the situation improves our chance of success. GIS provides a more accurate situational awareness for our critical decision making."

"Firefighters must be able to rapidly glean, from the vast amounts of data available to them, the critical information needed for a specific event," says Chris Abells, GIS analyst, City of Wilson. "The key for us is to understand what information firefighters need for their decision process and provide accurate information quickly."

Meeting Mission Requirements at Wilson Fire

Today, ArcGIS software, combined with desktop solutions from Esri Partner The Omega Group of San Diego, California, assists in all phases of the WF/RS mission. The city is a long-standing user of Esri software, beginning in the late 1990s.

Emergency planning for hurricanes, floods, and natural disasters begins with ArcGIS Desktop maps. Information is culled from multiple sources. This helps the fire agency access existing plans—like a 100-year floodplain model—that can prove useful in the event of a large emergency. Once a major incident occurs, WF/RS has all the information needed to plan a response, evacuate people, and maintain situational awareness as the event unfolds. Existing plans and maps can be identified for continuous updating.

ArcGIS is used for planning annual building inspections, including vacant commercial buildings. Firefighters must have information such as the building floor plan, the types of materials used in the building construction, the type of sprinkler system in place, and whether there are hazardous materials stored inside.

Staff uses GIS to map out every commercial structure in the city and plan inspections. Fire crews perform preincident surveys and inspections to document vital information useful in an emergency response. In addition, photos are captured to show all outside views and any special considerations inside the structures. The information shows the shape, size, location, and condition of all city buildings, as well as the water supply networks and any built-in fire protection systems that may be utilized during an incident. All this data is then cataloged and stored in GIS. For vacant buildings, the agency rates their conditions and plots their locations. Buildings are put into color-coded categories based on potential danger. Categories of vacant buildings range from structurally sound and secured to abandoned/dangerous. Firefighters can look at individual building plans and maps or macro-level maps showing multiple building locations and their corresponding color category designation.

The data collection for the building preincident surveys has been expanded to identify potential safety considerations regarding rapid collapse potential. Buildings with lightweight construction, engineered structural support features, heavy fire loading, or trussed roof or floor systems are identified and uniquely symbolized in the Rapid Collapse Consideration layer.

Oliver states, "Being able to access the critical data stored in our GIS immediately provides responding fire officers with the critical information they need to form their strategic plan and employ the appropriate tactics. This ability increases our firefighters' safety by knowing when crews should not enter a structure that is being degraded by fire."

In addition, maps of incidents such as fire, collision, and emergency medical services are brought in from Wilson County's computer-aided dispatch and records management systems and geocoded daily. Maps are generated by week, month, and quarter so that any spike in incidents can be identified and further investigated. Oliver and other staff can determine whether resources—such as fire companies, truck companies, or rescue squads—should be moved from one fire station service district to another location, either permanently or temporarily. Both of these options have been implemented in Wilson by using this data.

For instance, GIS was used to map the locations of traffic incidents. A hot spot map was created by combining fire department vehicle accident data with public services street and intersection GIS layers. When a large number of incidents were shown to be clustered around a specific intersection, it became obvious that action was needed. The city lowered the speed limit for the roadway and reconfigured the intersection, and incidents decreased. The analysis—and integration of data—facilitated the improved safety measures.

WF/RS has a GIS-based executive dashboard from The Omega Group in place that brings together multiple tabular and geospatial files into a single, comprehensive view. It's used for resource allocation and management. Recent events, such as inspections, EMS calls, and fire responses, are viewable in the form of reports, maps, and charts. The information is used by WF/RS senior staff via a simple web browser. Customized analysis routines ensure automatic data updates so that the information presented is always current. Both management personnel and support staff can quickly access and assess the different descriptive reports and maps for strategic planning purposes.

For tactical daily use, mobile data terminals located in fire trucks show digital maps and data as soon as personnel enter a truck to respond to an emergency. Digital street maps show the exact location of the incident. Maps and related tabular information help firefighters see aerial photos, possible hazardous materials, hydrant locations, electric lines, water supplies, and more. Personnel can quickly ascertain the situation and incident potential as they are arriving on scene.

In addition, Wilson County has built an emergency response common operating picture (COP) using ArcGIS API for Flex. This provides real-time data views and analysis during large-scale incidents. As part of the COP, the county is supporting a national geospatial grid. This grid provides a common set of georeferenced location points that are uniform across the United States.

Taking Advantage of Existing City Resources

WF/RS works closely with Abells, who is assigned to the fire department three days a week. The cooperation yields significant results. An enterprise Esri system was already in place at the city when WF/RS first began using ArcGIS. The fire department immediately began using information housed by other departments. Spatial data included streets, water lines and hydrants, electrical and gas lines, and building and zoning specifications. WF/RS combines these datasets with its own data, including fire stations, apparatus locations, service area boundaries, and types of incidents. Abells coordinates with the multiple city departments to ensure that each one can easily provide its data and access data from other departments. Perhaps no other city sector requires this valuable data—from nearly every city department—like WF/RS.

"We have to worry about all of it," explains Oliver. "We need to reach out and touch everything."

The city fire department has been a beacon for how technology can make a difference protecting communities. Oliver and his staff have presented at numerous conferences—including the Fire Department Instructors Conference, Fire Rescue International, and the Esri International User Conference. He's also traveled to fire departments across the country.

"GIS technology is making a significant difference in our industry," he says. "It's being used now more than ever for critical decision making. It is exciting and encouraging that our profession is creating a safer environment for our firefighters and citizens."

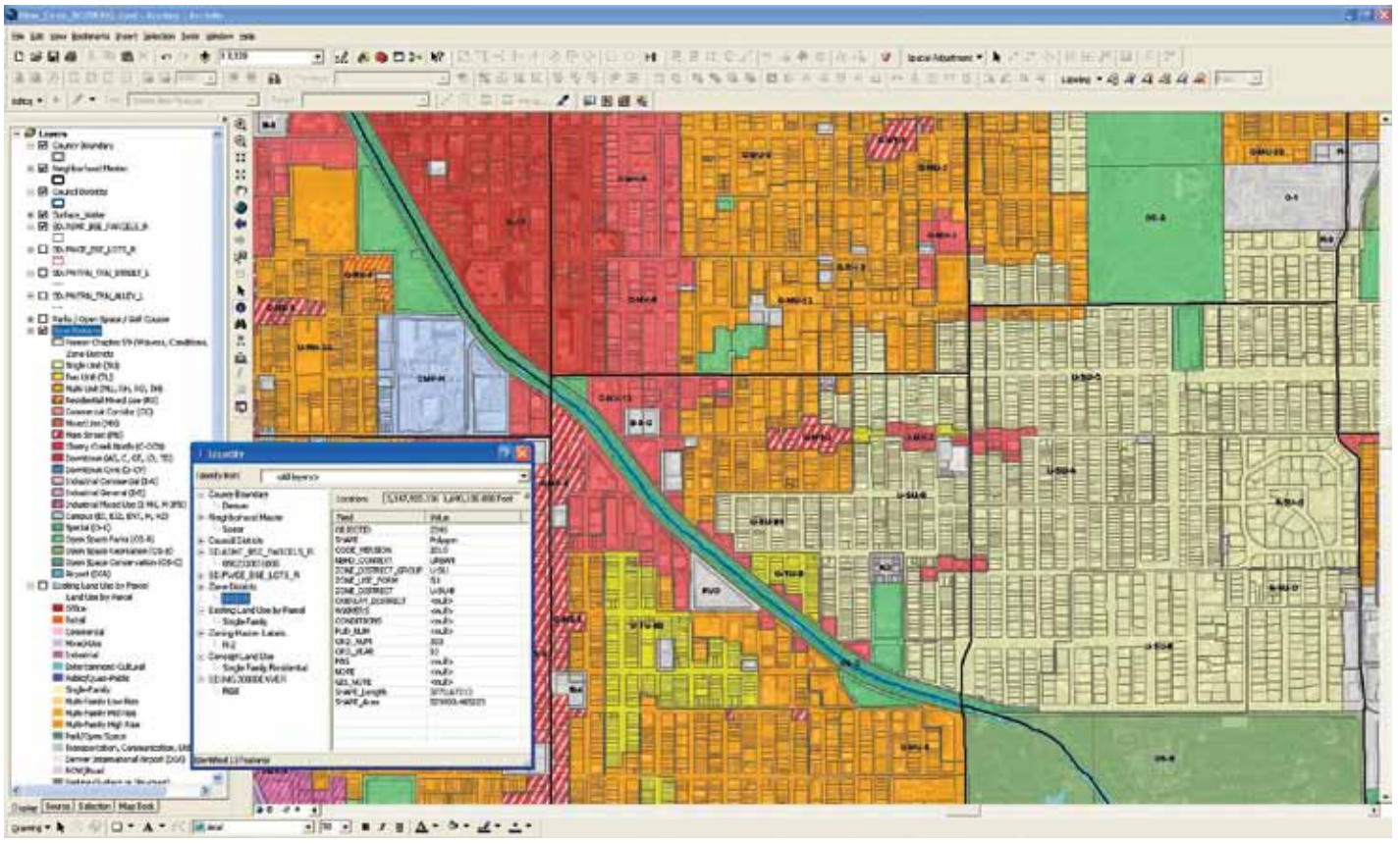
For more information, contact Chief Don Oliver, WF/RS (e-mail: doliver@wilsonnc.org).

Mile-High Mapping

Denver Addresses Population Growth Within a New Zoning Code

Highlights

- The City and County of Denver recently adopted a new citywide zoning code and map using ArcGIS.
- Drafting the new code was a multiyear effort requiring extensive mapping and spatial analysis.
- GIS provided the opportunity for ongoing public involvement and feedback.



Mapping with ArcGIS using the new zoning code.

Zoning is a powerful regulatory tool that allows municipalities to guide development and change within their boundaries. It can be used to channel density into the most appropriate locations, protect and maintain established neighborhoods, and promote the desired distribution of land uses well into the future. Recently, the City and County of Denver, Colorado, governing a current population of approximately 600,000 people (expected to increase by another 100,000 in the next 10 years), created and mapped a new zoning code to address modern-day development patterns and increasing population growth.

Denver's original zoning code was written in 1956 and had become outdated and difficult to follow. Citizens repeatedly called for fixing the code, and in 2009, Mayor John Hickenlooper tasked the Community Planning and Development (CPD) Department to map the new code. CPD, already equipped with two GIS analysts and the full suite of ArcGIS software, was ready to take on the challenge. The new code would be form and context based, where building form, in conjunction with land-use and neighborhood characteristics, would be a driving factor behind regulation. It would be designed by city planners and a mayor-appointed zoning code task force with guidance from the general public.

GIS was an essential tool in mapping the new zoning code throughout Denver, from predrafting stages to the final product. The city has an established central GIS operation, known as Denver GIS, which provides a framework of critical spatial data and all necessary software, including an internal mapping application called Locate, View, Map accessible to city employees. In addition, CPD had transitioned all its original hard-copy zoning maps to digital format in 2006, without which drafting a new code would have been much more challenging. Utilizing these available resources, CPD's GIS team was able to assist planners in identifying ground conditions and important characteristics throughout the city, perform extensive data processing and spatial analysis, and produce hard-copy maps and posters for public meetings. The draft layer was designed and maintained as a geodatabase feature class, while Denver GIS served daily updates via Locate, View, Map.

An external website was also designed for the general public, providing an interactive draft map, as well as downloadable reference maps in PDF format. Through the use of GIS technology and web applications, the city was able to map the new zoning layer digitally and serve the map internally for review then out to the general public, providing transparency and extensive opportunity for feedback.

Preparation for mapping the new zoning code began long before the draft map itself. Although some of the critical base layers already existed in digital format, a number of new layers had to be created or derived from other datasets. Taking a new form- and context-based approach, one of the very first steps was to map neighborhood context throughout the city, which is based on street patterns, the presence or absence of alleys, building forms, parcel dimensions, and the distribution and intensity of land uses. The map teams used existing GIS data, including high-resolution aerial imagery, to help delineate these contexts. Once the new context layer was drafted, ArcGIS was utilized to evaluate and analyze it. For example, the Frequency Statistics tool allowed planners to evaluate the distribution of parcel sizes and determine the appropriate minimum lot sizes within each context.

A second new layer had to do with the preservation of formerly customized zoning. These included old zones with waivers and conditions, Planned Unit Developments, or Planned Building Groups (PBGs). Mapping the PBGs required the extensive process of searching through thousands of site plans and digitizing their boundaries, followed by a quality control check. Combined, these "not to be rezoned" areas were incorporated into the new zoning code layer with their current attributes.

Once the necessary data was compiled, both digital and hard-copy reference maps had to be created. Maps were formatted for Denver's 11 city council districts, as well as for the 78 statistical neighborhoods. Reference maps included current zoning, conceptual and existing land use, aerial imagery, street classifications, parcel sizes, and residential character (showing housing structure types). The planning teams used these for their own reference and at workshops with the general public.

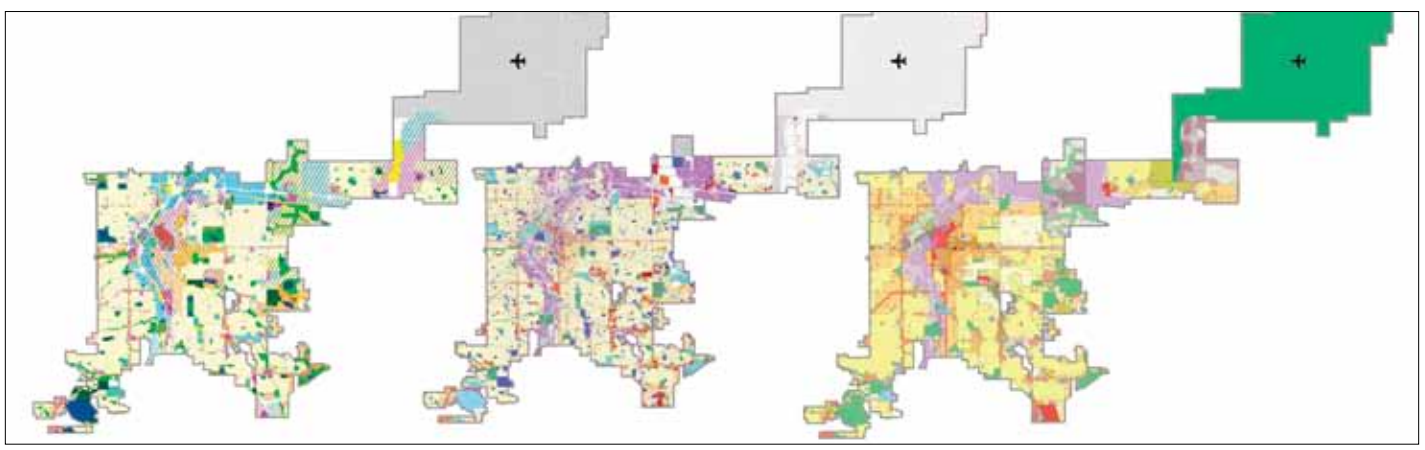
Preparation for mapping the new layer also involved designing a personal geodatabase in ArcGIS. Domains were created for neighborhood context and all zone districts (both for the new menu of zones and to accommodate anything carried over from the old code). Topology was built and maintained along the way.

After preparation was complete, the actual mapping of the new zoning code occurred in waves based on varying levels of complexity, from areas where existing conditions aligned in concept, use, and regulation to areas with conflicting conditions that required additional analysis. For example, a close look had to be taken at sites zoned for multifamily or high density but identified as primarily single-family neighborhoods or where regulated industrial areas were transitioning to mixed-use residential developments. The CPD GIS team provided information and maps to the planners, who would then return them marked with proposed boundaries to be digitized in ArcGIS. Over time, these boundaries were pieced together to form one complete citywide new zoning layer.

Public involvement is an integral part of the services provided by the Community Planning and Development Department. In the case of the new zoning code, it was especially important to reach out to everyone regardless of technical ability. To start, a series of public meetings was held to present the first round of draft zoning maps and allow public participation and feedback. Residents of each statistical neighborhood were provided with a map of the proposed zoning, as well as the reference maps from which the boundaries were derived. People were invited to mark up the drafts with suggested changes and comments. Through the new zoning code website, people could locate their areas of concern and note comments.

Throughout the drafting process, edits and revisions were continually being made. Planners took into account comments from the public, city council, the business community, and other city departments. The GIS team continued to run various spatial analyses on the new layer and for focus areas throughout the city, such as transportation corridors. Daily updates were pushed out to Locate, View, Map so that planners could review changes. Topology and geometry checks were applied as edits were made, and the domains were adjusted as the menu of zone districts changed to reflect input and feedback.

Upon completion, the new zoning layer contained 120 new zone districts, 43 old zone districts, and 3,553 unique polygons. Denver's new zoning code was unanimously adopted by the city council on June 21, 2010. Final quarter-section zoning maps are generated and maintained using ArcGIS software's Data Driven Pages and posted on the city's website at www.denvergov.org.



The three main base data layers used in analysis, from left to right: Blueprint Denver Concept Land Use, Existing Land Use, and Zoning (the old code).

For more information, contact Andrea Santoro or Eric McClelland, City and County of Denver (e-mail: andrea.santoro@denvergov.org or eric.mcclelland@denvergov.org).

Where Technology Sparks Imagination

2011 Esri International User Conference

Of the hundreds of thousands of Esri users around the globe, each July, about 14,000 of them gain considerable professional advantage by attending the Esri International User Conference (Esri UC) in San Diego, California. As the largest event in the world devoted to GIS technology, Esri UC offers unmatched opportunities to learn from experts and peers and to keep up to date with the latest innovations and practices.

"I've been to 15 Esri User Conferences in a row," said Drew Stephens, director of the GIS Institute. "Each one is different, yet the ongoing theme of support for the Esri GIS community and inspiration for us to take home is always there."

Esri UC is designed to let users choose from among a broad range of GIS sessions and events to create learning and networking experiences that meet their specific needs. The agenda includes 275 expert-led technical sessions at all levels, over 600 user presentations, and more than 100 user group meetings focused on specific regions or industries.

These offerings are framed by opening and closing plenary sessions that bring attendees together for an inspiring overview of the power and potential of GIS today. Plenary sessions showcase the latest capabilities of ArcGIS, innovative implementations of GIS around the world, and insights from world-class keynote speakers.

Perhaps the most extraordinary aspect of Esri UC is its ability to demonstrate the worldwide impact of GIS. This event attracts Esri users from over 100 countries and from every industry.

"This is an incredible gathering of innovative thinkers, with opportunities to connect with and build collaborations with people in fields that otherwise might not realize their collaborative potential," said Ann Mayo-Kiely of Alaska Geographic after the 2010 Esri UC. "People from urban planning, conservation, science, and education fields connected and shared ideas about how their technology and innovative use of GIS may cross disciplines in unexpected ways."

Between sessions, Esri UC features an abundance of less structured events. Attendees can stop by the GIS Solutions EXPO to find products and services to meet their needs, visit the Esri Showcase to learn about the latest products and get one-on-one assistance, or browse the Map Gallery to see hundreds of examples of Esri users' work.

Additional offerings include a series of preconference technical seminars held the weekend before Esri UC begins, five-minute GIS Lightning Talks on Monday afternoon, and a Managers' Open Summit that brings together GIS managers to share experiences and advice.

Amid this busy, information-packed week, attendees can enjoy San Diego and socialize with fellow GIS professionals at a variety of events. Highlights include the Map Gallery Opening Reception on Monday evening, Family Night for attendees and their families on Wednesday, and a themed outdoor party at the Thursday Night Celebration.

Feedback from first-time attendees is unanimous: Esri UC is inspiring, informative, and essential for any GIS professional. Here's what some Esri users had to say about their first Esri UC experience in 2010:

- "My first Esri conference exceeded my expectations more than I could have imagined," said Barry Conner, GIS analyst for the City of Huntsville, Texas. "Though I came with many years of GIS experience in my area of specialization, I very quickly learned of methods and resources that will totally revolutionize the way I work. I can hardly wait to implement the things I've learned."
- "I thought I knew everything about the products, but I learned something new every day, either in the workshops or in the Exhibit Hall," said Tim Fendrich, a consultant at Geodata Danmark.
- "The technical workshops offered at the conference were outstanding and full of immediately useful information," said Christopher Stueve, planning technician at Ozarks Transportation Organization. "I can't wait to return to San Diego for next year's conference!"

The Esri User Conference attracts Esri users from more than 100 countries.

More About Esri UC
This conference is for all Esri GIS users and will be held July 11–15. Get the latest 2011 Esri UC news at **esri.com/uc** and subscribe to the *UC Blog*. You may qualify for complimentary registration as part of your organization's Esri software maintenance program. To find out, call 909-793-2853, extension 1-1363, or visit **esri.com/uccomp**.

Join the Esri UC Social Network
Visit the Esri UC social media site at esri.com/uccommunity.

Asia Pacific User Conference—"One Community, One Map"

The Manila Water Company accepting the Special Achievement Award. From left: Rommel Gumapas; Mauricio "Mauch" Franco, Jr.; Director Abelardo Basilio; Romel Cariño; Rosie Cailao; Amy Pineda; Jack Dangermond; Joy Santiago; Susan Pablo; Edgar Santos; Dem Espiritu.

More than 640 users from the Asia-Pacific region descended on Manila, Philippines, January 26–27 for the 2011 Esri Asia Pacific User Conference (APUC). Hosted by Geodata Systems Technologies, Inc., Esri's international distributor for the Philippines, the conference drew users from 10 countries in the region: Australia, China, India, Indonesia, Japan, Korea, Malaysia, New Zealand, Philippines, and Singapore.

Esri founder and president Jack Dangermond delivered the keynote speech, in which he called for users to collaborate. Dangermond emphasized that the vision of "One Community, One Map" is the idea that geospatial information becomes pervasive and helps everyone in society do a better job.

"We were thrilled to see so many users from so many countries in the Asia-Pacific region sharing and collaborating at APUC," says Francisca N. Dayrit, Geodata executive vice president. "Thank you to all the attendees for making this event such a success."

The Manila Water Company was the recipient of the Special Achievement Award for Excellence in Enterprise GIS Implementation after successfully driving solutions in which the Esri GIS platform is one of the major technologies for its water supply management, pressure monitoring, nonrevenue water monitoring, asset management, and investment prioritization.

According to engineer Abelardo Basilio, director of East Zone Business Operations, Manila Water was able to reduce nonrevenue water from 63 percent in 1997 to 10 percent in 2010. With Esri GIS as the platform, the water utility shares information with different departments, and today, as many as 200 users have access to the system. These users perform data integration, planning, analyses, and decision making.

Users throughout the region embraced the theme of "One Community, One Map," as more than 25 maps were showcased in the Map Gallery.

Technical workshops and presentations are available online at the Geodata website (www.geodata.com.ph).

Upcoming Conferences

The 2011 European User Conference will be held October 26–28 at the North Convention Center, IFEMA, Feria de Madrid, in Madrid, Spain; the 2011 Middle East and Africa User Conference will be held November 1–3 at the Habtoor Grand Hotel in Beirut, Lebanon. Finally, the 2011 Latin America User Conference will be held September 28–30 at the Hotel Real Intercontinental in San Jose, Costa Rica. Visit esri.com/events for more information.

Redlands GIS Week

Volunteered Geographic Information Plays Critical Role in Crises

As a political revolution swept Egypt, led by protesters who organized via social media, attendees at Redlands GIS Week met in a workshop to explore the future impact of social media and volunteered geographic information, especially during crises and emergencies.

More than 100 academics, students, government and private-sector experts, and Esri employees attended the workshop, titled Volunteered Geographic Information (VGI): Real-Time and Emergency Applications. The event, held February 8–10, 2011, at Esri headquarters in Redlands, California, was cosponsored by the University of Redlands, University of Southern California Spatial Sciences Institute, and Esri.

Volunteered geographic information, or locational crowdsourcing—where citizen volunteers contribute data that's georeferenced then disseminated—is particularly useful in emergency applications where the data's timeliness can make it especially valuable. For example, Esri created the online Egypt Events Map just after antigovernment rallies began in Tahrir Square on January 25, 2011. The map pulled in social media related to the protest in real time. Though only a few Twitter, YouTube, and Flickr posts appeared initially because the government shut down the Internet early on, the number expanded as restrictions eased.

It's About Time

In his keynote speech, It's About Time: The Temporal Dimension in VGI, geography professor Michael F. Goodchild from the University of California, Santa Barbara, stressed the importance of time in VGI to create an accurate picture of what's occurring and when in a particular situation. Maps have traditionally emphasized the static aspects of geography. "You did not make maps of things that were changing," he said. "But rivers change course, people move, events occur, and emergencies develop. Geography is dynamic."

Quality of VGI

Goodchild also examined the issue of quality of VGI.

VGI can readily claim to be the most current data source, as witnessed by Twitter's ability to break news before other sources. Compared to traditional authoritative data sources, VGI has been criticized for having poorer positional accuracy and overall veracity, Goodchild explained in his talk. However, that assertion is countered by citing Linus's law, which states that the more people involved and watching over a project, the more likely errors can be spotted and fixed quickly. The law was named after Linus Torvalds, credited with initiating development of the Linux operating system. Examples of the self-regulating effect of crowdsourcing are open source software projects, such as Linux, and wikis, such as Wikipedia. Another law at play with VGI is Tobler's law, which states, "Everything is related to everything else, but near things are more related than distant things." This means that citizen contributions will tend to be more accurate in places the contributor lives near and knows best.

"The most compelling case for VGI is during emergencies," said Goodchild, adding that with experts sometimes thin on the ground, it's important to turn to citizens who can contribute data through social media or other means. "We have seven billion intelligent observers on the planet," he explained.

Successful VGI Projects

Two rapid and successful VGI deployments helped coordinate disaster response after a devastating magnitude 7 earthquake struck Haiti in January 2010.

OpenStreetMap project volunteers working outside Haiti rapidly created a digital streetmap of Port-au-Prince and other places in Haiti using fine-resolution imagery to trace vector maps of streets and other features. The Ushahidi Project was able to post appeals for help, translated from Creole into English by another group of online volunteers. Together, these VGI projects were instrumental in guiding first responders to disaster victims.

At the workshop, Anahi Ayala Iacucci from the International Network of Crisis Mappers (and an Ushahidi collaborator) presented Introducing the Standby Volunteer Task Force: An Online Community for Live Crisis Mapping. She explained how the digital response to the disaster in Haiti was organized. Iacucci stressed that volunteers need not wait until the next crisis happens to start creating and publishing VGI. People should work together right now to start collectively mapping poorly mapped regions at risk, she said.

After the protests began in Cairo, Esri created the Egypt Events Map that utilized social media, such as videos from YouTube and tweets from Twitter, that were related to the antigovernment uprising.

Iacucci acknowledged Esri's participation in many of the volunteer efforts, as well as in helping Ushahidi publish geodata. She also called for a stronger awareness campaign about the tools Esri offers to assist volunteers.

Kurt Daradics, cofounder of Esri Partner CitySourced, spoke about his company's experience with VGI in his presentation Using VGI to Mobilize Civic Engagement. CitySourced develops and markets software for mobile devices and servers that connect citizen requests for service to public agency back-office work order systems. The company used Esri's ArcGIS API for iOS to develop its iPhone application, which lets citizens report problems, such as potholes and graffiti, to their local governments.

Daradics said that having citizens directly report neighborhood problems using applications on smartphones can significantly reduce the cost of 311 call center systems. By connecting to enterprise work order systems, an alert can be sent notifying the person who reported the problem that it had been resolved, thus increasing citizen trust in government.

Other notable speakers at Redlands GIS Week included Lorant Czaran from the United Nations Office for Outer Space Affairs in Bonn, Germany; Lars Bromley from the United Nations Institute for Training and Research Operational Satellite Applications Programme in Geneva, Switzerland; Sentil Prakash Chinnachamy from Spatial Edge; and Joseph Toland from the United States Federal Emergency Management Agency (FEMA).

Toland said FEMA is committed to including VGI in the mix of data sources used to provide common operating pictures for first responders. These capabilities are being built into the System Assessment and Validation for Emergency Responders system, which includes a map viewer built on ArcGIS API for Flex.

Mapping Disasters

Esri staff conducted several demonstrations, including showing attendees the interactive Gulf of Mexico Oil Spill map. The application, created in April 2010 after the Deepwater Horizon oil rig explosion, shows VGI related to the massive oil spill posted by citizens via Twitter, YouTube, Flickr, and Ushahidi. The application provides context to the VGI data by including map data supplied by authoritative sources. The 2011 floods in Queensland, Australia, and the subsequent Tropical Cyclone Yasi presented further opportunities for mobile GIS to prove to be the best solution to a complex situation.

Current events have proved VGI valuable in case after case. Nontechnical but involved people around the world know they can contribute to the public record, and the power and value of VGI they produce will continue to influence world events.

For more information, visit www.redlandsgisweek.org.

ACSM and Esri Come Together to Host the Survey Summit

Conference Heats Up with Move from Spring to Summer

Adding greater value and wider interest to its annual conference, normally held in spring, the American Congress on Surveying and Mapping (ACSM) has joined forces with Esri to form the premier event in the surveying industry. The Survey Summit is the new conference cohosted by ACSM and Esri, and it promises to retain all the benefits of the long-running ACSM Annual Conference with the added curriculum that will come from the geospatial industry.

The inaugural Survey Summit will take place July 7–12, 2011, in San Diego, California, sharing its final two days with the Esri International User Conference (Esri UC). It will serve as the ideal forum for not only ACSM members but also anyone interested in GIS technology, as well as emerging technologies such as lidar and 3D scanning.

"ACSM has served as a voice of land surveyors and mappers for more than 70 years," says Brent Jones, Esri's surveying, cadastral, and land records industry manager. "As the surveying and geospatial industries continue to make technological advances together, it makes sense that the professionals of these related fields join together at one premier conference. We're excited to have ACSM as part of the Survey Summit. It's a must-attend event for the surveying community, as it provides access to the pinnacle of technology available to surveyors and mappers."

The society is composed of more than 5,000 surveyors, cartographers, geodesists, and other spatial data information-related professionals from private industry, government, and academia throughout the world. As technology has provided new methods of obtaining and using spatial data, such as GIS, land information systems and GPS, ACSM and its members have continually responded to the challenges presented by these new technologies.

"ACSM is dedicated to creating and maintaining a positive synergy between the GIS and surveying professions by exposing GIS professionals to surveying, and surveying and geomatics professionals to emerging geospatial technologies," says Curt Sumner, ACSM executive director. "The Survey Summit will allow us to demonstrate to the world that the surveying, engineering, and GIS professions do intersect with each other and can work together effectively. An event like this is great for the geospatial community at large."

Members of the storied organization share Sumner's sentiments. "This is undeniably one of the biggest steps forward in linking the surveying and mapping profession with the GIS profession," says ACSM member Richard Pryce, PSM, director of the Florida Surveying and Mapping Society, District 6. "This is truly a monumental step into the future for surveyors and mappers across the nation to join in the revolution and evolution of GIS."

For more information, to register, or to take advantage of sponsorship and exhibit opportunities, visit **surveysummit.com**.

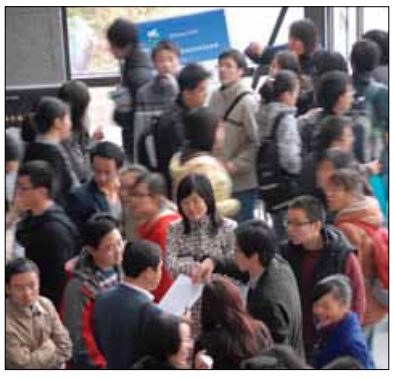
Organizations Use Webcasts, Mobile Devices, and More

For GIS Day 2010, organizations started to move away from traditional classroom lectures to more technology-based activities to show GIS in action during their events. Several organizations hosted a live GIS Day webcast to reach a wider audience. This allowed them to accommodate more participants and cut event costs. Also during 2010, GIS professionals hosted outdoor activities with local schools, scout groups, and 4-H clubs using mobile devices. Based on the success of these interactive events, GIS Day organizers have expressed interest in adopting new methods to include in their celebrations. GIS Day 2011 will be held on November 16 during Geography Awareness Week, a geographic literacy initiative sponsored by the National Geographic Society (**www.mywonderfulworld.org/gaw**). To find more information on GIS Day and to start planning an event, visit **gisday.com**.

Maui Economic Development Board's Women In Technology—Hawaii, USA

The Maui Economic Development Board's (MEDB) Women In Technology (WIT) held its second annual statewide GIS Day webcast. On November 17, 2010, for seven straight hours, various GIS professionals from around the state and country provided presentations via webcast to demonstrate how GIS is used in their work and share potential career pathways in GIS. Several hundred students throughout the state, from five different islands, logged on to view the webcast and interact with the GIS professionals.

Webcast facilitator Diana Papini Warren comments, "We especially enjoyed students' participation in answering questions after each presentation in order to win a T-shirt or poster. It was an exciting event this year!" Twenty-five different schools at elementary, middle, and high school levels participated in various sessions, and each teacher also received supplemental GIS Day materials and lessons. This annual event is offered as part of MEDB WIT's GeoTech for Hawaii schools statewide initiative.



GIS Day attendees at Nanjing Forestry University, China.

Nanjing Forestry University GIS Association—Nanjing, China

On GIS Day, Nanjing Forestry University's GIS Association invited nine other universities and alumni who majored in GIS to celebrate GIS Day. About 500 attendees sat together to enjoy lectures and demonstrations from university professors on 3D data acquisition and global climate change. Esri instructors were also in attendance to demonstrate ArcGIS 10. In the evening, participants continued to celebrate with a GIS Day cake, an awards ceremony to recognize university students who visited local elementary schools as GIS mentors, and video presentations created for the event by Nanjing Forestry University students that addressed their interest and ideas for the future of GIS.

Loudoun County—Virginia, USA

GIS Day in Loudoun County, Virginia, lasted all week. On the Saturday before, volunteers mapped fire hydrants using iPhones and Trimble handheld devices in the town of Hamilton, Virginia. That morning, they collected information on 90 fire hydrants. On Monday, the board of supervisors received a presentation on the latest uses of GIS. Wednesday morning, teams from the county, the water utility, and the Town of Middleburg mapped the hydrants in their city. And on GIS Day, locally made GIS videos were added to a display in the government center.

Volunteers in Loudoun County collecting spatial information using the county's Trimble GPS units, as well as Apple iPhones.

Resources Available

There are many more event examples and success stories available at **gisday.com/success**. The success stories are great ways to get ideas for your next GIS Day event, including hands-on GIS workshops, training seminars, special presentations and talks, map galleries, treasure hunts, and field trips. Once an idea is in the works, users are encouraged to access the resources and support provided online, including sample agendas, proposal letters, white papers, and ideas on how to do a GIS Day proclamation in your area and create a GIS Day cake.

Online-Only Articles

More *ArcNews*

The Spring 2011 issue of *ArcNews* Online (**esri.com/arcnews**) presents the following special online-only articles:

In New Zealand, Earth Science Students Map Geologic Features: ***New GIS and GPS Tools Capture Precision Data***

South Bend, Indiana, Uses GIS for Brownfields Inventory

Counting on Risk: ***Explore Information Services Turns to GIS for More Accurate Risk Analysis***

Also, look for the expanded Esri T-shirt section online, as well as new supplemental podcasts.

"Crossing Borders"

A column by Doug Richardson,
Executive Director,
Association of American Geographers

GIS and Geography: Interactions with the Humanities

The AAG will be continuing a decade-long arc of sustained activity around the theme of "Geography and the Humanities" with a special set of sessions on these interactions during its upcoming Annual Meeting in Seattle, Washington. We invite all interested GIS specialists, geographers, artists, writers, and humanities scholars to attend and participate in these sessions, to be held April 12–16, 2011.

As noted previously in this column ("Geography, GIS, and the Humanities," *ArcNews*, Summer 2006, Vol. 28, No. 2, p. 39), there has been a remarkable resurgence of intellectual interplay between geography, GIS, and the humanities in both academic and public circles. Metaphors and concepts of geography and GIS now permeate literature, philosophy, the arts, and other humanities. Terminology and concepts, such as space, place, landscape, mapping, and geography, are increasingly pervasive as conceptual frameworks and core metaphors in recent publications in the humanities.

The diffusion of ideas between geography and the humanities is significant for the insights and connections it has spawned. Scholars and writers outside the field of geography have developed new understandings from interrogating a sense of place or by examining the changing landscapes of globalization and complex new international realities in traditionally geographic terms. The core traditions of geography, combined with recent geographic technologies, such as GIS, have opened new lines of intellectual inquiry in the humanities and changed research methodologies in numerous fields. And, of course, the mutually beneficial interactions between the discipline of geography and such humanities fields as the philosophy of science, cultural and ethnic studies, and various literatures in postmodernist thought have also had far-reaching implications for GIScience and geographic research and education.

For many years, the AAG has focused on developing ideas, methods, and partnerships through which we might further explore, showcase, and foster the emerging interactions between geography, GIS, and the humanities. These efforts resulted in a seminal Symposium on Geography and the Humanities, sponsored jointly by the AAG, the American Council of Learned Societies, and the University of Virginia, in 2007. This symposium explored how geography informs the humanities and vice versa, took stock of the new and evolving connections between geography and the humanities, and identified promising new research paths along which such interaction can proliferate and be strengthened in the future.

These geography and humanities interactions are now the subject of two new books, emanating in part from the AAG Symposium and supported by grants from the National Endowment for the Humanities and the Virginia Foundation for the Humanities. The first of these complementary explorations, *Envisioning Landscapes, Making Worlds: Geography and the Humanities*, focuses a lens on the deep traditions of the humanities within the discipline of geography, with contributions from many of the most prominent authors in the humanities traditions of geography. The second book, *Geohumanities: Art, History, Text at the Edge of Place*, reaches outward to explore the new, rapidly evolving experimental and experiential engagements by humanities disciplines themselves as they seek to understand and incorporate geographic methods and concepts of space and place into their own work, which encompasses the rapidly expanding use of GIS throughout the humanities and the burgeoning field of historical GIS. Both of these new books, published by Routledge this spring, will be the subject of featured discussions during the AAG Annual Meeting's special Geography and the Humanities sessions in Seattle, together with the books' editors and authors.

Another highlight of the Geography and the Humanities track at the Seattle meeting for me will be a keynote presentation by the exquisite writer and longtime friend of geography, Barry Lopez, who won the National Book Award for his book *Arctic Dreams* and recently authored *Home Ground: Language for an American Landscape*. I am delighted to note as well that he has been selected as the AAG's 2011 Honorary Geographer, a fitting award in light of this year's special focus on geography and the humanities. Lopez's keynote talk will be presented on Friday, April 15, 2011.

The AAG welcomes and encourages broad participation by the Esri GIS community in these Geography and the Humanities sessions. An online program detailing these, as well as many other sessions of interest to GIS users (including three full days of special sessions on space-time integration in GIS and GIScience), is available at **www.aag.org/annualmeetings**. I look forward to seeing you in Seattle, a beautiful and most apt setting for these sessions on geography and the humanities.

Doug Richardson
drichardson@aag.org

ArcGIS Server Disseminates Geospatial Services

Esri's ArcGIS Server adds geographic data and analysis to web applications that serve organizations and communities in a variety of ways. To submit an ArcGIS Server site address and view other websites powered by ArcGIS Server, visit **esri.com/serversites**.

National Ice Center
www.natice.noaa.gov/products/products_on_demand.html
This site provides simple access to the National Ice Center (NIC) ice analysis archive. The daily ice edge is constructed by NIC ice analysts using various imagery products with resolutions including RADARSAT, ENVISAT, DMSP OLS, AVHRR, and QUIKSCAT.

USDA Food and Nutrition Service
www.snapretailerlocator.com
The USDA Food and Nutrition Service provides a retail locator for the Supplemental Nutrition Assistance Program (SNAP) that serves more than 40 million people each month.

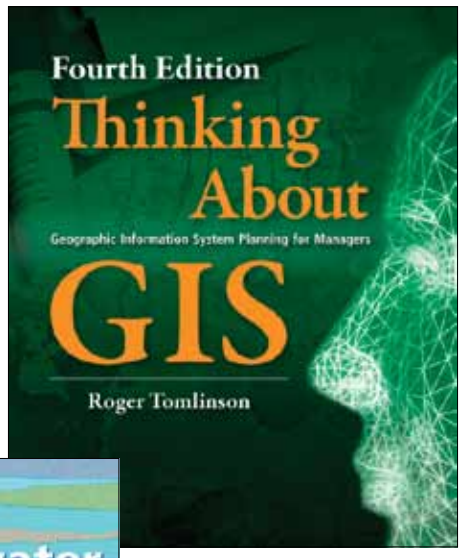
National Geographic Information System (NGIS)
ngis.moea.gov.tw/NgisFxWebEng/Default.aspx
The site, provided by the Ministry of Economic Affairs, R.O.C., gathers and serves natural data, including hydrology, water resources, terrain, meteorology, geology, and soil.

Canada's Biggest Infrastructure Projects
www.top100projects.ca/map
Built with ArcGIS Viewer for Flex 2, this year's Top 100 list of Canada's Biggest Infrastructure Projects represents more than $96 billion in infrastructure investments in Canada.

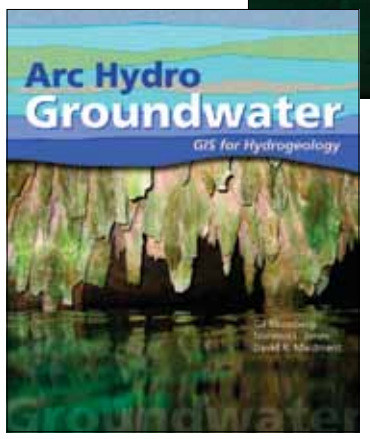
Industry Experts Offer Proven Planning Models

New Esri Press Books Document Best Practices

Established planning methodologies and models can play major roles in helping manage an organization's time, employee, and money resources, regardless of the endeavor. Learn how to support your GIS systems and related workflows, no matter the industry, with new books from Esri Press.



***Thinking About GIS: Geographic Information System Planning for Managers,* Fourth Edition**
By Roger Tomlinson
Based on decades of the author's consulting experience and global seminars, *Thinking About GIS* helps organizations succeed in implementing or expanding GIS. Roger Tomlinson, the "father of GIS," details a practical planning method that will help managers at all technical levels assess the needs of their organizations and establish what is required from a GIS. The fourth edition adds new case studies, an additional appendix that discusses custom workflows, and a DVD that includes exercises from Tomlinson's *Planning a GIS* training course and video of his Planning and Managing a GIS presentation from the Esri International User Conference. ISBN: 978-1-58948-273-9, 268 pp., $54.95



Arc Hydro Groundwater: GIS for Hydrogeology
By Gil Strassberg, Norman L. Jones, and David R. Maidment
Innovators within the hydrology community, authors Strassberg, Jones, and Maidment contribute a design for groundwater management based on ArcGIS that can be widely and easily adopted as documented in *Arc Hydro Groundwater: GIS for Hydrogeology*. The geographic data model, accordingly named Arc Hydro Groundwater, addresses the application of GIS to hydrogeology, providing a standard model that federal, state, and regional groundwater agencies can follow and apply to a broad range of water resource issues. This book is an invaluable resource for hydrologists, water professionals, GIS specialists, academics, and students who work with groundwater data to research and solve water resource problems. ISBN: 978-1-58948-198-5, 176 pp., $64.95

For more information about these books or to order, visit **esri.com/esripress**.

Esri Podcasts

Esri podcasts are a free and easy way to get the latest news from Esri and its users and partners. Esri Instructional Series podcasts focus on new and updated software features. Visit **esri.com/podcasts**.

"Managing GIS"

A column from Members of the
Urban and Regional Information Systems Association

URISA
The Association For GIS Professionals
www.URISA.org

GIS Management Scholars: Applying Practice to Praxis

By Dr. Michelle M. Thompson, Assistant Professor, Department of Planning & Urban Studies, University of New Orleans

As George Bernard Shaw stated in *Maxims for Revolutionists*, "He who can, does. He who cannot, teaches." This theory may hold some truth, but providing public participation geographic information systems (PPGIS) in an academic environment has similar, if not greater, challenges, since program implementation does not have the force of law or continuous financial support. My experience as a former licensed real estate appraiser and City of Ithaca, New York, GIS planning analyst strengthened my perspective as a former GIS manager at Cornell University and does so currently at the University of New Orleans. GIS technology allows planners to share both neighborhood and municipal data, but not typically within the same environment. This article focuses on how the WhoData (**www.WhoData.org**) Internet mapping service website moved the PPGIS concept into a New Orleans community data information system that works.

WhoData public participation geographic information systems (PPGIS) with Community Data.

Background

The University of New Orleans Department of Planning & Urban Studies (UNO-PLUS) (**www.planning.uno.edu**) is part of a city university where students apply planning theory to practice, or "praxis." The need for the planning community to work closely has never been greater than after Hurricanes Katrina and Rita in 2005. Community-based organizations, as citizen planners, significantly aided the recovery by identifying health and safety needs while prioritizing the cleanup of abandoned or blighted properties. Many local and out-of-state intermediaries, community-based organizations (CBOs), and university partners had good intentions, but the collection of neighborhood condition survey data was not synchronous, coordinated, or shared. In August 2010, the City of New Orleans Planning Commission approved the New Orleans master plan, Plan for the 21st Century: New Orleans 2030, which included a mandate to "establish a formal community participation program (CPP)" that may include a community data information system (CDIS) (City of New Orleans Master Plan, Section 15, 2010). WhoData was not created in response to the CPP but may support the CDIS since it is accessible to all.

Responding to Postdisaster PPGIS

In fall 2006, I served as the GIS team manager for the Association of Community Organizations for Reform Now (ACORN)/University Collaboration, which developed A People's Plan for Overcoming the Hurricane Katrina Blues for the ninth ward. This neighborhood plan was adopted by the City of New Orleans Planning Commission in spring 2007. Community-university-municipal PPGIS projects are typically customized for a single semester and serve a limited number of community clients. Since UNO-PLUS could not develop a GIS or manage the training needs of multiple organizations, creation of an Internet map service (IMS) was the next logical phase. In fall 2009, a PPGIS collaboration was formed with Neighborhood Housing Services of New Orleans (NHS), the Regional Planning Commission (RPC), and UNO-PLUS to further advance the **www.WhoData.org** website. By design, UNO-PLUS adopted the role of GIS manager of the IMS.

Outlined below are best practice standards that were used by this UNO-PLUS GIS scholar to manage the **www.WhoData.org** website from inception (summer 2009) to the present.

Project Scope/Planning: Identify and Evaluate Priority Public Policy Issues

The WhoData website includes neighborhood data and is modeled after many successful municipal data information systems. Dr. Joseph Ferreira, Jr., et al suggest that a "middle-out" approach combines the benefits of top-down and bottom-up initiatives while largely avoiding their respective pitfalls. ("The Future of Spatial Data Infrastructures: Capacity-Building for the Emergence of Municipal SDIs," 2007). New Orleans residents, investors, and municipal government departments need parcel-level data that identifies areas of blight, recovery, and renewal. However, until now, there hasn't been a unified approach to collecting the neighborhood condition survey data in a format that can be seamlessly integrated with city data.

Contracts and Services: Establish a Community-University-Municipal Project Scope and Service Contracts

Funding initially hampered server installation, but through the support of the University Computing Center, we were able to leverage the in-house computer support with high-end security, appropriate backup, and ongoing technical support. In fall 2009, GISCorps (**www.giscorps.org**) provided a generous gift of programming services using ArcGIS. Rafael Ferraro, GISCorps volunteer programmer, worked well beyond his call to duty and brought our dream to a reality on February 1, 2011. The collaborators were a web development team holding virtual project meetings for more than a year.

It was equally important to find a community partner willing to volunteer with IMS beta testing and share community survey data. We also needed a municipal partner that could provide regional data and suggest protocols that meet with Federal Geographic Data Committee National Spatial Data Infrastructure (**www.fgdc.gov/nsdi/nsdi.html**) standards. David Lessinger, project manager and GIS professional from NHS, and Lynn Dupont, principal planner/GIS coordinator for RPC, filled these roles, respectively.

Team Building: Evaluate the Team Skill Sets and Develop a Plan to Increase CBO Capacity Through Training

NHS, RPC, and UNO-PLUS worked diligently to craft an outreach plan, establish survey data training, develop instrument standards, provide survey map services for in-field data collection, and identify neighborhoods that were in need of support. In spring 2010, organizations that conducted resident-led and volunteer neighborhood surveys discussed interorganization collaboration and data sharing mechanisms. While some of the organizations possessed staff, time, funding, and the technical ability to conduct surveys and implement a GIS, many could not.

As of January 2011, participating organizations include Associated Neighborhood Development, Broadmoor Improvement Association, Faubourg Lafayette Neighborhood Association, Gentilly Terrace & Gardens Improvement Association, Jericho Road Episcopal Housing Initiative, Lowernine.org, New Orleans Neighborhood Development Collaborative, NHS, Phoenix of New Orleans, Project Homecoming, RPC, and UNO-PLUS.

Project and Data Management: Identify Data Requirements, Municipal Services, and PPGIS Staff That Will Support the Project

Negotiating data sharing contracts with CBOs has not been difficult since the WhoData team remains transparent and willing to work with any and all stakeholders. We expect that site customization issues will arise as citizen feedback is obtained after the phase I site release in February 2011. On January 20, 2011, the parcel layer file was released to the public by Denice Ross, interim GIS manager for the City of New Orleans GIS Department. Access to this layer will now allow public and private GIS professionals to openly integrate parcel-level community survey and municipal data within a shared spatial environment.

Reflection

An academic GIS manager must create decision support systems and conduct business in a manner similar to a municipal GIS professional. The project management limitations are the same for those in any GIS environment: lack of time, money, and capacity. These can be minimized by identifying nonuniversity resources that share a similar vision and provide pro bono, nonproprietary services and implementing a project plan that has a longer trajectory than would be deemed profitable.

As the face of the new New Orleans shifts, so will the needs of the community. The **www.WhoData.org** website will make this change more transparent, support citizens, and assist our city officials with developing policies that reflect the shape of a city reborn.

About the Author

Michelle M. Thompson, PhD, has been an assistant professor in the Department of Planning & Urban Studies at the University of New Orleans since 2008. Thompson has provided real estate and market valuation services for over 20 years. She received her bachelor of arts degree from Syracuse University in policy studies, her master's degree in regional planning, and her doctor of philosophy degree from the Department of City & Regional Planning at Cornell University. She is currently the vice president of the Louisiana chapter of URISA and a member of GISCorps.

For more information, contact Dr. Michelle M. Thompson, Assistant Professor, Department of Planning & Urban Studies, University of New Orleans (tel.: 504-280-6593, e-mail: mmthomp1@uno.edu).

Esri Partner Offerings

Esri maintains relationships with more than 2,000 partners that provide focused assistance to our customers. These partners have extensive experience providing GIS solutions and services across several industries, ranging from custom ArcGIS applications to complete system implementations. For a complete list and description of our partners and their offerings, visit the Esri Partners website at esri.com/partners.

K–12 Education Administration

Davis Demographics & Planning, Inc.
www.davisdemographics.com
SchoolSite Planning Suite for ArcGIS
The SchoolSite Planning Suite provides essential tools for K–12 demographic reporting, facility planning, and growth management. Implemented as an extension to ArcGIS Desktop, SchoolSite is used by more than 100 school districts in 26 states. Recently upgraded for ArcGIS 10, the SchoolSite Planning Suite includes the ability to create 10-year and maturation/build-out enrollment forecasts for multiple grade configurations at multiple geographic levels, including planning areas, attendance zones, and districts, as well as extensive redistricting tools for modeling attendance boundary changes and the opening and closing of school sites. In addition to desktop software licensing, SchoolSite is also used by Davis Demographics to provide planning consulting services to school districts throughout the United States.

Public Sector and State and Federal Governments

CyberTech Systems and Software Inc.
www.cybertech.com
CyberTech serves the public sector and state and federal governments for a variety of business needs, from geodesign to public safety and national security. CyberTech has a large enterprise client roster and focuses on enterprise GIS integration and assimilation while also building next-generation, lightweight GIS applications. CyberTech focuses on driving Esri and ArcGIS product absorption in multiple theaters by delivering state-of-the-art geographic information solutions.

URISA Announces Advocacy Agenda

Prior to GIS-Pro 2010 in Orlando, Florida, URISA chapter leaders from across North America were asked to gather relevant issues from their local members and report them during the chapter roll call at the conference. The concerns expressed by all the chapters on behalf of their members revealed the commonality of the issues. This input and subsequent discussions were used to develop URISA's first advocacy agenda. The association, its chapters, and its private-sector partners will use that advocacy agenda to guide efforts in communicating with national and state/provincial governments, county commissions, city councils, and other geospatial and professional organizations about actions that will help resolve those issues or address those concerns.

Four primary themes emerged, along with areas of activity being discussed and pursued:

1. Executive support and sustainable funding for geospatial programs
- Develop, promote, and implement URISA's ROI model.
- Promote and enhance the geospatial community.
- Encourage the development of GeoAuditing.

2. Nationwide development of high-quality, publicly accessible geospatial data
- Develop and implement the GIS Capability Maturity Model (discussed in the *ArcNews* Winter 2010/2011 issue).
- Coordinate advocacy with the National States Geographic Information Council (NSGIC) and other organizations on For the Nation data initiatives.
- Support the Coalition of Geospatial Organizations (COGO) Geospatial Report Card and NSGIC Geospatial Maturity Model.

3. Affordable geospatial training programs offered by academic institutions and other organizations
- Support the GeoTech Center and others in developing affordable geospatial training.
- Identify and promote open educational resources initiatives internationally.
- Promote more federal financial aid opportunities for part-time and nontraditional students.
- Continue developing web-based curricula of URISA workshops and webinars.
- Create web collaborations to extend the reach of geospatial education beyond URISA.

4. A highly capable geospatial workforce to meet current and future demands
- Support implementation of a Geospatial Technology Competency Model.
- Promote the use and understanding of the Geospatial Body of Knowledge.
- Develop Tier 9 of the Geospatial Technology Competency Model.

URISA's advocacy agenda is posted online at www.urisa.org/advocacy_agenda. Visit the site often for updates on activities and progress and attend GIS-Pro 2011, URISA's 49th Annual Conference for GIS Professionals (www.gis-pro.org) in Indianapolis, Indiana, in November to join the discussion in person. Send comments to Wendy Nelson, URISA executive director, at wnelson@urisa.org.

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For a directory of distributors, visit esri.com/distributors.

New Training Offerings from Esri

Training

Students Rate ArcGIS 10 Training
With the release of ArcGIS 10, Esri created new training courses and adapted existing courses to ArcGIS 10. A survey of students who completed ArcGIS 10 courses showed that
- 86 percent reported that they learned shortcuts they wouldn't have discovered without training.
- 92 percent learned efficient workflows that they would not have known without training.
- 90 percent said they were able to immediately apply what they learned to their job.

Find instructor-led courses, including *What's New in ArcGIS Desktop 10* and *What's New in Editing at ArcGIS Desktop 10*, at esri.com/training10.

Learn Key Ingredients for an Enterprise GIS
Dave Peters, manager of systems integration at Esri, created the *System Architecture Design Strategies* training course to help organizations large and small successfully plan, implement, and manage an enterprise GIS. Peters' recipe for success includes communication, planning, project management, and performance milestones. In the course, you will learn comprehensive guidelines for planning and selecting the right system architecture to meet your organization's needs, as well as unique performance validation and system capacity planning techniques for your enterprise GIS deployment.

Find out more and register at esri.com/coursecatalog.

Travel Still an Issue?
You can take training from Esri instructors without leaving your office. The Virtual Classroom provides an interactive classroom experience for most Esri instructor-led courses. See if the Virtual Classroom is for you at esri.com/virtualclassroom.

Learn a Lot in 60 Minutes
In free one-hour training seminars, you have access to Esri technical experts who guide you through new features and functions of ArcGIS 10.
- Live training seminars are presented two to three times per month and give you the opportunity to interact with presenters. View the schedule at esri.com/lts.
- Recorded seminars let you learn when it's convenient for you. See the schedule at esri.com/ts.

For More Information

Training website:	esri.com/training
Find a course:	esri.com/coursecatalog
Training Matters blog:	esri.com/trainingblog
Training on Twitter:	twitter.com/Esritraining
Subscribe to the training newsletter:	esri.com/trainingnews
Esri Press books:	esri.com/esripress

Esri Technical Certification

Register to Take a Certification Exam
Registration opened to users worldwide on January 17, 2011. Already, hundreds of Esri users have successfully completed exams and achieved one of five certifications currently available:
- ArcGIS Desktop Associate
- ArcGIS Desktop Professional
- Web Application Developer Associate
- Enterprise Geodatabase Management Associate
- Enterprise Administration Associate

Prepare to Take an ArcGIS Desktop Certification Exam
We've also introduced two new courses to help you prepare for the desktop certifications:

Skills Review for ArcGIS Desktop Associate
In this course, you will review, apply, and extend your ArcGIS skills in the areas of GIS data management, editing, visualization, and analysis. Hands-on practice with ArcGIS Desktop software is emphasized.

Skills Review for ArcGIS Desktop Professional
In a fast-paced class environment that emphasizes group discussion and hands-on practice, you will review, apply, and extend your ArcGIS skills in
- Vector and raster data management
- Data visualization
- GIS analysis
- Modeling and Python scripting
- Map production and sharing

You will leave these classes with a good understanding of the strengths and weaknesses in your body of ArcGIS knowledge, so any other preparation time you spend will be more focused and productive.

For More Information

Certification website:	esri.com/certification
Registration site:	pearsonvue.com/esri

Bermuda Is a Great Place for an Esri T-shirt

Kevin Mayall, Esri consultant partner in Bermuda, says, "I ran my first marathon here in Bermuda. My Esri race shirt from the 2010 User Conference remained comfortable for 4 hours, 38 minutes." Here he is at the event finish line on Front Street in Hamilton. Good job!

Wear an Esri T-shirt in a unique location and send a photograph to *ArcNews*. Photos will be considered for use in *ArcNews*, the expanded T-shirt section at *ArcNews* Online, or both. While digital photos sent via e-mail (tmiller@esri.com) are preferred, prints or slides can be sent to Thomas K. Miller, *ArcNews* Editor, *ArcNews* T-shirt Feature, Esri, 380 New York Street, Redlands, California 92373-8100 USA. See *ArcNews* Online at **esri.com/arcnews**.

Kevin Mayall.

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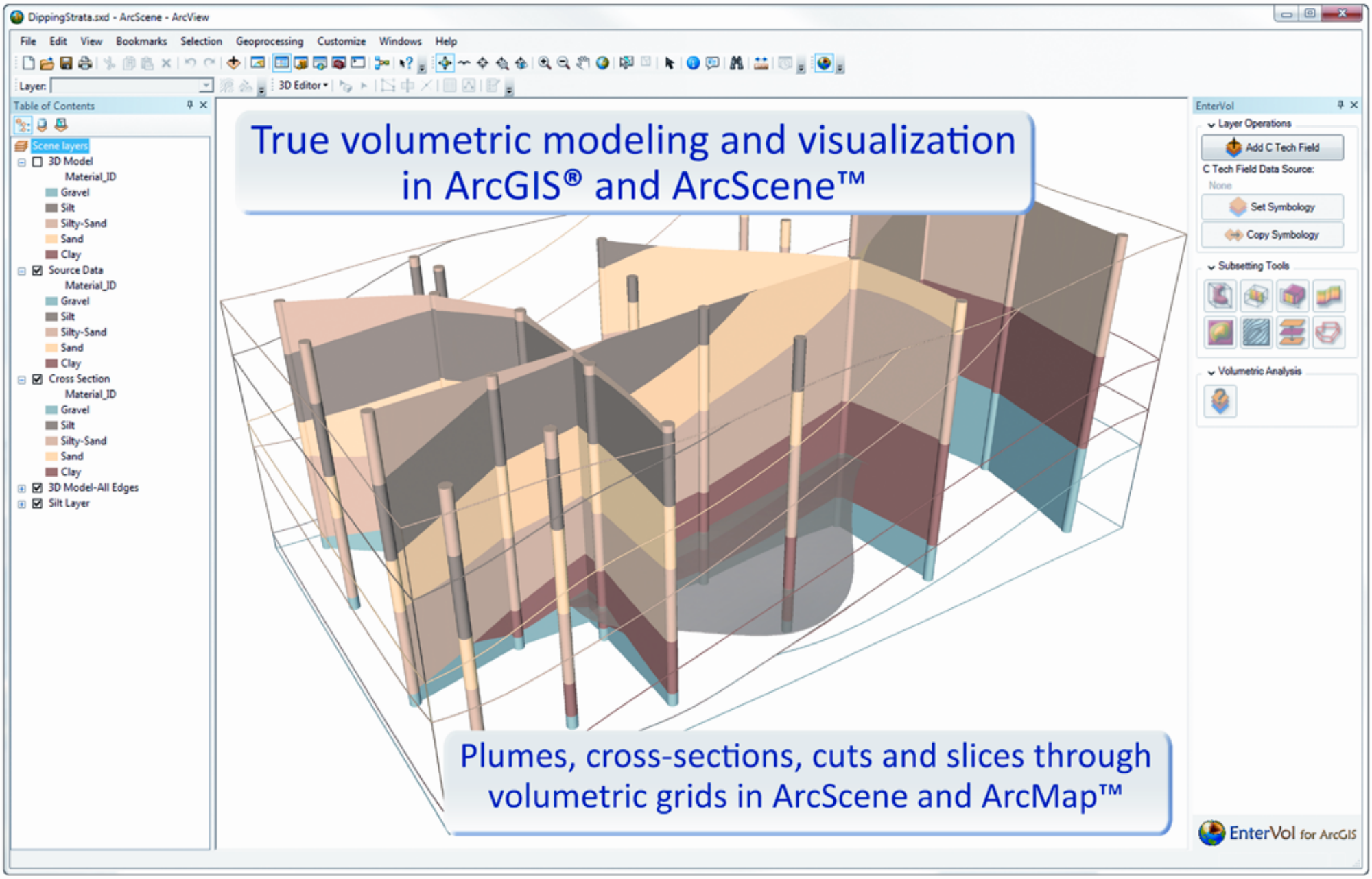

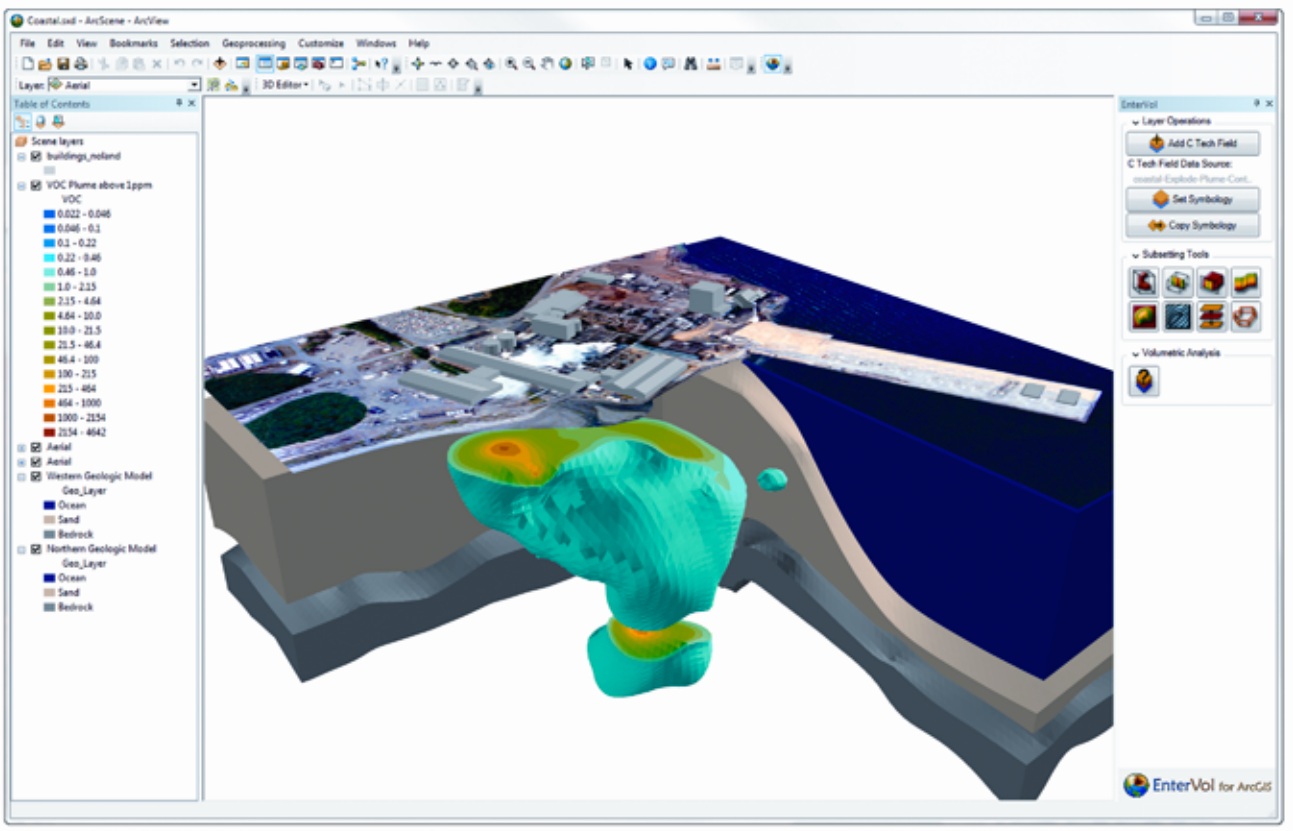

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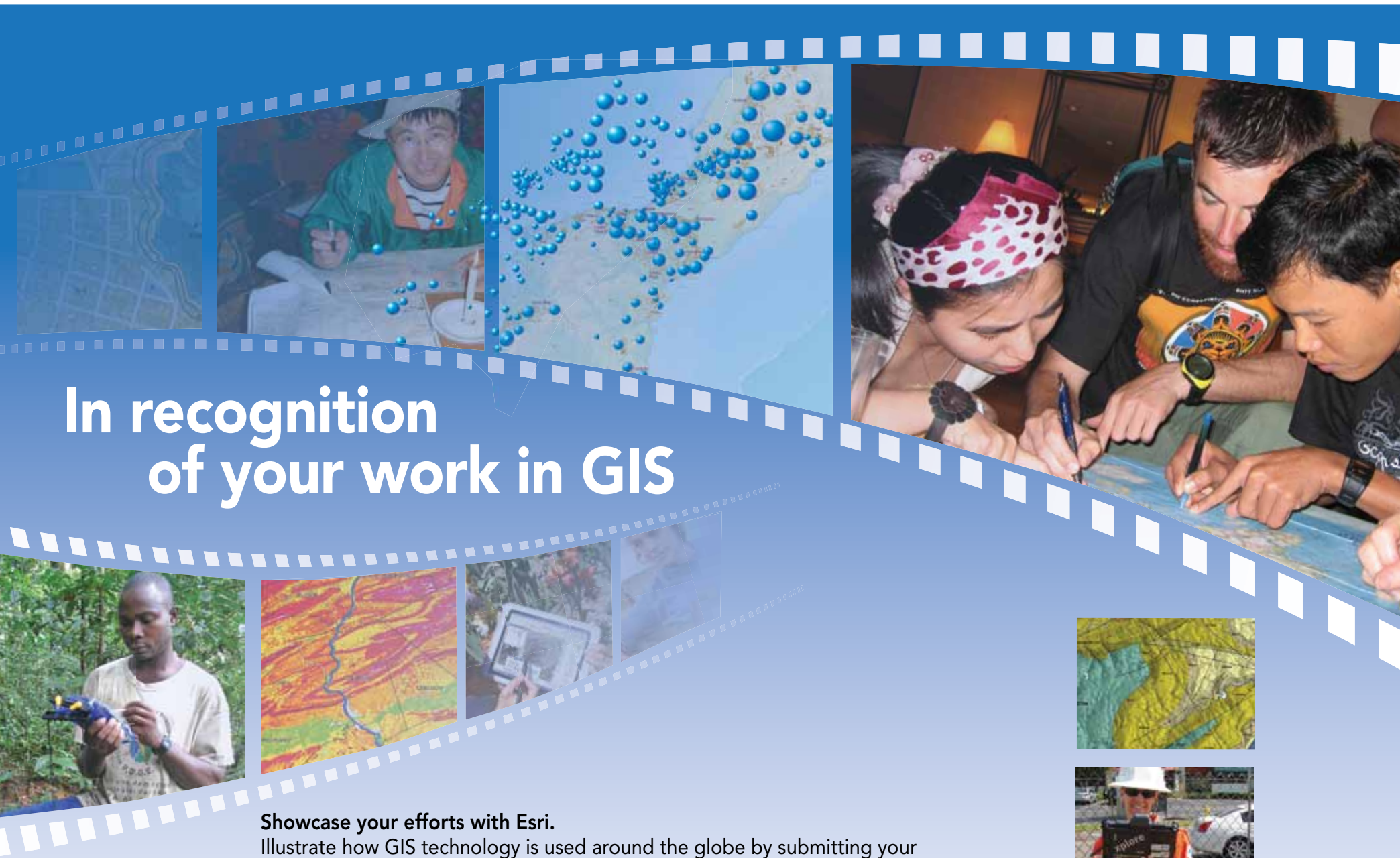

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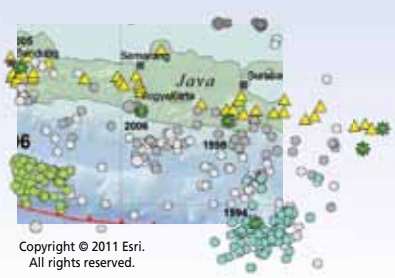

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